

**IN THE NATIONAL GREEN TRIBUNAL,  
PRINCIPAL BENCH, NEW DELHI**

**ORIGINAL APPLICATION NO. 250 OF 2025**

**U/S 14 and 18 OF THE NATIONAL GREEN TRIBUNAL ACT 2010**

**IN THE MATTER OF**

VAISHALI RANA

.....**APPLICANT**

**VERSUS**

UNION OF INDIA AND OTHERS

.....**RESPONDENTS**

**INDEX**

<b>Sl. No.</b>	<b>Particulars</b>	<b>Pages</b>
<b>01</b>	<b>INDEX</b>	<b>1-2</b>
<b>02.</b>	<b>Additional Affidavit on behalf of the Applicant</b>	<b>3-12</b>
<b>03.</b>	<b>Annexure A1/1</b> True copy of the order dated 21.05.2025 and 09.09.2025	<b>13-14</b>
<b>04.</b>	<b>Annexure A1/2</b> True copy of the relevant extract of the Land Revenue Settlement of the Gurgaon District (1882) and the map	<b>15-25</b>
<b>05.</b>	<b>Annexure A1/3</b> True copy of the <i>Assessment Report of Nuh Tahsil, Gurgaon District</i> containing all references to "Kotla Jhil"	<b>26-191</b>
<b>06.</b>	<b>Annexure A1/4</b> True copy of the land-acquisition declaration	<b>192-196</b>
<b>07.</b>	<b>Annexure A1/5</b> True copy of National Wetland Atlas, Haryana	<b>197-320</b>

<b>08.</b>	<b>Annexure A1/6</b> True copy of the D.O. letter dated 13.09.2025 issued by the Additional Chief Secretary (Environment), Government of Haryana	<b>321-323</b>
------------	---	----------------

**DRAWN AND FILED BY**

Gaurav Kumar Bansal  
Advocate  
For  
Applicant  
A26, Basement  
Jangpura Extension  
New Delhi – 14

New Delhi

**IN THE NATIONAL GREEN TRIBUNAL,  
PRINCIPAL BENCH, NEW DELHI  
ORIGINAL APPLICATION NO. 250 OF 2025**

**U/S 14 and 18 OF THE NATIONAL GREEN TRIBUNAL ACT 2010**

**IN THE MATTER OF**

VAISHALI RANA

.....**APPLICANT**

**VERSUS**

UNION OF INDIA AND OTHERS

.....**RESPONDENTS**

**ADDITIONAL AFFIDAVIT ON BEHALF OF THE APPLICANT**

**MOST RESPECTFULLY SHOWETH:**

I, Vaishali Rana, D/O Lt. Col. H.S. Rana, aged about 47 years residing at C-604, Sarve Satyam Co-operative Group, Housing Society Ltd., Plot No. 12, Sector-4, Dwarka, Delhi-75 do hereby solemnly affirms and declares:

1. That I am the applicant in the present Original Application and as such well conversed with the facts and circumstances of the present case.
2. That the Original Application pertains to the ecological degradation and unregulated anthropogenic activities threatening the Kotla-Akhera Wetland, situated in District Nuh, Haryana, which serves as a critical seasonal habitat for numerous resident and migratory bird species traversing the Central Asian Flyway (CAF).



3. That the Applicant in the Original Application sought the following prayers:

- a) Direct the Respondents to take immediate steps for the identification, notification, and protection of the Kotla-Akhera Wetland and restore its ecological integrity;
- b) Direct the Respondents to declare the Kotla-Akhera Wetland as a 'Biodiversity Heritage Site' under Section 37(1) of the Biological Diversity Act, 2002, considering its ecological significance, endemic and migratory bird population, and its role as a critical habitat supporting fragile ecosystems;
- c) Direct the Respondents to take immediate measures under Section 36(2) of the Biological Diversity Act, 2002, by issuing appropriate directions to the Haryana State Biodiversity Board (HSBB) and the State Government of Haryana to protect, conserve, and manage the Kotla-Akhera Wetland and its biological diversity;
- d) Direct the Respondents to develop national strategies, plans, and programmes for the conservation and sustainable use of the biological diversity of the Kotla-Akhera Wetland, in accordance with Section 36(1) of the Biological Diversity Act, 2002, including specific



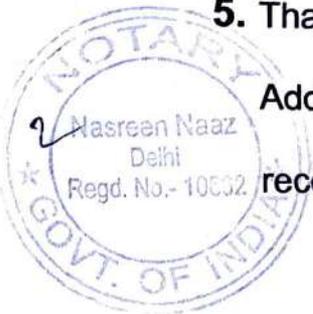
action plans for habitat preservation, pollution control, and ecological restoration;

- e) Direct the Respondents to remove all encroachments and restrain all illegal developmental, constructional, or polluting activities in and around the Kotla-Akhera Wetland that threaten its ecological integrity and avian population;
- f) Pass any other order or direction that this Hon'ble Tribunal may deem fit and proper in the facts and circumstances of the case, in the interest of environmental justice.

4. That this Hon'ble Tribunal, vide order dated 21.05.2025, and subsequently thereafter, on 09.09.2025 directed the Applicant to place on record *additional material* demonstrating the existence of a water body at Kotla-Akhera, District Nuh, Haryana, and the adverse impact of anthropogenic disturbances on the said water body.

**True copy of the order dated 21.05.2025 and 09.09.2025 is annexed and marked herewith as Annexure A1/1.**

5. That pursuant to the said directions and in continuation of the first Additional Affidavit already filed, the Applicant respectfully brings on record further authoritative documentary material which conclusively



establishes the historical existence, hydrological character, administrative recognition, and ecological importance of the *Kotla-Akhera Wetland / Kotla Jheel*.

6. That the Applicant relies upon the Land Revenue Settlement of the Gurgaon District (1882) authored by F.C. Channing, Settlement Officer, a government publication of unimpeachable authenticity forming part of the official colonial revenue survey. That the said Settlement Report contains a high-quality, official survey map depicting the Kotla Jheel, marked clearly as a major natural lake/depression within the Nuh region. This is one of the earliest official cartographic records of the water body and establishes its long-standing existence as a natural wetland.

**True copy of the relevant extract of the Land Revenue Settlement of the Gurgaon District (1882) and the map is annexed and marked herewith as Annexure A1/2.**

7. That the Applicant further places reliance on the *Assessment Report of Nuh Tahsil, Gurgaon District*, prepared by G.M. Boughey, C.S., Assistant Settlement Officer, and printed at the Government Press, which is another administrative document forming part of revenue



records. That this Assessment Report contains multiple explicit references to the Kotla Jhil:

- i. That the Kotla Jhil, described as the *chief natural depression* of the Nuh basin, lying immediately under the western range of hills, receiving drainage from Alwar (South), Gurgaon Tahsil (North) and the hill systems on either side.
- ii. That the Kotla Jhil historically functioned as the primary natural receptacle of drainage from the entire Nuh basin, including hill-torrents and the Landoha system, and in years of heavy rainfall remained submerged for long periods, thereby forming the primary hydrological receptacle of the entire basin.
- iii. That the document also describes in detail the construction of embankments (bunds) over the last century whose primary object was to prevent excessive flooding of the Kotla Jhil depression, demonstrating long-standing governmental recognition of the Kotla wetland system.
- iv. That the Assessment Report also records the special fiscal regime applied only to the Kotla Jhil villages because of fluctuating water levels ("fluctuating assessment"), confirming



that the area was officially recognised as a waterbody/wetland subject to periodic submersion.

That, therefore the Assessment Report unequivocally confirms that the Kotla Jhil is a natural lake (jhil) forming part of the hydrological identity of Nuh, and has been treated as a water-retaining natural depression by the Revenue Administration for nearly two centuries, leaving no doubt whatsoever about the existence, extent, ecological significance, and historical continuity of the water body i.e. Kotla-Akhera Wetland.

**True copy of the Assessment Report of Nuh Tahsil, Gurgaon District containing all references to "Kotla Jhil" is annexed herewith as Annexure A1/3.**

8. That the Applicant also places on record a Governmental land-acquisition declaration regarding the Kotla depression / Kotla Jheel area, issued in exercise of the powers under the Land Acquisition Act, 1894. The material includes the declaration that the land specified therein was "required by the Government, at public expense, for a public purpose, namely for the constructing Reservoir for irrigation in

Kotla Depression in Village Akera, Tehsil Nuh, Dist. Mewat"



True copy of the said land-acquisition declaration is annexed herewith as Annexure A1/4.

9. That the said land-acquisition declaration is significant for the following reasons:

- i. it is contemporaneous administrative recognition by the State that a topographic depression/surface waterbody existed at Kotla and that the State proposed to create/rehabilitate a reservoir in that depression for irrigation;
- ii. it constitutes additional documentary evidence of the long-standing presence and public importance of the Kotla depression/wetland; and
- iii. it confirms that the State has treated the area as water-retentive/irrigation-worthy land, which is squarely germane to the issue of existence, ecological character and statutory protection of the Kotla-Akhera wetland.

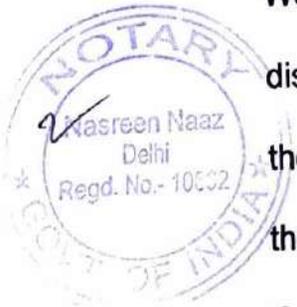


10. That the Applicant also wishes to place reliance on the National Wetland Atlas, Haryana as part of Project in National Wetland Inventory & Assessment, wherein the (District Gurgaon – Chapter 7.1.18) expressly identifies 'Kotla Dahar Lake' as one of the important natural depressions forming part of the district's drainage system. The Atlas

further records that this depression is ecologically linked with the larger chain of lakes and natural basins in the region, including Khalilpur Lake, Chandaini Lake, Sangel-Ujina Lake and Najafgarh Lake. Accordingly, the existence of the Kotla Jheel stands conclusively established through the Government of India's own satellite-based wetland mapping exercise undertaken by ISRO-SAC.

**True copy of National Wetland Atlas, Haryana is annexed and marked herewith as Annexure A1/5.**

11. That in continuation of this recognition, the Applicant also places reliance on a D.O. Letter dated 13.09.2025 issued by the Additional Chief Secretary (Environment), Government of Haryana, addressed to all Deputy Commissioners, pursuant to the directions of the Hon'ble Supreme Court in W.P.(C) 304/2018 – Anand Arya v. Union of India. The said communication mandates all districts to undertake ground-truthing and boundary demarcation of all wetlands identified in the SAC Wetland Atlas (2021) within prescribed timelines, and encloses the district-wise list of 1,881 water bodies requiring verification, including those located in Nuh district. The combined effect of the SAC Atlas and the ACS Environment D.O. letter is that both the Union and the State Governments have officially acknowledged the presence of wetlands



and natural depressions in the Kotla–Akhera region, thereby reinforcing the Applicant's plea that Kotla Jheel constitutes an existing, ecologically significant wetland requiring legal protection.

**True copy of the D.O. letter dated 13.09.2025 issued by the Additional Chief Secretary (Environment), Government of Haryana is annexed and marked herewith as Annexure A1/6.**

12. That the cumulative documentary record now placed before this Hon'ble Tribunal, removes every possible doubt regarding the existence, hydrological character, administrative recognition and ecological significance of the Kotla-Akhera Wetland. The material demonstrates beyond cavil that the Kotla Jheel is a long-standing natural depression forming part of the regional drainage system and continues to function as an ecologically sensitive wetland requiring immediate protection from anthropogenic pressures.

13. That in view of the facts and documents placed on record, any further delay in notifying, conserving and restoring the Kotla-Akhera Wetland would result in irreversible ecological loss, continued habitat destruction, and potential violation of the binding statutory obligations under the Wetlands (Conservation and Management) Rules, 2017, the



Biological Diversity Act, 2002, and the constitutional mandate under Articles 48A and 51A(g).

14. That the Applicant therefore respectfully prays that this Hon'ble Tribunal may be pleased to take on record the present Additional Affidavit, along with the annexed documents, and pass appropriate orders in furtherance of the reliefs already sought in the Original Application, in the interest of environmental protection and justice.
15. The balance of convenience lies squarely in favour of the Applicant, and grave prejudice will be caused to the environment and local biodiversity if urgent protective measures are not directed.
16. That the applicant has not approached any other court or tribunal seeking similar relief as prayed before this Hon'ble Court.

I Identify the deponent who has signed in my presence

*Vishal Kumar*  
DEPONENT

VERIFICATION:

- 2 DEC 2025

Verified at New Delhi on this day of 28<sup>th</sup> of November, 2025, that the contents of the above affidavit are true and correct to the best of my knowledge and nothing material is concealed therein.

*Vishal Kumar*  
DEPONENT



ATTESTED

*N*  
NOTARY DELHI (INDIA)

- 2 DEC 2025

Item No. 03

Court No. 1

**BEFORE THE NATIONAL GREEN TRIBUNAL  
PRINCIPAL BENCH, NEW DELHI**

Original Application No. 250/2025

Vaishali Rana Trustee Aravalli  
Bachao Citizens Movement

Applicant

Versus

Union of India &amp; Ors.

Respondent(s)

Date of hearing: 21.05.2025

**CORAM: HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON  
HON'BLE DR. AFROZ AHMAD, EXPERT MEMBER**

Applicant: Mr. Gaurav Kumar Bansal, Ms. Nandita Bansal, Ms. Chandrika  
Upadhyaya & Mr. Vishnu Kumar Gupta, Advs. for Applicant

Respondents: None.

**ORDER**

1. Learned counsel for the applicant seek short adjournment to place on record additional material in support of the plea that there is a water body existing on Kotla-Akhera in District Nuh, Haryana and also that the water body is affected on account of some anthropogenic activities.

2. List on 08.09.2025.

Prakash Shrivastava, CP

Dr. Afroz Ahmad, EM

May 21, 2025  
AB

Item No. 04

Court No. 1

**BEFORE NATIONAL GREEN TRIBUNAL  
PRINCIPAL BENCH, NEW DELHI**

Original Application No. 250/2025

Vaishali Rana Trustee Aravalli  
Bachao Citizens Movement

Applicant

Versus

Union of India &amp; Ors.

Respondent(s)

Date of hearing: 09.09.2025

**CORAM: HON'BLE MR. JUSTICE PRAKASH SHRIVASTAVA, CHAIRPERSON  
HON'BLE DR. A. SENTHIL VEL, EXPERT MEMBER**Applicant: Mr. Gaurav Kumar Bansal, Ms. Nandita Bansal & Ms. Chandrika  
Upadhyaya, Advs. for Applicant**ORDER**

1. Learned Counsel appearing for the Applicant seeks further four weeks' time to place on record the additional material in terms of the previous order dated 21.05.2025.

2. List on 03.12.2025.

Prakash Shrivastava, CP

Dr. A. Senthil Vel, EM

September 09, 2025  
dv

272

LAND REVENUE SETTLEMENT

OF THE

GURGAON DISTRICT;

BY

F. C. CHANNING, Esquire,

LATE SETTLEMENT OFFICER.



Lahore :

PRINTED AT THE CENTRAL JAIL PRESS,

1882.

15

# LAND REVENUE SETTLEMENT

## OF THE

### GURGAON DISTRICT.

#### CHAPTER I.—THE DISTRICT.

*Section 2.*—The Gurgaon district, which forms the subject of this report, is of a very irregular shape, and contains a total area according to the professional survey of 1,946·87 square miles, and according to the Settlement survey of 1,940·797 square miles; of which the professional survey shows as cultivated and fallow 1,560·332 square miles, and the Settlement survey 1,558·175 square miles. It lies at a height of from 600 to 700 feet above the sea, and between 76° 20' and 77° 35' east longitude and 27° 40' and 28° 32' north latitude. It is one of the three districts of the Delhi division, and is the extreme south-east corner of the territories ruled by the Lieutenant-Governor of the Punjab. It is bounded by the Delhi district on the north-east; separated by the Jumna from the districts of Bulandshahr, Aligarh and Muttra on the east; bounded on the south by Muttra and the state of Bhartpur; on the west by Alwar; on the south-west, *i. e.*, south of the Rewári tahsil, by the Jaipur pargana of Kot Kasim, the Bawal pargana of Nabha, and by Alwar; on the north-west by the Kanti pargana of Nabha; and on the north by Dujana, the British district of Rohtak, and the little state of Patandi, which it almost encloses in its clasp. It is at present divided into five tahsils, the names of which with their respective areas are given below:—

*Area by professional survey.*

	<i>Acres.</i>	<i>Sq. Miles.</i>
Gurgaon           ...	273,372	427·14
Rewári           ...	260,646	407·25
Palwal           ...	246,603	385·32
Náb               ...	271,365	424·01
Firozpur       ...	194,014	303·15

I take these areas from the table in the Revenue Survey map of Gurgaon, where the tahsils are given as they at present stand, after the changes sanctioned in Secretary to Government's letter No. 1521, of 29th October 1875.

There are 1,264 separate estates.

*Section 3.*—The hill ranges of the district form a marked feature in its physical characteristics: they are connected with the great Aravalli chain, of which they are among the most northern spurs, and like that range their general direction is from S. S.-W. to N. N.-E. One chain forms the western border of the district from the south-western corner of the Firozpur tahsil to a point about opposite the town of Náb.

There the district boundary line turns off to the west, while the range runs on in the same course, and then sweeping off in a curve to the west, ends in three short spurs, two thrown out to the north and one to the west. Another range on the east of this one runs almost parallel to, but gradually diverging from it. After a course of 25 miles northwards from the southern border of the district, it becomes more and more broken, and for 20 miles its existence can only be traced by a line of detached rocky hillocks of various sizes, appearing here and there above the surface of the ground. Then it once more reappears as a range, and, forming the north-eastern boundary of the district, runs with gradually lessening height past the northern boundary of the district into Delhi.

These are the only chains of any unbroken length; but short broken ranges and detached hills are numerous in the south and west of Rewári, whence they just cross the border into Rohtak and are also found to the north-east of Rewári, the north-west of Núh, and in the eastern portion of the Ferozpur tahsil, formerly known as the parganah of Funáhána. The total hill area of the district is shown by the professional survey as 99·397 square miles. As to the geological formation of these ranges, I quote from page 52 of the *Geology of India* by Medlicott and Blanford:—"The many narrow ridges stretching from the south-west into the plains at Delhi and to the west in Hissar, are probably formed of some group or other of Arvalli series. They all have a core of quartzite with more or less vertical bedding, and the associated rocks, as far as they are exposed on the flanks of the ridges, indicate advanced metamorphism." Iron, inferior plumbago, and mica are found in these hills, and I have been shown what were alleged to be traces of copper. The hills are generally of inconsiderable height, generally lessening as you proceed northwards, of the same general character as the well-known ridge at Delhi, and frequently of considerable breadth at the summit; the range between Delhi and Gurgaon is in places more than three miles broad. I estimate the ordinary height of the ranges above the plain from 500 to 750 feet: the hill above Meoli is marked on the map as 1,347 feet above the sea, the elevation of the plain below being about 625 feet. The isolated hill of Tankri is the highest in the district, and must reach, I should estimate, quite 2,000 feet above the sea. This, however, is only a rough guess.

*Section 4.*—Except the Jumna, the deep stream of which forms the eastern boundary of the district and the province, within which it is therefore partly contained, there is no river of permanent flow in the district; but the Sahibi, which rises in Jaipur, passes through the east of Rewári, where its sandy bed is in places more than half a mile broad, into Pataudi and the Rohtak district, one branch passing also through the north-west of Gurgaon. After heavy rain in Jaipur, this stream sometimes comes down with great force, and it has twice, within the last generation, flooded the town of Rewári; in 1845, and on the 15th August 1873. On both occasions

the water came from the south by Lalpur and Dawána, having left the proper bed, which must gradually have been raised by the deposits of sand in Alwar state. In August 1873, the water came at mid-night, and was some 3 feet deep in the city; it flowed away to the northwards in some three or four hours, but caused considerable damage in the city, and outside it utterly destroyed the railway bungalow, and swept away large portions of the line.

**The Kanshaoti or Kasháwati.** another stream rising in Jaipur, runs through the north-west of Rewári and passes into Dujána; formerly, according to the old maps, it joined the Sahibi in Rohtak, but I believe that its waters now never reach so far. Like the Sahibi and most of the other streams it brings down a great deal of sand.

**The Indori.** Two different streams go by the name of Indori, so called from Indor in the Alwar hills not far from Nuh, near which they both rise, or rather commence their course; for like all the other streams of occasional flow, they are merely torrents running for a few hours after rain. One of these streams enters the district at Nandrapurbás and falls into the Sahibi opposite Jarthal: the other flows northward into the country round Taora, and after being joined by a number of other small nullahs, bringing down the drainage of the surrounding hills, spreads its waters over the low country south of Bahora, and eventually joins the Sahibi. Thus the Sahibi, while it only comes down in full force after heavy rain, in the north of Jaipur, flows with a smaller stream after merely local rain, carrying off the discharge of the Indori.

**The Bádshahpur nullah.** The Bádshahpur nullah brings down the drainage of part of the Balabgarh tahsil of Delhi through a gorge in the range, dividing Delhi and Gurgaon: it formerly flowed southwards through the Bhundsi valley, but more than a century-and-a-half ago it was diverted by the construction of a bund by Bahadur Singh of Gháséra into its present course, falling into the Najafgarh jhil. In the heavy floods of 1875, part of its stream found out its old channel and swept down past Bhundsi.

**The Landoha.** Another important stream is the Landoha, which is formed by the union of two streams in Alwar, one flowing south from the direction of Tijárah and the other joining it nearly at right angles from the west. After pursuing its southward course to a point nearly directly west of the southern end of the Firozpur tahsil, it sweeps round in a curve and, crossing the border, flows northwards up the Firozpur valley, and if left to itself would finally fall into the Kotila jhil. It will be found again referred to in the extracts from the assessment report of the Firozpur tahsil.

**The Manise.** Formerly a far more important stream, the Manise or (Manase, i. e., man taker), now generally known as the Rupareil, entered the district from Alwar and passed up the Firozpur valley along the Landoha channel. Bábar in

his autobiography mentions that it then fell into the Kotila lake, but later it either was artificially diverted or naturally found out its present course into Bhartpur. The tradition as recorded by Mr. C. Gubbins, in a memorandum quoted in some correspondence on the subject of the Landoha is, that some Meos violated and then murdered some women in the bed of the river, then dry in the hot winds, and that a fakir who lived near by left it with the curse, that the streams should never again enter the polluted bed.

Besides these more important streams, there are numerous torrents of short course, which after rain rush down with the water drained from the hillsides and spread their floods over the lower levels. There are also a few petty brooks fed by springs, the most important of which is the Jhirr of Firozpur.

*Section 5.* — Another marked physical characteristic of the district is found in its jhils or lakes. The most important of these is the Najafgarh jhil on the northern border of the district; but this is mainly situated in the Delhi district. Into it the Sahibi, swollen by the Indori, and the Bádshahpur stream pour their waters.

Another jhil, but of very much smaller size, is that known as the Sarmathla jhil in the south-east of the Gurgaon tahsil near the Delhi border.

The other jhils of the district are found in the tract of Núb, lying under the first range of hills mentioned in para. 3. This is a low-lying strip of country, the natural receptacle of the drainage of the Firozpur valley and parts of Alwar to the south; of the higher land to the east; of the hills that lie on both sides the Bhundsi valley to the north; and of the eastern slopes of the bounding range to the west. From all these four quarters, but principally from the north and south, come during the rainy season the surplus drainage waters of the surrounding country. Omitting for the present mention of the works which will hereafter be described, the natural course of these flood-waters is from the north part into the Khalilpur jhil. This receives the overflow of the Sarmathla jhil which passes to the south through a sort of escape channel; the drainage of the eastern slope of the southern part of the range dividing Delhi and Gurgaon; and part of the drainage of the Bhundsi valley. The Khalilpur jhil again has a natural escape channel which conducts the surplus waters into the Chandeni jhil, which also receives directly the other part of the drainage of the Bhundsi valley.

The only natural outlet for the waters of the Chandeni jhil is towards the Kotila jhil lying further south immediately under the Firozpur-Alwar hills and on the

The Kotila jhil.

borders of the Núh and Firozpur tahsils. This jhil also forms the natural receptacle of the drainage of the Firozpur valley including the Landoha, and in former days the Manisne. It is the largest of the Gurgaon lakes, and is some 3 miles long from north to south by 2½ miles broad.

Although a great part of the water, which would naturally pour into it, is diverted by artificial works, the jhil remained filled during 1874-5-6, and before these works were constructed can hardly ever have been free from water. The other jhils are usually quite dry in the hot weather, and unless the rains have been somewhat heavy, their whole area is generally cultivated, either with the usual spring crops or the later sown melons and spring juár, used for fodder. But after heavy rain the greater part of this low tract of Núh is flooded and one continuous sheet of water sometimes exists for nearly 20 miles.

*Section 6.*—I shall reserve my more detailed accounts of the country until I describe the assessment circles; here I shall content myself with stating, that although the Gurgaon and Rewári tahsils, forming the northern and western parts of the

Brief account of the general aspect of the district.

district, are generally sandy,—the lands near the hills are very inferior and often cut up into a perfect net-work of ravines,—further from the hills, in some tracts, the soil is better, approaching a light loam in its character; in other places it is of very loose consistency, and some parts present a desolate appearance with high hillocks of sand. To the south-east and south-west of Gurgaon, low-lying lands of a better character are found, which are benefited by natural irrigation, and on the north border of Gurgaon is the low basis of the Najafgarh jhil. The banks of the Jumna are generally high, but in the north-east corner of the Palwal tahsil there is a small tract between the main and a small branch channel of the river, low-lying and liable to inundation. From the Jumna and this tract westwards there is a stretch of country some 30 to 35 miles from north to south, and some 15 to 20 miles from east to west of a level good loam, rising gradually from the Jumna and then sloping to the east and south, and extending over most of the Palwal tahsil and the eastern portions of the Núh and Firozpur tahsils. Between this plain and the range of hills mentioned as dividing Gurgaon and Alwar, there is in Núh the low-lying country before mentioned. There the prevailing soil is clay, but immediately under the hill and to the north-east of Núh and in the north-west of Palwal, the country is very sandy. The part of Núh which lies above the hills is a high-lying table-land of a consistent but sandy loam, inferior near the hills, but sloping down towards the somewhat better lands in its central and western parts; while the part of Firozpur not contained in the plain above mentioned, consists of a valley between two ranges of hills, the lands of which are generally good, but are partly damaged by sand deposits; the soils near the hills are generally inferior, and the valley merges on the north into the Núh tract of depression. Map No. VIII shows the distribution of the soils.

*Section 7.*—The average rain-fall of the district may be taken at about 30 inches. The average fall, as registered at the head-quarters of each tahsil during the 10 years ending with 1876, was as follows:—

Gurgaon	...	...	...	28.6
Bewári	...	...	...	31.7
Núh	...	...	...	32.0
Palwal	...	...	...	33.6
Firozpur	...	...	...	31.1

An analysis of the rain-fall returns given with the Revenue Report for the sixteen years, 1863 to 1878, both inclusive, gives the following results:—

Month.	Total rain-fall of 16 years.	Annual average.	Number of years in which no rain fell in the month in question.	Maximum rain-fall.
	Inches.	Inches.		Inches.
January	11.9	0.7	4	3.4
February	7.5	0.5	7	1.5
March	10.9	0.7	6	2.1
April	3.3	0.2	9	0.9
May	19.5	1.2	4	2.7
June	40.0	2.5	3	7.6
July	160.8	10.0	...	24.9
August	103.3	6.5	1	16.7
September	89.3	5.6	1	28.3
October	10.9	0.7	9	3.5
November	0.3	...	15	0.3
December	6.9	0.4	8	3.5

The average annual rain-fall of these sixteen years was 29 inches, the maximum 46.1 inches in 1873, and the minimum 11.3 in 1868.

*Section 8.*—The climate generally is more temperate than that of the Punjab proper, the cold in winter and the heat in summer are both less extreme. Near the hill ranges, however, and in the Firozpur valley, bounded as it is by hills on either side, the heat is very great; and in some villages which lie immediately under the hills, the people are accustomed to go out in the fields to sleep at night, so as to escape the heat radiated from the glowing masses of rocks.

*Section 9.*—The flooded tracts near Núh are terribly fever-stricken in years of abundant rain-fall, and few men can stand a lengthened residence at Núh without injury to their constitution. The higher parts of the district, and notably the Taoru table-land, and the high plain of Palwal and the east of Núh and Firozpur used to be very healthy; but fever has come with the Agra canal into the villages along its course in the high plain,

and last year the west of the district was like the neighbouring tracts devastated by fever. The town of Rewári has been unhealthy ever since the incursion of the Sahibi in 1873.

The most unhealthy months are September, October and November, while in February the deaths are at their minimum point. Fever is the chief cause of mortality, but cholera visitations are not rare, and are sometimes very severe: while the district is, I believe, the worst in the Punjab for small-pox.

*Section 10.*—The district has from time to time suffered severely from the effects of drought; beginning with the well-known "Chalisa" the effect of which were so terrible in all this part of India. The years of drought still remembered in the district are the following:—

A. D.	Sambat.			
1783-84	1840	...	...	Severe famine.
1803-4	1860	...	...	Scarcity.
1812-13	1869	...	...	Scarcity.
1817-18	1874	...	...	Scarcity.
1824-25	1881	...	...	Scarcity.
1833-34	1890	...	...	Severe famine.
1837-38	1894	...	...	Severe famine.
1843-44	1900	...	...	Scarcity.
1850-51	1907	...	...	Scarcity.
1860-61	1917	...	...	Famine.
1868-69	1925	...	...	Scarcity.

To these must now be added the famine of 1877-78. The effects of the droughts of 1860-61 and 1868-69 were greatly mitigated by the relief afforded by Government and the liberality with which the people were treated in the matter of collecting the revenue. I have reason to believe that the people generally compare very unfavourably with the treatment they then received, the action taken in what I believe to have been the worse famine of 1877-78.

*Section 11.*—Map No. IV shows the varying depths to water of the wells in the various villages, each difference of 10 feet being distinguished by a separate colour; the estates which are destitute of wells are left blank. As might be expected from the varied configuration of the country the depths to water are very diversified, ranging from under 10 feet to over 120 feet. The wells in the tract watered by the Agra canal were measured before the commencement of irrigation. The details of the well irrigation of each circle and tahsil will be found in the appendices; in some parts of the district, as in the low-lying flooded tracts of Núh in the villages near the hills, where the depth to water is great, and in some tracts where the soil is good but the water somewhat deep and not very good, the area under well irrigation in years of average rain-fall is unimportant. In some of these tracts well irrigation, from the saltiness or depth of the water, is practically impossible; in others, the wells exist and are worked when the season is unfavourable for dry cultivation, although the expenses are too great to make it worth

while to use the wells much when the rains are favourable. In other parts of the district, and especially in tahsil Rewári and parts of tahsil Gurgaon, the well irrigated area is comparatively large and the produce raised on the well land is very important. The bucket and rope or lao-charas system of working the wells prevails throughout the district; the Persian wheel is absolutely unknown. One immense well at Bîwan, known as Raja Bal's well and dating from before the advent of the present Meo owners of the village in the Firozpur tahsil, has room for twelve laos and possesses an inexhaustible supply of water; but I do not remember any other well with more than four laos, and most wells have only one or two laos. The area which can be irrigated from a lao varies greatly according to depth and supply of water, and the character of soil and the season; for a well of about 30 feet deep about ten acres may be taken as an average. Where water is near the surface, *dhénklis*, i. e., lever buckets, are sometimes used, especially for market gardening near towns, but the area thus irrigated is insignificant. In many parts of the district, *kacha* wells, i. e., wells without masonry cylinders, are numerous; they are constructed with cylinders made either of timber or of wattled branches, and last very various periods according to the character of the soil and the rain-fall; in other parts the character of the subsoil makes the construction of such wells impracticable.

**Section 12.**—A marked peculiarity of the Gurgáon district is the

Character of well water  
sweet, brackish, and salt.

saltiness or brackishness of the water supply in many parts; in some tracts, such as Chak Chiknot of Firozpur, the water is invariably salt, in others it is everywhere sweet, and in others again it is impossible to tell beforehand whether a well will be sweet or salt; and sometimes there are two strata of water, one salt and the other sweet, so that the well when first worked is sweet, and after being worked some little time, yields salt water. I think it may be said that the wells are especially liable to be salt, (1), when the depth to water is considerable and the soil of a clayey character (as a rule, in sandy villages the water is sweet); (2), in tracts, which are low-lying and receive and retain the drainage of higher lands: the salt producing tracts near Farakhnagar and near Núb both fall under this heading. The wells are classed in the Settlement papers as sweet, brackish, or salt: the effect of the character of the water on the produce depends partly on the nature of the soil; where this is sandy, a certain amount of saltiness in the water is a positive benefit, and where the water is very salt, very fine crops can be grown if the seed is once sprouted by rain water; on the other hand, on a clay soil saltiness in the water is very prejudicial. For vegetables and tobacco, sweet or only slightly brackish water is ordinarily necessary. Besides the above three descriptions of water, there is a kind of water found in some wells in Rewári, known as *matwála*, or hard, the crops on which are generally good; and there are also a few wells in which the water is sweet *kallar*; on sweet *kallar* wells and on very salt wells on clayey soils, it is often necessary to let the land, which has

been watered one year, lie fallow or be cultivated with rain crops the next year, in order to prevent its becoming unculturable.

In some parts of the district the only drinking water which the people can get is procured from wells sunk close to the village tank or pond, and is, in fact, the pond water roughly filtered. If the pond goes dry in the hot weather, water has to be fetched sometimes from a distance of two or three miles.

*Section 13.*—Another point which may be noticed is, that the water supply in the wells situated in that part of the district which lies east of a line drawn along the range of hills on the Alwar border, and thence prolonged northwards, is, as a rule, comparatively scanty, while west of that line it is abundant; the cause of this is probably connected with the fact shown by the course of the Sahibi, that this western part of the district is lower than the Rajputana country to the south.

*Section 14.*—Although more properly belonging to the chapter on assessment, the following statement of which all the figures but those contained in the last column have been extracted from a report furnished in Assistant Settlement Officer's letter No. 122 of 23rd April 1878, may conveniently be given here :—

Difference as to amount of water supply in the east and in the west of the district.

Revenue due to well irrigation in each circle.

assessment, the following statement of which all the figures but those contained in the last column have been extracted from a report furnished in Assistant Settlement Officer's letter No. 122 of 23rd April 1878, may conveniently be given here :—

[Statement

Augustus Census

Mandoullee

Buhadarghar

DELHI

Indrapat

Palum

Nuyogh

Bojony

Scale 2 1/2 Miles = 1 Inch.



BURHIL

SOSUH

BELLESHIRE

REWARRE

NOH

PULWEL

NOHILLA

HUTTER

HORUL

## ASSESSMENT REPORT

OF THE

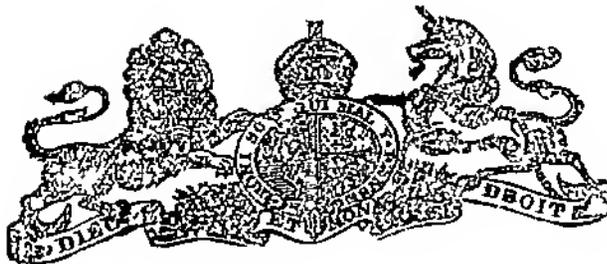
## NUH TAHSIL

OF THE

## GURGAON DISTRICT.

BY

G. M. BOUGHEY, C. S.,

*Assistant Settlement Officer.*

of its drainage, in years of heavy rainfall, finding its way out towards Bhartpur. The drainage from part of Alwar on the south, from part of Gurgaon tahsil on the north, and from the hills on either side, flows down towards the low-lying Nuh basin, and if left to itself would fill up the numerous shallow depressions in that basin, of which the chief is the Kotla Jhil, lying close under the western range of hills. A large number of embankments and drainage-cuts have however been constructed during the last century, partly with the object of making the water irrigate land it would not naturally flow over, but mainly with the object of keeping floods out of the natural depressions, where in years of heavy rainfall they swamp the land, destroy the crops and give rise to malarial fevers. The history of the district shows that until recently all the officers who have dealt with this tract have been much more impressed by the injury caused by these destructive floods than by the danger of drought, and that their efforts have been chiefly directed towards the prevention of the accumulation of water in the natural depressions. The present Settlement Officers have naturally enough been impressed by the experience of the recent series of dry years, and seem doubtful as to whether the system of embankments has done more good or harm to the tract. In such a country it is very difficult to estimate the effect on the crops and on the prosperity of the people of such a system of embankments in a long series of years, and the people themselves, with their short memories, cannot help us much in forming such an estimate. In former days their general cry was "Save us from floods and fever," now their complaint is that the embankments prevent the fertilising flood waters from reaching their lands in dry years, and reduce the outturn of their fields. Even in the case of an individual embankment it is difficult to judge of its general utility. In a year of heavy rainfall it retains the floods on the land above it, and, unless the ponded up water is let out in good time, this land may be unsowable, if the embankment were not there, the lands below would be swamped, in a year of poor rainfall, on the other hand, the land above the embankment benefits by the retention of the water, while the land below is crying out for it. In such circumstances it behoves us to take a broad general view and to consider the history of a long series of years. I have, in paragraph 3 above, pointed out how much below the previous average has been the rainfall of the last twelve years, and given the reasons which lead me to the conclusion that this period has been abnormal, and that we must expect a return to an average rainfall more like that of the previous period, and be prepared for years of heavy rainfall, destructive floods and swamping. It would be shortsighted to jump to the conclusion that the embankments on the whole now do more harm than good. They must have had some effect in reducing the floods in the low country, but it is only reasonable to conclude that the contraction of the flooded area is more largely due to the scantiness of the recent rainfall than to the construction of the embankments. There are indirect, and yet undoubted, advantages from the existence of these embankments which are difficult to estimate in figures. They prevent the formation of ravines, and save the fields below from being overwhelmed with destructive sand: they add moisture to the fields above and, by percolation, to the fields below, and raise the underground water-level in their neighbourhood, and, above all, they tend to lessen the accumulation of water in the depressions, and thus to save the people from fever and other diseases. The Nuh basin used to be notorious for the constant presence of malaria. I have myself seen literally the whole population of this tract so prostrate with fever at one time that they had not strength to reap the crops, and could hardly cook food for one another. Now the tract suffers much less from fever, and, although this must be mainly due to the decrease in the rainfall, the embankments must have helped towards this most desirable change. I look upon the maintenance of the embankments in this tract as much more a sanitary than an agricultural improvement. It is on the whole far better for the people that they should, now and then, suffer from drought and burnt up crops and feel the pangs of hunger, than that they should have fat harvests and be themselves constantly enervated by malaria; and, even if it were proved that the existence of these embankments on the whole lessened the outturn of the crops, I should still strongly advocate their maintenance for the sake of the health of the people in the Nuh basin. I believe however that on a long series of years they increase the gross outturn, and that they save more crops in 7 wet years than they prevent from

maturing in dry years. From every point of view therefore, I strongly advocate the maintenance of the whole system of embankments, and of practically each individual embankment.

23 The Landoha Valley in Ferozpur tahsil, while it must in any case receive the drainage from the hills that border it on both sides, is especially dependent for a large portion of its moisture on the floods of the Landoha torrent, which enters it from Alwar territory at the extreme south of the district. The correspondence that has taken place from time to time regarding the distribution of these fertilising floods between Alwar and Gurgaon has been summarised in paragraph 301 of Mr Channing's Settlement Report and in paragraph 2 of the present Assessment Report of Ferozpur. The main principle of

Proceedings Ferozpur September 1877, No 1

the agreement, which was arrived at in 1877 and is still in force, was that the

Alwar authorities should be allowed to divert the floods from their natural channel so as to make them irrigate lands in the Alwar portion of the Landoha Valley, but should leave all surplus water, with a small exception, to flow on into the Ferozpur tahsil, and not divert it out of the Landoha Valley proper through the eastern hills south-east towards Ramgarh. I do not think the lengthening and strengthening of the Atharia Band in Alwar, described by Mr Gibson, is a breach of this agreement. As pointed out by Mr John Lawrence seventy

Proceedings Ferozpur September 1877, No 1

years ago, the supply of water which has been secured to Ferozpur by this agreement in seasons of abundant rain is entirely dependent upon the maintenance of the "Jat Band No 2" at Nahirpur, by which the stream is made to return

See plan.

to its old channel towards Ferozpur, as, almost the whole body of water would be carried by the force of its direction and the natural level south-eastwards towards Ramgarh, i.e., out of the Landoha Valley proper. The most important part of the agreement therefore is that mentioned as (2) in the extract from Mr O'Dwyer's report, viz "The Jat

Assessment Report paragraph 2

Band No 2 is to be maintained by Alwar so as to prevent in all seasons any portion of the stream passing to the east at that point through the channel CC".

See plan.

Unfortunately an exception was allowed to the general principle above stated Mr John Lawrence found that the supply of water passed into Ferozpur was much diminished by a nullah marked E E E, which branched off from the

See plan.

Landoha at a short distance before it reached the Jat Band No 2, and he thought that this channel should be closed. So at first did Mr Channing, but the ultimate agreement regarding it was that summarised by Mr O'Dwyer

Assessment Report, paragraph 3

as No 3, viz, a masonry dam has been constructed across this channel two feet higher than a masonry floor sunk in the main Landoha channel, so that, so long as the water in the main channel is less than two feet deep, the whole supply will flow towards Ferozpur and, when it is more than two feet deep, a portion of it will flow south-east through the channel E E E, which means that some part of high floods is diverted out of the Landoha Valley proper.

24 I think the matter is important enough to call for the following action. Mr Gibson should, with the aid of the Alwar authorities, which will no doubt be readily given, make a better map of the course of the Landoha in Alwar territory with its bands and subsidiary channels than that attached to his report. He should, with the aid of the Gurgaon District Engineer, make accurate measurements of the Jat Band No 2, of the New Cut D D, of the channel E E E, its masonry embankment F and the masonry floor G. If necessary, the Jat Band No 2 should be strengthened (possibly a masonry embankment should be erected here at the cost of the British Government), "so as to prevent in all seasons any portion of the stream passing to the east at that point through the channel CC". The channel D D, through which the water returns to its old course towards Ferozpur, should be cleared of all obstructions. The masonry floor G, and the masonry embankment F, should be thoroughly repaired, and care should be taken that the channel E. E E is not widened, so

as to divert more than its former share of the water. The Deputy Commissioner should be informed that one of his duties is, as recommended by Mr Channing, to have an inspection made every year by a competent officer shortly before the rains, and also somewhat later during the rains, to see that nothing is being done contrary to the agreement. I make these recommendations, not in the interest of the land revenue, but in that of the land-owners of Ferozpur, who are entitled to their prescriptive rights in the surplus waters of the Landoha. There is no doubt that in recent years the Landoha floods in Ferozpur have been less favourable than formerly, but this, I think, is clearly due, not so much to any larger absorption in Alwar of the Landoha water, as to the failure of rain described above, which has affected the whole catchment area. If the rainfall returns to its old normal, the flooded area in Ferozpur will probably attain its old normal also, and in years of excessive rainfall it is still possible that the Landoha floods may reach the Kotla Band.

25. The question of how to assess lands supposed to be benefited directly by particular embankments is discussed by Mr. Gibson in paragraphs 3, 43, 47 and 52 of his Ferozpur Report and by Mr. Boughey in paragraphs 41 and 44 of the Nuh Report. They show how extremely difficult it is to decide which fields have actually benefited from an embankment, what elaborate rules are required to make a special fluctuating assessment on those benefits, how unpopular the system of charging such an *abiana* is, and how insignificant is the income from this source. I shall deal with the whole question of the Gurgaon embankments when the figures for the Gurgaon tahsil are available, but meanwhile I would, in accordance with the permission given in Government's letter No. 2825, dated 8th October 1907, instruct the Settlement Officers in these two tahsils not to impose any general system of fluctuating *abiana* on lands benefited by embankments, but to assess *abi* land to a fixed assessment on its present circumstances. The total area of lands classed as *abi*, which includes both the lands above, flooded by water held up by the embankment, and the lands below, irrigated by cuts from it, is now only 1,104 acres in the Ferozpur tahsil and 4,124 acres in Nuh. Should the final orders direct the imposition of a fluctuating *abiana* in any case, they can alter their fixed assessment accordingly before announcing it.

26. One important question is what land should be classed and assessed as *dahr* (flooded). Where the area actually flooded varies so much from year to year, it is difficult to say whether a field should be so classed or not. Mr. Gibson explains that in Ferozpur the area flooded by hill torrents as distinct from the Landoha has been fixed by the Tahsildar and Naib Tahsildars after careful observations on the spot; and that, as regards flooding from the Landoha, all *barani* land, which was flooded both in 1904 and 1906, has been recorded as *dahr*. In Nuh also care has been taken to class as *dahr* only the lands which are now ordinarily flooded in a normal year. The result, taken from the complete figures now available, is as follows (omitting the area in the Kotla Jhil under fluctuating assessment) :—

Paragraph 6

Paragraph 7

Statement II and Appendix I

Tahsil	Class of soil	Area recorded at last Settlement	Area now recorded.
Ferozpur	Abi	Acres ...	Acres 1,104
	Dahr	22,185	6,257
	Total <i>abi</i> and <i>dahr</i>	22,185	7,361
Nuh	Abi	...	4,124
	Dahr	27,363	14,672
	Total <i>abi</i> and <i>dahr</i>	27,363	18,796

It will be seen that, as compared with last Settlement, a very great reduction has been made; and, when allowance is made for the abnormally scanty rainfall of recent seasons, it may safely be said that the flooded area has not been exaggerated in the present classification, and that we may confidently apply the *dahri* rate to the area now returned as *dahri*.

## TAHSIL FIROZPUR—BHUDER CIRCLE

27 Now that we have complete attested figures for all the villages of the two tahsils, they form a better basis for assessment calculations than the Settlement Officers had at the time they submitted their reports, and, although Mr. Gibson tells me that the rent figures of the villages last attested were only checked by the Tahsildars, there can be no doubt that they represent the rates actually agreed upon, and I take the totals now given as furnishing the best

available data for half net asset rates

The Settlement Officers have made extraordinarily liberal deductions for rents not collected, amounting in the Dahar Khari Circle of Firozpur to as much as 30 per cent. I have asked Mr. Gibson whether he still thinks that, on a normal series of years, so much of the nominal rent remains uncollected, and he can only say that the pitch of the rents in this circle is so extremely severe that he does not see how they can be collected in any but a good year. But the soil of this circle has always been famous for its fertility, and the rents paid for it have always been comparatively high, and, when we find a numerous body of tenants voluntarily contracting to pay high rents for it, we are not justified in saying that they do not know its true value and that it cannot pay those rents. I think we shall be making a very liberal allowance if we deduct from the rents found to be actually agreed upon, for cost of management and collection and for rents that finally remain unpaid, 15 per cent. in all circles, on all classes of soil. The rent rates and the half net asset rates deduced from them compare as follows for the Bhuder Circle—

Soil	ASSUMED BY SETTLEMENT OFFICER		Normal rents now reported	Half net asset rate assumed by Financial Commissioner
	Normal rents	Half net asset rate		
	Rs a p	Rs a p	Rs a p	Rs a p
Chabi ...	5 11 0	2 9 0	5 15 0	2 8 0
Abi ..	6 2 0	2 12 0	6 0 0	2 8 0
Dabri ...	5 9 0	2 8 0	4 12 0	2 0 0
Barani	3 10 0	1 10 0	4 9 0	1 12 0
Bhur ...	1 15 0	0 14 0	1 15 0	0 13 0

I take a lower rate on *barani* than the rents would warrant—because Mr. Gibson tells me they include high rents in the town of Firozpur-Jhirka

If we apply these rates to the corrected areas now returned, we get the following half net asset estimate (treating the excess of recorded *chahi* over actual average irrigation as *barani*)—

Soil	Area in acres	Half net asset rate	Resulting estimate.
		Rs a p	Rs
Chahi (actually irrigated)	2,656	2 5 0	6,640
Abi	62	2 8 0	205
Dabri	1,110	2 0 0	2,220
Barani	12,941	1 12 0	22,616
Bhur	21,861	0 13 0	17,762
Total	38,650		49,473

18

Allowing for the miscellaneous income from *munj* grass which in some villages is large, we may safely take Rs. 50,000 as the half net assets estimate.

Paragraph 15

Mr. Gibson's kind rent estimate was Rs. 55,650 and his cash rent estimate, founded on the incomplete figures, was Rs 51,713. He estimated the true half net assets at Rs. 52,000, but, on the more accurate figures now available, Rs. 50,000 is a safer estimate. The present assessment is Rs. 44,420 or practically the same as the circle paid before Mr. Channing's assessment, so that it has paid its present assessment for sixty years. I agree with the Settlement Officer and Settlement Commissioner that it should stand practically unaltered. The circle is at present prosperous, but much of its *bhur* soil is liable to go out of cultivation in bad years, and when I saw it in 1883 large tracts had reverted to waste I am glad to find it has more than recovered its former prosperity, and that the number of wells shows a considerable increase. The Settlement Officer should aim at a total assessment of Rs. 45,000, or 90 per cent of the liberal half net assets estimate, and on the corrected figures now available should use the following circle-revenue-rates :—

Revision Report, page 116

Soil.	Area in acres.	Revenue rate	Resulting assessment.
Chahi (actually irrigated) ... ..	2,656	Rs a p 2 8 0	Rs 6,640
Abi and Dabri . . . . .	1,192	2 0 0	2,384
Barani .. . . .	12,941	1 10 0	21,029
Bhur .. . . .	21,861	0 11 0	15,029
Total	38,650	...	45,082

The *bhur* rate should be kept low because so much of that soil is inferior and precarious. The *chahi* half net asset rate may be retained, as it is to be applied only to the actual average irrigation (2,656 acres), not to the recorded *chahi* area (5,191 acres).

FIROZPUR—DAHAB MITHA CIRCLE.

28 This circle, formerly called the Landoha Circle, receives the Landoha when it enters the Gurgaon district from Alwar, and is largely dependent on the floods of that stream. Partly owing to the spread of cultivation and construction of embankments in Alwar, but no doubt mainly owing to the recent years of scanty rainfall, the area flooded has fallen off greatly, and is now recorded as only 3,784 acres against 8,147 acres so recorded by Mr. Channing. I have already given reasons for supposing that it is likely to increase again with a return to years of normal rainfall. This low-lying soil remains fairly moist, even when actual floods do not reach it, and, as Mr. Gibson says, it is of excellent quality. We may therefore safely treat the comparatively small area now recorded as *dahri* as fairly assessable at a high *dahri* rate. The rent rates now returned compare as follows with those assumed by the Settlement Officer :—

Soil	ASSUMED BY SETTLEMENT OFFICER.		Normal rents now reported	Half net asset soil rate assumed by Financial Commissioner.
	Normal rents	Half net asset rate		
Chahi .. . . .	Rs a p 7 11 0	Rs a p 3 4 6	Rs a p 7 11 0	Rs a p 3 4 0
Dahri .. . . .	6 15 0	2 15 0	6 8 0	2 12 0
Barani .. . . .	4 6 0	1 13 9	4 8 0	1 14 0
Bhur .. . . .	2 7 0	1 0 6	3 2 0	1 4 0

If we apply these rates to the corrected areas now returned we get the following half net asset estimate —

Soil	Area in acres	Half net asset rate	Resulting estimate.
		Rs a p	Rs
Chahi (actually irrigated) ..	1,952	3 4 0	6,344
Dahri ..	3,784	2 12 0	10,406
Barani ..	15,596	1 14 0	29,242
Bhur ..	4,011	1 4 0	5,014
Total	25,343	...	51,006

I would take the half net asset as Rs 51,000 as against the Re 55,000 estimated by Mr. Gibson, who applied his *chahi* and *dahri* rates to larger areas than those now returned. The present assessment is Rs 47,276, which Mr Gibson proposes to reduce to Rs 45,348 I agree with the Settlement Commissioner that, with the evidence now afforded us by the rents paid on a large proportion of the area, there is no good ground for making any reduction in the present total assessment of the circle. The cultivation is unusually secure, as on the average of the 21 years given in Statement X the matured area equals 93 per cent of the total cultivated area. The Settlement Officer should therefore aim at an assessment of Rs 47,000, which is 92 per cent. of the cautiously calculated half net asset estimate. This assessment should be distributed by the following rates over the corrected areas now available. —

Soil,	Area in acres.	Revenue rate	Resulting assessment
		Rs. a p	Rs.
Chahi (actually irrigated)	1,952	3 0 0	5,856
Dahri	3,784	2 8 0	9,460
Barani	15,596	1 12 0	27,293
Bhur	4,011	1 0 0	4,011
Total	25,343		46,620

This *chahi* rate may fairly be assessed on the average actual irrigation of a typical series of years from *kachha* wells as well as from *pakha* wells, as this shows the actual benefit derived by each village from its facilities for *kachha* well irrigation. Within the village the distribution over holdings must be left largely to the wishes of the people. In assessing the *barani* the Settlement Officer should lower the rate when applying it to the high-lying loam mentioned in his paragraph 26, and raise it for the low-lying moist loam which is sometimes flooded. Much of the *bhur* is good moist soil and can easily pay more than the average rate of Re 1.

#### TAHSIL FIBOZPUR--DAHAE KHABI CIRCLE

29. I entirely agree with Mr. Gibson that it would have been a mistake

Paragraph 4 to combine this circle (the old Mandukhera Circle) with Mr Channing's Chiknot Circle, which is a very inferior tract. Here too, ample allowance has been made for the decrease in flooding, which is probably only temporary, by the reduction in the area recorded as *abi* or *dahri*, which now amounts only to 1,407 acres against 5,971 recorded as *dahri* by Mr Channing. The complete rents now returned give the following comparison —

Soil	ASSUMED BY SETTLEMENT OFFICER.		Normal rents now returned	Half net asset rate assumed by Financial Commissioner
	Normal rents	Half net asset rate.		
	Rs a p	Rs a p	Rs a. p	Rs a p
Chahi .. .. .	7 3 0	2 8 0	7 14 0	3 4 0
Abi . . . . .	6 4 0	2 3 0	7 12 0	3 4 0
Dabri . . . . .	6 10 0	2 5 0	6 11 0	2 12 0
Barani . . . . .	6 7 0	2 4 0	6 13 0	2 12 0
Bhur ... . . . .	5 10 0	1 15 0	6 9 0	2 12 0

Mr Gibson has in this circle allowed 30 per cent. for rents not collected, but he can give no good reason for this very high allowance, except his impression that the rents are too high to be realised at all fully over a series of years. But there is no real reason to suppose that a larger proportion of the rents voluntarily agreed on between landlord and tenant remains uncollected than in the other circles, and I would allow only the usual 15 per cent. for costs of management and non-realisation. As for the rents being high, the tenants know better than we do what the land can pay, and have voluntarily taken on lease nearly a fifth of the total cultivated area of the circle on a promise to pay rents averaging Rs. 7 per acre, so that the only reasonable conclusion is that the net proprietary profit of cultivation is something approaching this sum. It will be noticed how similar the rent rates are on all classes of soil. The fact is that this circle as a whole is exceptionally fertile and secure and does not entirely depend on the Landoha floods, and its moist low-lying lands, even if sandy in texture, rarely fail to produce excellent crops (On the average of the 21 years given in Statement X the matured area equals 94 per cent of the total cultivated area). Therefore it naturally supports a comparatively dense population, and there is no reason why we should not frame the half net assets estimate by applying the rates above deduced to the soils as now classified. This gives the following result —

Soil	Area in acres	Half net asset soil rate	Resulting estimate
		Rs. a p	Rs
Chahi (actually irrigated)	987	3 4 0	3,208
Abi .. .. .	662	3 4 0	2,152
Dabri . . . . .	745	2 12 0	2,048
Barani . . . . .	16,205	2 12 0	44,563
Bhur ... . . . .	2,168	2 12 0	5,962
Total ..	20,767		57,933

I do not think we can fairly estimate the half net assets of this circle at less than Rs 55,000. Mr. Gibson makes it Rs 47,000, the difference being chiefly owing to his deduction of 30 per cent for uncollected rents. The present assessment is Rs 37,411, and Mr Gibson proposes to reduce this to Rs. 35,911, although he admits that the circle cannot be said to be over-assessed, and that it has suffered less from the past ten years of drought than the Chiknot and Dahar Mitha Circles. The Settlement Commissioner gives good reason for not reducing the present demand, but as it is only 68 per cent. of my estimate of half net assets, I think we must, in fairness to other circles and tracts, enhance it. According to the alienation statistics of the five years ending 1905-06 land sells for 60 times and mortgages for 28 times the land revenue assessed upon it.

I propose the following revenue rates —

Soil	Area in acres	Revenue rate per acre	Resulting assessment
		Rs a p	Rs
Chahi (actually irrigated) ... .	987	3 0 0	2,961
Abi ... ..	662	3 0 0	1,986
Dahri	745	2 8 0	1,862
Barani ... .	16,205	2 4 0	36,461
Bhar .. ..	2,168	1 12 0	3,794
Total	20,767		47,064

These rates are low compared to the rent rates actually in force, and would give an assessment only 85 per cent. of the moderate half net assets estimate I have framed, but they give too large an increase in this circle of small holdings, and I would instruct the Settlement Officer to aim at a total assessment of Rs 42,000, which equals 76 per cent of the half net assets and gives an increase on the present demand of 12 per cent. Even so, this rich and secure circle will be assessed much more lightly than its neighbours 53 per cent. of the cultivated area of the circle is under mortgage, and there is no good reason why the mortgagees should continue to pay as land revenue a much smaller proportion of the renting-value of the land than in other circles. As Mr. Gibson says (paragraph 26) the soil of this circle is the best in the tahsil, a moist fertile soil. It should therefore pay a high rate of assessment per acre.

#### TAHSIL FIROZPUR—CHIKNOT CIRCLE.

30 This circle is of a very different character, and there can be no doubt that its hard soil, which, when thoroughly moistened, can produce excellent crops, has suffered very much during the cycle of dry years, and, although we may hope that in future years the rainfall will be better and the floods more favourable, it would not be safe to assess this circle, and especially that part of it which is cut off from the Landoha floods by the Kotla embankment, at any higher rate than its present circumstances warrant. Omitting the area under fluctuating assessment, which I shall deal with separately, the areas are now returned as follows:—*chahi* 85 acres, *abi* 360, *dahri* 5, *chiknot* 6,598, *narmot* 3,236, *magda* 293, *bhar* 331 acres—total 10,908 acres, whereas at Mr Channing's

Settlement the total cultivated area was returned as 11,335 acres of which 4,639 acres were classed as *dahri*. The areas other than *chiknot* and *narmot* are so small that it is hardly worth while having more than an all-round rate. The crops here fluctuate so much in outturn that cash rents are unpopular, and we have figures for only about a twentieth of the area which pays cash rents averaging Rs 8-14-0 per acre—a great contrast to the adjoining Dahar Khan Circle. Mr. Gibson based his cash rent estimate on a rent rate of Rs 3-9-0 per acre, and, taking a half net asset rate of Re. 1-6-0, made his cash rent half net asset estimate Rs 15,170. He pointed out however that in this circle as rents are commonly taken in kind the kind-rent estimate is the more trustworthy. It amounted to Rs 16,188, but, because he thought the usual *batai* rate of one half too high for the extremely precarious soil of this circle (an assumption hardly warranted), he made his half net asset estimate Rs 15,200. The present assessment is Rs 14,151, and Mr Gibson proposes to reduce this to Rs 12,503, a reduction of 12 per cent. The Settlement Commissioner would retain the present assessment. In this circle the cropping is much more uncertain than in the other circles. The average percentage of matured to cultivated area is only 73,

and in the last two quinquennial periods the percentage fell to 63 and 52. In 1904-05 and 1906-07 the cropped area (10,908 acres) almost equalled the total area under cultivation, but in the dry year 1905-06 it was only 2,271 acres, and in

1907-08 1,304 acres. It would obviously not be safe to suppose that every acre on an average of years can pay the average rent of Rs 3-14 per acre. In the case of this circle I would accept Mr. Gibson's estimate of the average half net assets at about Rs 15,000, and, in consideration of the great precariousness of the cropping on its hard clay soil, allow him to assess, as he proposes, at Rs 12,500; a reduction of 12 per cent on the present assessment.

TAHSIL NUH—DAHAB CIRCLE.

31. This circle with its hard loam, its liability to floods and drought and its system of embankments, has been well described by Mr. Boughey. The soils have now all been carefully reclassified, and compare as follows with those classed at Mr Channing's Settlement, (omitting the area under fluctuating Assessment)

Soil.	At last Settlement	Now
	Acres	Acres
Chahi . . . . .	2,752	3,106
Abi . . . . .		2,978
Dabri . . . . .	26,412	14,464
Chiknot . . . . .	1,160	1,963
Narmot . . . . .	29,816	36,557
Magda . . . . .	8,183	8,598
Bhur . . . . .	8,828	7,803
Total . . . . .	77,151	75,489

It will be noticed that there has been a small falling off in the area under cultivation, and that the area now returned as *abi* or *dabri* (17,462 acres) is much less than the area classed as *dabri* at last Settlement, and than the area used by Mr Boughey in his assessment calculations (*abi* 6,615 acres, *dabri* 19,713 acres); so that in this respect it is probable that the resources of the tract are not now over-estimated indeed it seems likely that, when seasons of normal rainfall return, the area flooded will be considerably larger than this. The complete figures for rents now available give the following comparison.—

Soil.	ASSIGNED BY SETTLEMENT OFFICER		Normal rents now returned.	Half net asset rate assumed by Financial Commissioner
	Normal rents	Half net asset rate		
	Rs a. p.	Rs a. p.	Rs a. p.	Rs a. p.
Chahi . . . . .	3 14 0	1 7 3	4 1 0	1 11 0
Abi . . . . .	3 13 0	1 7 6	3 13 0	1 10 0
Dabri . . . . .	3 15 0	1 7 6	3 13 0	1 10 0
Barani . . . . .	4 1 0	1 8 5	4 1 0	1 11 0
Bhur . . . . .	2 10 0	0 15 9	2 3 0	0 14 0

The rents now returned are paid on a sixth of the total cultivated area, and may be taken as representative of the proprietary profits on the whole area. In calculating his half net asset rate, Mr. Boughey allowed the very large deduction of 25 per cent. for rents not collected, partly because he thought the rent-rates high, and partly because of the precariousness of the cultivation,

But there is no reason to think the rents rack-rents, and, as for the precariousness, the area sown averaged for the five selected years 77,548 acres, or more than the total area under cultivation, and the figures for *matured* area for the last four years are as follows (including the 4,354 acres under fluctuating assessment)—84,974 acres, 28,273 acres, 86,174 acres, 10,943 acres. These figures show that in such exceptionally dry years as 1905-06 and 1907-08 the *matured* area does fall off enormously, but that in ordinary years the area *matured* is larger than the total area under cultivation, and there seems no reason to assume that the proportion of cash rents uncollected is much larger than in the other circles. It will be enough to allow, as in them, 15 per cent. off the gross rent demand for cost of management and non-realisation. The resulting half net asset rates applied to the corrected area figures give the following half net asset estimate —

Soil	Area in acres	Half net asset rate	Resulting estimate
		Rs a p	Rs
Chahi (actually irrigated) ...	1,536	1 11 0	2,592
Abi . . . . .	2,978	1 10 0	4,839
Dahri . . . . .	14,484	1 10 0	23,536
Barani .. . . .	48,688	1 11 0	82,161
Bhur ... ..	7,803	0 14 0	6,828
Total ..	75,489		1,19,956

Mr Boughey's estimate based on cash rents came to Rs 1,17,950. His estimate based on kind rents was Rs 1,26,093. He thinks that estimate too high, because he considers half the gross produce too high a rent but, as I have pointed out, over great part of India it is common to find such a rate of rent, and, if the tenants as a body contract to pay it, we are not justified in assuming it is a rack-rent. Moreover the years, on the *matured* areas of which the estimate was based, were below what may reasonably be expected to be the normal. I think then we may safely estimate that a full fair half net assets demand would not be below Rs 1,20,000. The present assessment is Rs. 1,01,251. Mr. Boughey proposes to reduce this to Rs 95,672, but the Settlement Commissioner rightly shows that there is no need to make any reduction, and proposes to maintain the present assessment, which is 84 per cent of my cautious estimate of the half net assets. I think that the evidence of the rents requires us to take a small increase. The statistics of alienations also show that purchasers and mortgagees do not consider the present revenue demand too severe, as, on the average of the five years ending 1905-06, land sold for 44 times and mortgaged for 29 times its land revenue assessment, and the mortgagees who have voluntarily taken on mortgage 41 per cent of the total cultivated area cannot have thought the present assessment severe. I would also accept the evidence of the rents, which goes to show that the renting-value of all soils except *bhur* is much the same. The *dahri* lands do produce excellent crops in a favourable year, but they are liable to be flooded in wet years and in dry years they produce very poor crops, so that on a series of years their average produce is probably not much better than that of ordinary unirrigated loam. I propose the following rates —

Soil	Area in acres	Revenue rate.	Resulting assessment.
		Rs. a p	Rs
All soils except bhur . . . . .	67,688	1 8 0	1,01,539
Bhur ... ..	7,803	0 10 0	4,877
Total ..	75,489	...	1,06,416

The Settlement Officer should <sup>294</sup> at a total assessment of Rs. 1,06,000, which gives an increase of less than 5 per cent., and equals 88 per cent. of my cautiously calculated half net assets estimate.

#### AREA UNDER FLUCTUATING ASSESSMENT

32. Lands belonging to seven villages, lying partly in Nuh and partly in Ferozpur tahsil, were placed under fluctuating assessment at last Settlement, because their land in the Kotla basin was exceptionally liable to be submerged in wet years and to remain uncultivated in dry years. The system at present in force appears to be that proposed in paragraph 62 of my Revision Report; but there seems some doubt about the rates and rules and the Settlement Officers had not inspected the villages thoroughly. They say that the system is popular, and there is no doubt it should be continued, as recommended by the Settlement Commissioner. I would however instruct the Settlement Officers after full enquiry into the working of the system, to submit definite rules and rates on the lines recommended in paragraph 29 of my Palwal Review. Probably the system can be somewhat improved in the light of our recent experience in the West Punjab. Mr. Diack has since withdrawn his proposal that the villages under this system in the Ferozpur tahsil should be transferred to Nuh, and I agree with the Settlement Officer that there is no sufficient reason for a change in the present tahsil boundaries.

33. As explained in paragraph 61 of my Revision Report, in 97 villages in the Gurgaon, Nuh and Ferozpur tahsils, where lands are subject to excessive inundation a condition was recorded at last Settlement entitling them to remission of revenue when more than 10 per cent of the whole cultivated and fallow land was submerged. I pointed out how unequally this rule worked and proposed a

Note on the Revision Settlement, paragraph 37

Wace) Mr Boughey says that it is better that the Deputy Commissioner

Nuh Report, paragraph 41.

by any rules as to the proportion that must be submerged before relief can be claimed. I would go further and charge no revenue on submerged land in a year in which it produces nothing owing to submersion. I propose the following rules

Shahpur Settlement Report, paragraph 104

based on those sanctioned for areas similarly liable to submersion in the Shahpur district, and would apply them to all submerged lands in the Gurgaon district, not under fluctuating assessment

*Rules for the remission of revenue on submerged lands in the Gurgaon district.*

(1) The assessment as announced at settlement shall stand on the fixed rent-roll, relief being given when necessary in the form of remission of fixed land revenue.

(2) No land which was left unassessed at settlement shall be liable to assessment until the term of settlement expires

(3) At the time of the Kharif girdawari every year the patwari will make an extract from his field map showing the area then submerged and will draw up a field register in the form of an extract from his field inspection register showing all fields, assessed at settlement, which have failed to produce a crop owing to submersion. These extracts he will correct and bring up to date at the time of the rabi inspection, and he will then draw up from them a register of holdings in the form of the jamabandi showing for each holding the area of land which was assessed at settlement, and which has owing to submersion failed to produce a crop either in the kharif or rabi harvest, with the amount of assessment due on such land.

(4) After check by an Assistant Collector, report will be made in the prescribed form for the remission of the land revenue assessed at settlement on all land which, owing to submersion, has failed to produce a crop either in the kharif or rabi harvest

34 I would however go further still and recommend that, as regards the many areas in Chak Chiknot and the Nuh Dabar which are subject to entire loss of crops in wet years from submersion and in dry years from hardness of soil, it should be made possible to introduce a fluctuating system of assessment at any time during the term of settlement, should the people wish it. In such areas it is impossible to adapt the demand to the outturn of the year for each holding in any other way, and it is hard to make a small owner pay a fairly high and revenue on land which has actually produced nothing owing to floods or

drought, while his neighbours, whose land lies higher, are getting good crops, I think it likely that much of the excessive amount of mortgage in these circles may be partially due to this cause. I do not advise that in this tract a system of fluctuating assessment should be forced on any village against its will, but I think that when the land-owners of any village become convinced that a fluctuating system, with all its undeniable disadvantages, is better for them than a rigid fixed assessment, it behoves Government to meet their wishes. I would therefore instruct the Settlement Officer to draw up rules and rates, founded on those in force for the Kotla Basin, for a system of fluctuating assessment suitable to those areas in these two circles which are specially liable to submersion or to entire loss of crop in dry years owing to their hard soil, and would make it a condition of the Settlement that, when the majority of owners in any village ask for the extension of this system to any part of its area, it may be introduced at any time with the sanction of the Financial Commissioner.

## TAORA CIRCLE

35 The Taora Circle is separated from the rest of the tract by the main range of hills, and is quite unlike it, as it consists chiefly of light sandy soil suited for bajra in the Kharif and, when irrigated in the Rabi, for barley. It closely resembles the Rewari tahsil. The area under cultivation has only increased by 1 per cent, but there has been a satisfactory increase in the number of wells in use from 263 *palla* and 96 *lakhha* wells at last settlement to 394 *palka* and 335 *kacuha* now, the area recorded as *chahi* having increased from 3,791 acres to 5,333, or 13 per cent of the total cultivated area. The *dohri* area has been reduced from 886 acres to 73, and is certainly not now over-estimated, and, owing to the construction of embankments, there is now an area of 904 acres recorded as *abi*. The complete figures for rent compare as follows with those used by the Settlement Officer —

Soil	ASSUMED BY SETTLEMENT OFFICER.		Normal rents now returned	Half net asset rate assumed by Financial Commissioner
	Normal rents	Half net asset rate		
	Rs a p	Rs a p	Rs a p	Rs a p
Chahi ..	5 2 0	2 5 0	5 12 0	2 6 0
Abi ..	3 1 0	1 7 0	4 8 0	1 12 0
Dabri ..	3 2 0	1 7 0	3 2 0	1 4 0
Barani ..	2 5 8	1 2 0	2 8 0	1 1 0
Bhur ..	1 6 0	0 10 6	1 10 0	0 11 0

The Settlement Officer has in this circle deducted only 5 per cent from the rent demand for well-costs and uncollected rents on unirrigated soils, but, for the reasons already given, I have added 10 per cent for costs of management and collection, and made a deduction of altogether 15 per cent as in the other circles. The half net asset rates assumed by me give the following estimate when applied to the corrected areas —

Soil	Area in acres	Half net asset rate	Resulting estimate
		Rs a p	Rs
Chahi (actually irrigated)	3,391	2 6 0	8,054
Abi ..	904	1 12 0	1,582
Dabri ..	73	1 4 0	91
Barani ..	28,195	1 1 0	29,957
Bhur ..	8,535	0 11 0	5,863
Total ...	41,098		45,552

This gives a half net asset estimate of Rs. 45,552 against Mr. Bonghey's cash rent estimate of Rs. 49,507, but he allowed smaller deductions than I have

and applied his *chahi* rate to the whole area recorded as *chahi*. His kind rent estimate came to Rs 59,900. I would take Rs. 45,000 as a very safe estimate of the half net assets. The present assessment is Rs. 36,501. Mr. Boughey proposes to make it Rs 42,214, an increase of 15 per cent. on the present assessment, and the Settlement Commissioner supports his recommendation. I think it is about as much as we should take, though Rs. 45,000 is a cautious estimate of the half net assets. The revenue rates on the corrected areas should be :—

Soil	Area in acres	Revenue rate	Resulting assessment.
		Rs a p	Rs
Chahi (actually irrigated) ...	3,391	2 4 0	7,630
Abi ...	904	1 10 0	1,469
Barani and Dahri... ..	28,268	1 0 0	28,268
Bhur ... ..	8,535	0 9 0	4,800
<b>Total ...</b>	<b>41,098</b>	<b>...</b>	<b>42,167</b>

The Settlement Officer should aim at an assessment of Rs 42,000, which gives an increase of 15 per cent. over the present demand and amounts to 93 per cent of my liberal half net asset estimate, as against the 94 per cent. taken in Rewari tahsil. It is not worth while having a separate rate on the small area classed as *dahri*. Nor would I have a separate rate on *kachha chahi*. The Rs. 2-4 rate, if applied only to the average area actually irrigated, is not too high. As between villages their facilities for irrigation from *kachha* wells are best assessed by putting a *chahi* rate on the actual average area of such irrigation. How the *kachha chahi* assessment of the village is to be distributed over the holdings must be left to the villagers in each case, aided by the Settlement Officer. In this circle the Settlement Officer proposes to retain the system of putting an extra fluctuating charge on irrigation from embankments (*abi*), but, for the general reasons already given, he should assess such lands to a fixed assessment, subject to the orders to be passed when the Gurgaon tahsil report is disposed of.

Paragraph 25

36. I sum up my proposals in the following statement which may be compared with that given in paragraph 25 of the Settlement Commissioner's Review. (The area in the Kotla Basin under fluctuating assessment is excluded) :—

Circle	Present assessment	Financial Commissioner's estimate of half net assets	Assessment proposed by Financial Commissioner	Increase or decrease	Percentage of increase or decrease.	Percentage of proposed assessment on half net assets.
	Rs	Rs	Rs	Rs		
Dahar Mitha .. ..	47,276	51,000	47,000	-276	-1	92
Do Khari ... ..	37,411	55,000	42,000	+4,589	+12	76
Chiknot fixed .. ..	14,151	15,000	12,500	+1,651	-12	83
Bhader ... ..	44,420	50,000	45,000	+580	x 1	90
Bangar ... { Fixed .. ..	79,661	1,12,000	91,000	+16,846	+21	86
... { Increase of occupiers' rates			5,507			
<b>Total Ferozpur Tahsil ..</b>	<b>2,22,919</b>	<b>2,83,000</b>	<b>2,43,007</b>	<b>+20,088</b>	<b>+9</b>	<b>86</b>
Dahar .. ..	1,01,251	1,20,000	1,06,000	+4,749	+5	88
Taoru ... ..	36,501	45,000	42,000	+5,499	+15	93
Bangar { Fixed .. ..	1,00,360	1,39,000	1,10,000	+25,232	+25	90
... { Increase of occupiers' rates			15,592			
<b>Total Nuh Tahsil ...</b>	<b>2,38,112</b>	<b>3,04,000</b>	<b>2,73,592</b>	<b>+35,360</b>	<b>+15</b>	<b>90</b>

When the enhancement of assessment on any village is very high, a portion of it may be deferred as proposed in paragraph 24 of the Palwal Review.

37. The proposals for an alteration in the boundaries of the Nuh and Ferozpur tahsils have been dropped. Settlement Commissioner's paragraph 26  
There is no objection to treating the Dahar Mitha and Dahar Khari circles in future as one circle; or to classifying *chiknot*, *narmot* and *maqda* together in the village note-books, but the distinction should still be carefully kept up in the village papers. I would call the Settlement Officer's attention to the remarks I have made regarding the distribution of assessment over holdings in paragraph 23 of my Palwal Review. The cesses will remain as at present. The rules proposed for the remission of assessment on lands affected by *reh* in paragraph 32 of that review will apply to these two tahsils also.

38. For the reasons given in paragraph 34 of that review the new assessment should take effect from Kharif 1909. The current year (1907-08) has been one of the driest on record, and, of the total demand for the year of Rs 2,22,919 in Ferozpur, Rs. 1,72,267 have been suspended while in Nuh the suspensions are Rs 1,86,906 out of a total demand of Rs. 2,38,109. When the new assessments are introduced, the arrears then outstanding will be dealt with in accordance with the recent orders of Government on the subject. The term of settlement may be announced as likely to be sanctioned for thirty years.

39. The assessment reports are both full and clear, and, as the Settlement Commissioner says, show great sympathy with the people. I think this sympathy has sometimes carried the Settlement Officers too far in the direction of leniency, and that they have not allowed quite enough for the abnormal character of the recent cycle of dry years. but Mr Diack's careful review has to some extent corrected this tendency. I have gone more fully than usual into the assessment problem in this tract, because it is an exceptionally difficult one, because I once knew these two tahsils intimately, having inspected every village in them in bad times, and because I have felt it necessary to recast the calculations in the light of the fuller information now available. It is often necessary for a Settlement Officer to submit an Assessment Report before the revision of the areas and attestation of the rents are complete for the whole tahsil, but in that case he should submit revised statements, and, if necessary, revised proposals, when the complete and correct figures are available.

J. WILSON,  
Financial Commissioner.

20th July 1908.

Firozpur as in Nuh. If this system is to be adopted, I support the proposal. But, for the reasons given in my Gohana and Palwal Reviews, I strongly recommend that this fluctuating rate be lumped with the present occupiers' rate, and that, in addition to the fixed land revenue stated above assessed on the land in its unirrigated aspect, the only charge should be a consolidated occupiers' rate, levied at the simple rates per acre proposed in my Palwal Review.

Statement XIII.

If all the villages in the Firozpur and Nuh Bangar were placed in the first class according to that schedule, the total fluctuating canal demand on matured irrigated crops would be—

Class of crop	First class consolidated occupiers' rate	FIROZPUR BANGAR.		NUH BANGAR.	
		Area irrigated.	Result.	Area irrigated.	Result
		Acres	Rs	Acres	Rs.
I . . . . .	9 0 0	627	5,643	1,154	10,386
II . . . . .	5 8 0	5,828	32,054	13,182	72,501
III . . . . .	3 0 0	1,982	5,946	2,849	8,547
Total		8,437	43,643	17,185	91,434

If we suppose that the Settlement Officer will place in the second class, paying one rupee per acre less than the first class, villages containing one-fourth of the average irrigated area in Firozpur and one-half in Nuh (where the actual *nahr* cash rents are lower) the total canal demand will be Rs. 41,584 in Firozpur and Rs. 82,842 in Nuh, while the actual sum realized in canal rates was for those years Rs. 36,027 in Firozpur and Rs. 67,250 in Nuh.

21. My proposals for these Bangar Circles may now be compared with Mr. Diack's as follows.—

Class of demand	FIROZPUR BANGAR			NUH BANGAR.		
	Present.	Settlement Commissioner's proposals	Financial Commissioner's proposals	Present.	Settlement Commissioner's proposals	Financial Commissioner's proposals
	Rs	Rs	Rs	Rs.	Rs.	Rs
Fluctuating canal charge	36,027	36,027	41,534	67,250	67,250	82,842
Fixed land revenue	79,661	85,325	91,000	1,00,360	1,03,299	1,10,000
Fluctuating land revenue...	...	4,493		...	12,152	..
Total demand . .	1,15,688	1,25,845	1,32,534	1,67,610	1,82,701	1,92,842

According to my proposals, while the increase in the fixed land revenue will be 14 per cent in Firozpur and 10 per cent, in Nuh, the increase in the total cash demand, fixed and fluctuating, will be 15 per cent in both tahals against the 25 per cent. increase I have proposed for Palwal; and the new fixed land revenue, plus the increase in the occupiers' rate, together amounting to Rs 96,507 in Firozpur and Rs. 1,25,592 in Nuh, will be equal in Firozpur to 86 per cent. and in Nuh to 90 per cent of my half net assets estimate, against the 90 per cent, I have proposed for Palwal.

#### LANDOHA VALLEY AND NUH BASIN.

22. I follow Mr. Diack in treating this tract as a whole. Its chief characteristic is that it is almost entirely land-locked, only a small proportion

AREA STATEMENT OF THE FIROZPUR AND NUH TAHSILS AS RETURNED IN THE NEW MEASUREMENTS.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
Name of Assessment Circle	Total area	Forests	UNCULTIVATED OTHER THAN FORESTS			CULTIVATED AREA										REMARKS
			Not available for cultivation	Available for cultivation		Chahri	Nahri	Abo	Dabri	Chiknot	Narmot	Magda	Bhar	Total		
				Unappropriated Government waste	Others											
<b>FIROZPUR TAHSIL</b>																
Bangar	74,765		6,230	2,066	6,035	11,281	.	613	3,783	33,389	7,440	3,028	68,469			
Bhuder	56,235		16,650	935	5,191		82	1,110	1,247	2,919	6,240	21,881	38,650			
Dabar Mitba	39,651		7,617	691	3,951		..	8,784	801	7,621	5,175	4,011	25,843			
Dabar Fbari	22,652		1,911	173	1,668		662	745	4,630	7,868	3,138	2,168	20,767			
Chiknot	Fixed		664	700	65		360	5	6,598	3,236	993	331	10,908			
	Fluctuating		200	234				842					842			
	Total		864	934	65		360	847	6,598	3,236	993	331	11,750			
Total Tahsil	Fixed		32,662	4,569	16,028	11,281	1,104	6,257	16,959	55,023	33,286	32,290	1,62,137			
	Fluctuating		206	234				842					842			
	Total		32,868	4,803	16,928	11,281	1,104	7,099	16,959	55,023	33,286	32,290	1,62,979			
<b>NUH TAHSIL</b>																
Taoru	64,946		12,025	1,823	5,333		904	73		113	26,140	6,536	41,098			
Dabar	Fixed		12,502	8,708	3,106		2,978	14,484	1,383	36,557	3,598	7,803	75,489			
	Fluctuating		1,899	762	34		..	3,847		313	158	2	4,354			
	Total		14,401	9,470	3,140		2,978	18,331	1,963	36,870	3,756	7,805	79,843			
Total Tahsil	Bangar		6,242	6,319	4,029	21,962	243	115	1,358	41,393	11,175	6,324	86,598			
	Fixed		29,788	16,850	12,468	21,969	4,124	14,672	3,321	78,083	45,913	22,662	203,185			
	Fluctuating		1,899	762	34			3,847		313	158	2	4,354			
Total		31,687	17,612	12,502	21,962	4,124	18,519	4,179	81,406	46,284	22,820	207,539				

APPENDIX II.

STATEMENT OF CROPPED AREA IN ACRES FOR THE YEARS 1901-05 TO 1907-09, TALSILS FIROZPUR JHIRKA AND NUH.

Crops	1901-05						1905-06						1906-07						1907-08						
	3	4	5	6	7	Total	Chahi	Nahr	Abi	Dahr	Baran	Total	Chahi	Nahr	Abi	Dahr	Baran	Total	Chahi	Nahr	Abi	Dahr	Baran	Total	
...	654	6,733	44	75,711	63,17	5,491	11,050	...	10,811	27,391	1,168	9,620	632	78,655	81,965	5,813	9,801	72	9,019	23,736	...	...	...	...	...
...	1,273	..	52	1,165	43,693	4,536	..	6	11,900	16,561	1,567	..	78	1,509	43,412	4,511	..	22	0,889	11,784	...	...	...	...	...
...	513	..	26	25,151	31,821	3,829	..	107	8,409	12,195	621	..	7,770	20,427	20,018	3,608	..	900	5,205	10,003	...	...	...	...	...
...	222	..	109	22,500	23,337	2,539	..	110	6,884	9,552	308	..	618	4,710	17,014	2,834	..	280	5,480	8,882	...	...	...	...	...
...	12	..	101	9,815	10,41	153	..	..	2,118	2,271	14	..	..	703	10,018	10,633	209	2	1,000	1,271	...	...	...	...	...
...	12	..	..	512	605	..	..	219	..	219	..	..	..	703	703	..	..	3	0	30	...	...	...	...	...
...	12	..	101	967	9,881	11,021	153	..	219	2,400	14	..	6	793	10,615	11,431	200	..	1,000	1,304	...	...	...	...	...
...	2,701	6,330	768	8,261	17,356	192,425	10,500	11,050	116	49,311	68,270	3,068	9,520	697	14,611	102,877	101,673	17,488	302	28,452	57,625	...	...	...	...
...	..	..	..	512	60	608	..	..	..	219	..	..	..	793	793	..	..	3	0	33	...	...	...	...	...
...	2,701	6,331	768	8,806	17,422	193,033	16,590	11,050	116	49,311	68,489	3,968	9,520	697	15,404	102,877	102,460	17,500	302	28,491	57,601	...	...	...	...
...	1,116	..	610	53,910	55,076	1,513	..	382	24,335	28,265	2,840	..	610	68	40,904	53,135	4,793	..	211	1,000	6,076	...	...	...	...
...	309	..	52	5,793	78,778	84,073	3,103	..	29	28,273	407	1,023	17,305	07,349	86,174	4,798	..	6	902	5,180	10,943	...	...	...	...
...	152	6,630	..	31,369	1,01,151	3,031	17,000	..	22,938	45,572	980	12,568	57	82,887	96,501	3,844	15,275	..	8,546	27,705	...	...	...	...	...

# 301

## APPENDIX III.

STATEMENT SHOWING NORMAL RENTS FOR ALL THE VILLAGES IN THE FIROZPUR TAHSIL

1	2	3	4	5	6	7	8	9	10	11	12	
Circle	Class of land & soil.	SIMPLE RENTS			LUMP RENTS RESOLVED.			TOTAL RENTS			REMARKS	
		Area in acres	Rent	Rate per acre	Area in acres	Rent	Rate per acre	Area in acres	Rent	Rate per acre		
BAYAN	Chahi	277	1,127	5 3 0	162	770	5 1 0	425	2,197	5 2 0		
	Nahri	470	2,602	1 12 0	160	740	4 10 0	600	2,832	4 12 0		
	Dahri	43	238	1 14 0	78	181	4 12 0	87	419	4 13 0		
	Narmot	2,261	10,244	4 2 0	777	3,132	4 0 0	3,768	15,376	4 1 0		
	Magda	623	2,283	1 4 0	202	1,097	4 3 0	787	3,360	4 4 0		
	Bhor	407	224	2 0 0	110	215	1 15 3	577	1,143	2 0 0		
	Uncultivated				10	10	1 0 0	10	10	1 0 0		
	Total	1,741	10,162	4 1 0	1,509	6,145	4 1 0	6,232	25,337	4 1 0		
BHUDYAN	Chahi	225	1,339	5 14 0	234	1,416	6 0 0	465	2,755	5 15 0		
	Abi	1	24	6 0 0	3	18	6 1 0	7	42	6 0 0		
	Dahri	42	195	4 11 0	61	291	4 13 0	103	476	4 12 0		
	Narmot	188	681	1 9 0	110	516	4 11 0	298	1,377	4 10 0		
	Magda	508	2,211	4 8 0	158	870	1 10 0	658	3,119	4 9 0		
	Bhor	2,500	5,522	1 15 0	377	723	2 0 0	3,237	6,286	1 15 0		
	Uncultivated				10	10	1 0 0	10	10	1 0 0		
	Total	3,971	10,201	2 11 0	955	3,878	3 16 0	4,806	14,079	2 15 0		
DARAN MITHA	Chahi	602	4,758	7 13 0	365	2,669	7 5 0	668	7,417	7 11 0		
	Dahri	104	2,673	6 11 0	206	1,273	6 3 0	610	3,968	6 8 0		
	Narmot	1,310	5,274	4 0 9	419	1,552	3 11 3	1,728	6,826	3 15 0		
	Magda	731	1,973	3 9 0	240	1,245	6 3 0	504	3,218	5 7 0		
	Bhor	500	1,502	3 3 0	145	428	2 15 3	645	2,020	3 2 0		
		Total	3,187	16,280	5 2 0	1,375	7,169	5 3 0	4,656	23,449	5 2 0	
DARAN KHAN	Chahi	216	1,529	8 0 0	253	1,915	7 11 0	472	3,704	7 14 0		
	Abi	81	732	7 14 0	49	371	7 9 0	142	1,103	7 12 0		
	Dahri	52	350	6 12 0	23	181	6 0 0	77	514	6 11 0		
	Narmot	1,472	10,018	6 13 0	855	5,808	6 0 0	2,304	15,876	6 11 0		
	Magda	339	2,505	7 7 0	237	1,775	7 3 0	563	4,260	7 5 0		
	Bhor	178	1,191	6 10 0	107	683	6 6 0	286	1,873	6 9 0		
	Total	2,357	16,605	7 1 0	1,566	10,740	6 14 0	3,924	27,350	7 0 0		
CHIKHOT	Chahi	2	8	4 0 0	2	7	3 12 0	4	15	3 12 0		
	Abi	23	95	1 5 0	21	85	4 1 0	43	160	4 3 0		
	Narmot	310	1,215	3 15 0	167	621	3 11 0	477	1,839	3 14 0		
	Uncultivated				3	3	1 0 0	3	3	1 0 0		
	Total	335	1,321	3 15 0	193	716	3 11 0	527	2,037	3 14 0		
TOTAL TAHSIL	Chahi	1,328	8,281	7 0 0	1,008	6,807	6 12 0	2,337	16,088	6 14 0		
	Nahri	410	2,082	4 12 0	160	740	4 10 0	600	2,832	4 12 0		
	Abi	119	651	7 2 0	73	474	6 8 0	192	1,325	6 14 0		
	Dahri	537	3,477	6 8 0	330	1,914	6 13 0	577	5,391	6 3 0		
	Narmot	6,282	29,685	4 12 0	2,858	11,629	4 15 0	8,640	41,294	4 12 0		
	Magda	1,715	8,900	5 4 0	337	4,987	5 5 0	2,652	13,977	5 4 0		
	Bhor	4,006	9,243	2 5 0	738	2,079	3 13 0	4,745	11,322	2 6 0		
	Uncultivated				23	23	1 0 0	23	23	1 0 0		
		Total	14,438	68,599	4 7 0	5,628	28,658	5 2 0	20,066	92,252	4 10 0	

Nahri includes Chahi Nahri and Narmot includes Chahnoot throughout this statement

1	2	3			4			5			6			7			8			9			10			11			12
		SIMPLE RENTS						LUMP RENTS RESOLVED						TOTAL RENTS															
		Area in acres		Rent		Rate per acre		Area in acres		Rent		Rate per acre		Area in acres,		Rent.		Rate per acre											
LACHRO	Chahr	476	2,865	6 0 0	382	2,077	5 7 0	858	4,942	5 13 0																			
	Abi	32	153	4 12 0	44	187	4 4 0	76	340	4 8 0																			
	Dahr	4	13	3 4 0	6	18	2 15 0	10	31	3 2 0																			
	Magda	2,712	6,963	2 9 0	996	2,303	2 5 0	3,708	9,266	2 8 0																			
	Bhur	932	1,597	1 11 0	480	727	1 8 3	1,412	2,324	1 10 0																			
	<b>Total</b>	<b>4,156</b>	<b>11,591</b>	<b>2 18 0</b>	<b>1,919</b>	<b>5,323</b>	<b>2 12 0</b>	<b>6,075</b>	<b>16,914</b>	<b>2 13 0</b>																			
DAHAR	Chahr	229	1,004	4 6 0	371	1,426	3 13 6	600	2,480	4 1 0																			
	Abi	159	653	4 2 0	295	1,068	3 9 11	454	1,721	3 13 0																			
	Dahr	1,093	4,426	4 1 0	887	3,165	3 9 1	1,980	7,591	3 13 0																			
	Narmot	3,580	15,769	4 6 0	2,061	7,922	3 18 6	5,641	23,691	4 8 0																			
	Bhur	876	2,589	3 13 0	1,321	4,417	3 5 6	1,997	7,006	3 8 0																			
	<b>Total</b>	<b>6,579</b>	<b>26,381</b>	<b>4 0 0</b>	<b>5,622</b>	<b>19,205</b>	<b>3 7 0</b>	<b>12,201</b>	<b>45,566</b>	<b>3 12 0</b>																			
BANGAR	Chahr	280	1,308	4 11 0	182	808	4 7 0	462	2,116	4 9 0																			
	Nahr	546	1,830	3 6 0	276	890	3 2 0	822	2,710	3 5 0																			
	Dahr	4	9	2 4 0	16	34	2 2 0	20	43	2 2 0																			
	Narmot	3,297	12,803	3 15 0	938	3,518	3 12 0	4,235	16,421	3 14 0																			
	Bhur	980	2,608	2 11 0	551	1,402	2 8 9	1,511	4,016	2 10 0																			
	<b>Total</b>	<b>5,670</b>	<b>19,728</b>	<b>3 8 0</b>	<b>2,390</b>	<b>7,386</b>	<b>3 1 0</b>	<b>3,060</b>	<b>27,109</b>	<b>3 5 0</b>																			
TOTAL TAHSIL	Chahr	965	5,177	5 4 0	595	4,311	4 10 0	1,920	9,488	4 15 0																			
	Nahr	546	1,830	3 6 0	276	890	3 3 0	822	2,710	3 5 0																			
	Abi	191	806	4 4 0	339	1,255	3 11 0	530	2,061	3 14 0																			
	Dahr	1,101	4,448	4 1 0	909	3,217	3 9 0	2,010	7,665	3 13 0																			
	Narmot	6,877	28,672	4 3 0	2,999	11,440	3 13 0	9,876	40,112	4 0 0																			
	Magda	4,343	12,100	2 13 0	2,888	8,122	2 13 0	7,216	20,282	2 13 0																			
	Bhur	2,835	4,555	1 16 0	1,876	2,425	1 12 0	3,711	6,980	1 14 0																			
	<b>Total</b>	<b>16,405</b>	<b>57,695</b>	<b>3 8 0</b>	<b>9,931</b>	<b>31,914</b>	<b>3 3 0</b>	<b>28,336</b>	<b>89,609</b>	<b>3 6 0</b>																			

Narmot includes Chahr not

Nahr includes Chahr and Narmot includes Chahr

## Settlement Commissioner's Review of the Assessment Reports\* of the Ferozpur and Nuh Tahsils.

The tract dealt with in these two reports comprises along its eastern boundary a strip of the high-lying land above the Jamna bank, known as Bangar, which slopes eastward down towards the Jamna and westwards down to a depression that, extending from north to south down the middle, used at one time to receive the drainage from hills, valleys and torrents in the south-west, west and north of the tract and, while retaining part of the drainage in *jhils* or swamps, conveyed part away to Bhartpur territory to the south. In the south-west corner, west of this depression, comes down the Landoha valley, the upper (and southern) portion of which is in Alwar territory. It is enclosed between two parallel ranges of low hills, the westernmost of which extends northwards so as to form the western boundary of the tract throughout, except in the north-west corner, where the Taorn plateau, sloping down west of the range, is included within the limits of the tract. The range confining the Landoha valley on the east sinks down into the plain towards the centre of the tract, and after forming up to that point the watershed between the Landoha on the west and the drainage depression on the east, there permits the former to join the latter. The tendency of the Landoha water, however, appears at a comparatively recent time to have been to turn, not south-eastwards into this depression, but northwards into the Kotla *jhil*, one of the swamps above referred to, which lies immediately under the westernmost range of hills, and it was to guide it away from this, and into the central drainage depression that one of the oldest and largest of the many embankments which are fully described in paragraph 4 of the Nuh report and paragraphs 2 and 3 of the Ferozpur report, viz, the Kotla *band*, was constructed. Towards this central point, also, the flood water brought by torrents rising in the north in the hills of the Gurgaon tahsil and flowing southwards, had a strong inclination to turn, or such of it as was left after it had filled the swamps in the north-eastern extremity of the tract, of which the largest were the Khalipur and Chandamni *jhils*. The object of the first series of embankments described in detail in these two reports, the series, that is, that was constructed before the first regular settlement, was to keep the flood water of the Landoha valley to the south out of these swamps and to distribute it, and the overflow from the swamps, beneficially over cultivated land, passing the surplus down the central drainage depression to Bhartpur. The originators of these embankments had for their object to drain a water-logged and unhealthy tract. In constructing the later (Kaisari) embankments within this tract, Mr Macdonald had a similar object, viz, to keep the flood water of the northern torrents out of the swamps and to spread it over the fields. His scheme, however, also included a still later series of embankments in the Gurgaon tahsil which was intended, on the other hand, to hold up the northern torrents as near their sources as possible and utilize them there. Extended training works undertaken by the Alwar Durbar in the Upper Landoha valley have led to the utilization of more water in that State. Consequently, for ten years or more, little flood water has come either from the north or from the south, and the embankments within these two tahsils have had little work to do. These ten years, however, have been years of deficient rainfall, and it may be going too far to say that the later systems of embankments have so effectually controlled the torrents above as not only to render the original system unnecessary but also to change essentially the nature of the low-lying land in the tract now under consideration by depriving it of the flood water which was beneficial to it. The question is one that has a very vital bearing on the assessment proposed for this land.

\* Sent to Press on 26th September and 8th October 1907, respectively, and received together in print from Financial Commissioner's Office on December 10th, 1907.

2 The tract is divided, by an arbitrary line stretching from east to west across its centre, into the Nuh tahsil on the north and the Firozpur tahsil on the south

Assessment Circles

The strip of Bangar on the east thus forms two assessment circles of that name, one in each tahsil. It adjoins the circle of the same name in the Palwal tahsil, and on its eastern side receives irrigation from a distributary from the Agra Canal. The depression to the west of it extending to the boundary range of hills forms in Nuh one circle under the name Dahar. The portion of the Firozpur tahsil immediately adjoining it to the south Mr. Gibson has found necessary to form into a small assessment circle, the Chiknot, in addition to the two circles, the Dahar Mitha and Dahar Khar, which were originally considered sufficient for the corresponding tract in this tahsil. The Dahar Mitha is to the south and comprises the land which still benefits by Landoha floods in years of good rainfall, while the Dahar Khar lying to the north of this receives flood water only from the hills on either side of the valley and a further difference between the two circles is, as their names imply, that the wells are in the southern circle sweet and in the northern salt. Several strips of land fringing on the two Dahar circles and lying along the skirts of the two ranges of hills already mentioned, and on either side of the eastern range, have been included in one circle, the Bhuder circle of Firozpur, of which the characteristic is a light sandy soil too high in level to be benefited by torrent floods. Firozpur has thus been divided for assessment purposes into five circles, while Nuh has been formed into three only, the third being the Taoru plateau in the north-west corner of the tahsil. The collection of statistics for these units of area at this settlement has shown that certain alterations may with advantage be made in the above arrangement; a matter which will be reverted to at the end of this review. The following table brings together the leading statistics for the circles. Well cultivation is not of the same importance that it is in the Rewari tahsil, but is considerable in the Dahar Mitha, Taoru, and Bhuder circles; wells are everywhere in this tract of the nature of an insurance against years of drought and are left unworked in years of good rain when the well area will bear a crop without the aid of irrigation. The most remarkable figures are those indicating the area now under mortgage, but although these figures are enormous, against them are to be set the facts that the area sold out and out is small,\* and that the mortgagees are very often fellow-landowners of the mortgagors. To show the extent to which landowners are mortgagees I have given in the last line of the table percentages taken from Statement VI. The percentage of cultivated area under mortgage in these two tahsils was already high at the time of Mr Wilson's Revision, *vide* page 27 of his report, being 20 and 18 per cent respectively of the cultivated area of the two tahsils, as compared with 34 and 46 per cent now.

	Bangar (Nuh)	Bangar (Firozpur)	Dahar (Nuh)	Chiknot (Firozpur)	Dahar Khar (Firozpur)	Dahar Mitha (Firozpur)	Taoru (Nuh)	Bhuder (Firozpur)
Percentage to total cultivation of <i>Chahrs</i>	6	8	4		8	18	13	13
" " " <i>Nahri</i>	27	16	"				"	
" " " <i>Abi and Dahri</i>		5	37	30	12	12	4	4
" " " <i>Chiknot, Nar-mot &amp; Maada</i>	59	65	49	67	70	54	63	26
" " " <i>Dahar</i>	8	6	10	3	10	16	20	58
Incidence of population on square mile of cultivated area.	417	517	309	295	465	491	465	468
Percentage of cultivation sold since Settlement	2	1	6	2	5	14	4	5
" " under mortgage	24	29	38	47	53	37	24	27
" " by owners to owners	15	18	22	30	31	20	11	15

\* The large percentage in the Dahar Mitha circle has no significance, as is explained on page 22 of the report

3. The assessing officers have, in accordance with rule, prepared two estimates of the net income to proprietors from the land, the one based on the

Rents as a guide to assessment

share of the produce taken when the rent is collected in kind, and the other on cash rents. It is well to consider before examining these estimates in detail, how far they can be relied on as representative of the income to the peasant proprietors who themselves cultivate more than half the area in each circle, and which of them is the better guide in each of the various circles. For the purpose of this enquiry the percentages of cultivated land held by non-occupancy tenants paying cash rents as given in paragraph 28 of the Nuh report are deceptive, because they include all such lands irrespective of the nature of the cash rent paid. In the table below the percentages have been reduced so as to include only the land entered in column II of Statement XI as paying "other cash rents" and to exclude land paying at revenue rates with or without *malikana*.

Tahsil	Circle	PER CENTAGE OF CULTIVATED LAND HELD BY TENANTS PAYING	
		In kind	In cash
Nuh	Bangar	7	11
Firozpur	" "	6	18
Nuh	Dahar	11	16
Firozpur	Chiknot	17	6
"	Dahar Khari	18	31
"	" Mithe	7	31
Nuh	Taura	8	17
Firozpur	Bhuder	5	18

In the three circles placed lowest in this table the cash rent estimate is clearly a better guide than the produce estimate. In the Chiknot, on the other hand, the area under rents paid in kind is much greater than that under cash rents, and although it is not so in the Nuh Dahar and in the Dahar Khari, it is of considerable importance in these two circles. And Mr. Boughey's remarks, in paragraph 24 of his report, are worthy of note, they show that in the Dahar circle, at any rate, there is a growing preference on the part of tenants to pay in kind, a recognition that this class of rent is better suited than cash to the now precarious nature of the cropping. In the two Bangar circles the larger area is under cash rents, but the remarks on page 28 of Mr Boughey's report show that the cash rents paid on canal irrigated land in the Nuh Bangar, are no true indication of the letting value of that class of land. No such objection is taken to the recorded cash rents on that soil in the Firozpur Bangar but it is stated (page 32 of the report) that its renting value is the same as that of unirrigated land. That which the two estimates can be made use of in the various circles. In deducing from them the estimate of the net income of the self-cultivating proprietor the Settlement Officer and his Assistant have considered it necessary to make allowances and reductions of various kinds, which will be considered when the assessments proposed for the various circles are discussed.

4. As the basis of the estimate of income from rents in kind, the average cropped area forming the basis of the produce estimate. In Nuh the average area cropped annually is taken of a five years' period which is different in each of the two tahsils. In Nuh the period is that of the years 1898-99 to 1903-04, excluding the famine year of 1899-1900, or the same as was taken in Rewari and Palwal. In Firozpur, with Mr. Doue's approval, Mr Gibson adopted the five years 1900-01 to 1904-05 instead, as giving a more typical average of the distribution, of crops. The propriety of making a similar change in Nuh was considered but I understand that there the later cycle was held not to be any more representative than the other. In a tract where rainfall and flooding are so

variable and precarious as they are shown to be in the Rainfall Return (Statement I appended to the report) it is hard to pick out any cycle as typical of the tract, but it is noteworthy that the five years adopted in Nuh give an average cropped area which is less than the average, according to Statement X, of the 21 years ending 1905-06, among which are included 1896-97 and 1899-1900, two years of famine in the Punjab, the areas being 87 and 90.7 per cent. respectively of the total cultivated area. This is for the tahsil as a whole. For the Dahar circle the difference is still more marked, the percentages being 72.8 and 78.9. For the Bangar circle the corresponding figures are 94.7 and 98.1. In the Taoru circle, on the other hand, the average for the five years nearly coincides with that of the 21 years. In the Firozpur tahsil, even with the different term of five years, the average area cropped is well below the average of the 21 years. In the two Dahar circles and the Chiknot, though nearly equal to it in the other two circles, the percentages of cultivated area being—

	Bangar	Bhnder	Dahar Mitha	Dahar Khar	Chiknot
For 5 years	99.5	90.7	89.6	88.4	66.6
For 21 years	102.2	91.6	93	93.9	72.8

5. The rainfall statement\* may, in this connection, be referred to. It shows that the two tahsils have an average rainfall of from 23 to 24 inches, of

which 20 to 22 should fall in the four months, June to September, and  $2\frac{1}{2}$  to 3 inches in the cold weather. During the 11 years 1895-96 to 1905-06, however, the rainfall was below the average in seven years in Firozpur and in eight years in Nuh, and very often much below it; while in the previous 10 years it was only twice below it, and not badly so. If regard be had to the rain of September which is so important for the Rabi harvest, and also to the rainfall of the subsequent cold weather months the deficiency of the last 11 years is also marked, as compared with the amount received in the previous 10 years. It may be doubted whether even the period of 21 years for which figures are given is sufficiently long to be a representative cycle, but it may be safely asserted that a period of five years, however selected, is too short to form a safe foundation for a produce estimate for a circle or a tahsil, though it may give a fairly reliable result per acre cropped. The deficiency of the last 11 years must also be borne in mind in considering another important matter, the falling off in recent years in floods from the Landoha and other torrents, which the people ascribe to the stoppage of these torrents by embankments, but which may possibly be due in a large degree to the scanty rainfall of these years. This will be reverted to hereafter when the circle assessments are discussed.

6. The yields per acre adopted in the reports for the various crops are not based upon the results of experiments.

Produce estimate yields

This is not due to experiments having been neglected, for the Settlement Officer and his Assistant have devoted much care to this branch of their work, but owing to the abnormal harvests experienced most of the experiments have had to be rejected and the area shown in Statement XII as having been made the subject of experiments is too small to afford results of any value. Mr. Gibson and Mr. Boughey, however, have, working from the experience gained from experiments conducted by themselves, been able, by inquiry from the people, and by comparison with the yields ascertained in neighbouring tracts, to formulate rates which may be characterized as full, though they are generally lower than the yields assumed by Mr. Channing at the last settlement and are unquestionably fair to the people. The tract is, like the adjacent land in Alwar, a fertile one, and when the rainfall enables it to yield at all, it yields well. The outturn per acre is particularly good for gram and for cotton.

7. The scale of prices adopted in these two tahsils is the same as has been accepted for the Rewari and Palwal tahsils by Mr. Douie as Settlement Com-

Produce estimate prices

MISSIONER. In Nuh and Firozpur which are more remote from the railway than

the rest of the district, a lower scale might have been expected, but it is vouched for by the assessing officers that the Zamindars get the same prices for their produce here as in the rest of the district. The rise in prices which has occurred since last settlement is referred to in paragraph 18 below.

8. From the assumed prices and yields applied to the assumed area is deduced the gross produce estimate for each circle. Before calculating the share of this which the landlord is entitled to receive as rent, the Settlement Officer has made the usual deductions on account of the crops which, although their value has been included in the total, are fed off in whole or part to the cattle. These deductions are very considerable in this tract, where cultivation has reached its limit and the margin available for grazing is very small, they have been very carefully thought out, and no objection can be taken to them. Nor need objection be taken to the value of the straw, which the landlord receives as rent, being written off, although theoretically half of it should be credited to the Government half of the net assets even if it is the case that the straw is not sold by the landlord but fed off to his cattle. Menials' dues are paid by the tenants from their share of the produce in both tahsils, and consequently no deduction has been made from the gross produce on this account. I have ascertained that the meaning of the remark (paragraph 31, Nuh report, paragraph 32, Ferozpur report) that allowance must be made for these dues in assessing is that Mr. Gibson thinks the liability for them would be thrown on the landlord, or at any rate shared, if there were a larger area held on rents in kind. This, however, is an assumption only, and would not warrant a reduction being made in the half assets estimate: it is merely a corollary of the general criticism that where the area held on rents in kind is small, the half assets estimate based on such rents must be viewed very guardedly. The allowance made for the patwaris having underestimated the area of failed crops in the two Bangar circles may be accepted. Both Mr. Gibson and Mr. Boughy in checking crop inspections in these circles have observed that the allowance given by the revenue patwaris is inadequate not only in the canal irrigated villages but also in those which are not commanded by the canal, the patwaris in these circles having acquired the system of the canal patwaris. The extent of the correction allowed on this account is a matter of conjecture only, but I believe it to be very near the mark. In the case of canal irrigated crops the landlord pays a share of certain cash expenses detailed in paragraph 34 of each report, and his expenditure on this account has rightly been deducted from the value of the produce.

9. The value of the gross produce available for division between landlord and tenant having thus been determined the proportion taken by the landlord as rent is set aside in Statement XIII as the owner's net assets, and one half of that as the theoretical Government share. As regards *nahr* crops this calculation has been made for each crop separately in consequence of the cash expenses shared by the landlord. The Settlement Officer in paragraph 34 of his report expresses his opinion that the proportion is higher for unirrigated land than would be given by the tenant if kind rents were more general than they are, but the half asset estimates as framed are in accordance with the existing practice, and may be accepted, subject to the general criticism referred to above, as guides in the few cases where kind rents are more generally paid than cash.

10. The usual comparison has been made for each tahsil\* between the gross produce of food grains and the probable annual food consumption of the total population, rural and urban. The annual deficit works out to 12 per cent. of the food required for Ferozpur and 10 per cent. for Nuh. In view of the remarks in paragraphs 4 and 5 above on the average cropped area taken as the basis of the produce estimate, the wonder is that the apparent deficiency is not greater. The area is less than the average area of the last 21 years, and, though the population of these two tahsils were not distressed in the famine of 1896-97 and held out bravely in the second famine year of 1899-1900† there can be no doubt that grain had to be imported for food in these two years, and the average

\* Paragraph 38, Nuh report, paragraph 39, Ferozpur report  
 † Paragraph 38, Punjab Famine Report of 1896-97, and page 9, Volume V of the Report of 1899-1900.

produce for the whole period may actually have been little in excess of the local requirements and may even have been below it. But it is more probable that here, as elsewhere where similar estimates have been worked out the deficit is apparent only, and is a proof that the produce estimate has been, as it ought to be, based on rates of yields which are those of the average field in the average year, and therefore gives a result below the actual produce of all fields in a year of fair harvests. The tract is not well served by railways and it is consequently impossible to test the estimate by comparison with railway returns, but Mr. Gibson is of opinion that in ordinary years there is no import of food-grains; and his conclusion may be accepted that, except in years of drought, the tract is self-supporting in respect of food and has a surplus produce of cotton and wheat for export.

11. Cash rents undoubtedly afford the better guide to assessment throughout the greater part of the tract. They are paid on even a larger area than appears in the returns, for the meaning of the remark at the top of page 26 of Mr. Boughey's report is that a certain area of land shown as cultivated by the owners is really held by them as tenants of others to whom they have mortgaged it by a form of deed not recognised by the Land Alienation Act, and who are therefore not recognised as mortgagees in our papers. Transactions of this sort are also referred to at the end of paragraph 16 of the Nuh report. Very great care has been exercised by the assessing officers in sifting the recorded rents and in rejecting those which are unsuitable as guides owing to there being rack rents or for other reasons, but a considerable area remains after this process (*cf.* Statements XIV and XV) on which the rents paid indicate clearly the letting value, not only of nearly every circle as a whole, but also of the various classes of soil. The only matter in respect to which the estimates based on these are open to criticism is the allowance made on account of non-realization and cost of collection. The allowance of 5 per cent. made on this account in the Rewari tahsil was based on the accounts of a Court of Wards' Estate, and similarly in Palwal the deduction of 12 per cent. was justified by the books of the Skinner Estate. In the tahsils now under consideration returns of similar accuracy and importance have not been available, and yet for most of the circles the deductions made on this account are greater than those of Rewari and Palwal, being 30 per cent. in the Dahar Khari, 25 per cent. in the Nuh Dahar, 15 per cent. in the Dahar Mitha, Chiknot and the two Bangar circles, 10 per cent. in the Bhuder, and 5 per cent. in Taoru. These allowances are liberal, and seeing that they are, to some extent at any rate, covered by the remissions granted under our system of land revenue collection, I think that the resulting half asset estimates based on cash rents may be accepted as very moderate ones. Only in two circles are they in excess of the corresponding estimates based on rent in kind, which have themselves been framed in a liberal manner, and on a contracted crop area, and in most circles they are much below them:—

	Bangar Nuh.	Bangar Firozpur.	Dahar Nuh.	Chiknot.	Dahar Khari.	Dahar Mitha.	Tsora.	Bhuder.
Half assets produce	Rs. 1,51,438	Rs. 1,11,586	Rs. 1,26,093	Rs. 16,188	Rs. 46,775	Rs. 53,579	Rs. 59,900	Rs. 55,650
Half cash rents ...	1,17,350	1,06,810	1,11,785	15,170	46,841	55,097	49,507	51,713

12. The most difficult question in the assessment of the two tahsils is the treatment of the Dahar circles, The four Dahar circles. Reasons assigned for proposing a reduction of assessment. I therefore take them first in discussing the proposed assessments. Their present assessments are given below\*, with the percentage they bear to the half asset estimate now framed, and the assessments proposed by the Settlement Officer or Assistant Settlement Officer. In the Chiknot circle the half asset estimate is that based on rents in kind:

\* From Statement XVI.

in the other circles it is the estimate based on cash rents One-sixth of the value of the gross produce is also shown in the table for comparison—

Name of Circle.	One-sixth of value of gross produce	Present revenue	Percentage on half assets.	Revenue proposed by Settlement Officer	Percentage on half assets
	Rs	Rs		Rs	
Dahar Mitha ... ..	47,600	47,276	86	45,348	82
Dahar Khari , ..	41,635	57,411	80	35,911	77
Chiknot ... .	14,400	14,151	87	12,508	82
Dahar Nuh . ..	1,88,968	1,01,251	90	95,672	81

A reduction is thus proposed in each case, and, while there are reasons special to each circle for the Settlement Officer proposing this course and for arriving at the exact amount of reduction proposed, the main reasons are common to all, and may conveniently be discussed in this paragraph. There has been a diminution in the area annually flooded by torrents or drainage from the hills, and this flooding, however insalubrious it may have been, was always beneficial to the agriculturist and allowed of a better class of crops being grown than can be produced with the aid of rainfall alone. The extent to which this has occurred is indicated by the figures in columns 7 and 8 on page 13 of the Ferozpur report, but is a matter of inference only as regards the Nuh Dahar (paragraph 10 of that report). The figures in Statement X also bear witness to it, for they show that the falling off in the area cropped in the last ten, as compared with the previous ten, years is much more marked in the Rabi than in the Kharif, and the Rabi is the more important harvest of the two on flooded lands. Owing partly to the deterioration of the Dahar circles in this respect, but still more, probably, to the long cycle of bad years, with their times of scarcity and famine, the people have become impoverished, and have been driven to mortgage large areas of their land to provide themselves with food. With a more thrifty population the result of bad years might have been less serious, but with the character of the Meo being such as it is (paragraphs 13 and 41, Ferozpur report), a curious mixture of thriftlessness and industry, we can only accept the result. They are the more liable to suffer from bad years that the pressure of the population on the area of cultivation is very great. And they have little miscellaneous income, very few of them serve in the army; and the grazing is barely sufficient to support the cattle required for the ploughs and the wells. Mr. Gibson thinks that even his carefully-adjusted half asset estimates are true only for the proprietors who receive rent, and that to represent the half net assets of the peasant proprietors who cultivate themselves they must be reduced by 15 or 20 per cent, and as the present assessments are higher than the estimates so reduced they should be lowered. Mr. Boughey has put the case more strongly than he intended on page 45 of his report, in saying that the demand as reduced by Mr. Wilson in 1883 has proved too heavy for the people to pay, and has explained his meaning to be that the demand has not been collected in full in practice, and remissions have had to be granted. He does not question the equity of the demand at the time when it was imposed, but he considers that it was too high for the recent years of scarcity which the tract has had to endure, and that the people are now in a bad way and should be treated leniently to put heart into them.

13 Now these arguments certainly form a strong case for leniency, but Considerations to be weighed against the arguments they do not appear to me to take sufficient account of the circumstances which but for these arguments would justify an enhancement of the assessment. There has been no increase in cultivation, but on the other hand there has been no decrease, and there has been a considerable increase in prices, estimated at 39 per cent in paragraph 30 of the Ferozpur report and at 24 per cent in paragraph 29 of the Nuh report. These percentages might be modified as the similar percentages

for Palwal was modified in Mr. Douie's review, paragraph 7, but as to the reality of the rise, and especially in respect of cotton and wheat which are the chief marketable articles in the circles now under consideration, there can be no doubt, and in the forecast of the financial results of this settlement it was anticipated that the revenue might be enhanced 15 per cent. on this account alone. The tenants who have to pay cash rents have to sell produce in order to pay them, and the figures on pages 26 and 32 respectively of the Nuh and Ferozpur reports show that cash rents have gone up steadily, no doubt in response to the rise of prices. Mr. Gibson is right in saying that the rise is largely discounted by the fact that the revenue payers are peasant proprietors, and the remarks in paragraph 377 of the Settlement Manual are very pertinent in regard to this tract. But the improvement in resources due to rise in prices cannot be ignored altogether, especially when it is borne in mind that there is no separate tenant class in this tract, and the tenants are themselves proprietors who add to their assets by cultivating such land as they can get on rent from others. I may note that Mr. Gibson thinks that this circumstance tends to keep rents low, or at any rate fair, rather than high, because when a tenant has no land of his own he is at his landlord's mercy. It has also to be borne in mind that a number of the owners are sufficiently well off to be mortgagees themselves, and these draw rent from the mortgaged land. Then we have to bear in mind the manner in which the existing demand was arrived at, and the facility with which it was paid during the greater part of the period of the expiring settlement. The revenue assessed by Mr. Channing at the Second Regular Settlement was based on the experience of abnormally favourable years, and it was very soon put to the test by a series of bad seasons including the famine year of 1877-78, with the result that it was very carefully revised by Mr. Wilson from village to village in the light of the more normal, or less favourable, years that had supervened. The resulting demand, which is practically that now in force, was admittedly paid without difficulty up till 1895 (paragraph 38 of the Ferozpur report) and the suspensions which were granted in subsequent years, and which are conveniently tabulated on pages 39 and 50 of the two reports, were no more than might be expected to be required out of a fair assessment in abnormal years. The suspended revenue was for the most part collected without difficulty in the good years which intervened between the bad, and the amount which it was ultimately found necessary to remit was equivalent to half-a-year's revenue in the Nuh Dabar, and to rather more than that in the Dahar Khar and rather less in the Dabar Mitha, though in the small Chiknot circle it was equal to nearly two years' assessment. The danger of generalizing from the experience of a few good years was illustrated by Mr. Channing's settlement, and there is at least a possibility of our being led now by the experience of a series of bad years to fix the Government demand at an unduly low pitch. Even the strongest argument for the reduction of assessment, the falling off in the flooded area, does not rest on entirely secure ground, for the falling off may be due as much to a prolonged deficiency of rainfall as to the action of embankments in stopping floods. And while the density of population must be admitted to be great (the figures are given in paragraph 2 above), it is less than the incidence of rural population per square mile of cultivated area in many districts of the province, and considerably less than in these districts which are generally conceded to be congested.

14. My opinion is, on a review of the circumstances telling for and against the proposed reductions, that there is on general grounds no case for a reduction. The fact that the present assessment forms a high percentage of the half asset estimates is not in itself an argument, especially when we consider how carefully these estimates have been framed so as to exclude any chance of their being unfair to the revenue payer. We cannot judge of an assessment by arithmetical rule, and when the question is whether to reduce or not, the main fact to be considered is how the assessment has worked. The existing revenue seems to have stood this test. The people, and they are evidently numerous, who take land on mortgage, find no difficulty in paying the revenue, and if those who have been driven to mortgage have found a difficulty, it is not because of the pressure of the revenue but because owing to large families and bad years, they find it hard to get a living at all. In dealing with the question of maintaining the

present high pitch of assessment I have been led to consider whether the system proposed by Mr Wilson as Settlement Commissioner in paragraph 17 of his review of Mr King's Sirsa Assessment Report might not suitably be applied to these two tahsils, and I should be inclined to advocate its adoption, were it not that the recent revision of the rules for the suspension of land revenue, and for the remission and collection of suspended land revenue, the result of which is given in the last edition of Revenue Circular 31, seem to sufficiently secure the objects aimed at. If the Settlement Officer, in framing his scheme for suspensions and remissions of land revenue, has regard to the provisions of paragraphs 10, 12, 13, 22 and 23 of that Circular, and if the scheme is carefully worked by the Deputy Commissioner of the district, I think no hesitation need be felt in at least maintaining the present assessments of the Dahar circles. Paragraphs 13 and 22 in particular give a very wide discretion in differentiating between the impoverished and the well-to-do landowners in the matters of suspension and of the collection or remission of suspended land revenue, and in order to maintain the present pitch of the demand no further differentiation in assessment appears to me to be necessary. The proposals in regard to each circle may now be considered briefly.

15 The Dahar Mitha is in some respects the best of these four circles,

Circle Dahar Mitha.

it has a very fertile soil and gets what-  
ever flooding there is to be had from the

Landoha. It is better protected by wells than any other circle in the two tahsils, and the wells are sweet. Sixty masonry wells have been sunk since last settlement, and so, even if the revenue is not reduced, there will be a considerable initial remission of revenue owing to the grant of protective certificates for the wells sunk within the last 20 years. It will be observed that the percentage of *chahi* soil to total cultivation is given as 18 on page 13, and that of *chahi* irrigation as 8 on page 54 of the report. The latter figure represents the average area watered from wells in the year, on an average of years, while the former represents the total potential area, or the area protected by wells. It is to the latter area that the revenue rate sanctioned for *chahi* soil is applied for the purpose of framing the jama in the report, but in practice the soil will be assessed, as has been done in Rewari and Palwal, at the *barani* rate suitable for the soil, while the excess yielded by the application of the *chahi* rate will be taken in the form of a lump *abiana* on the well. I understand that this system has been generally accepted in Rewari by the people in the distribution of revenue over holdings. Mr Gibson proposes a reduction of nearly Rs 2,000 in the revenue of the circle on account of the loss of Landoha floods, the *chahi* area having contracted from 8,147 to 3,095 acres. How far this is permanent, it is difficult to say, and against it has to be set an increase of 1,300 acres in *chahi* soil, and such enhancement as can be taken from rise of prices. I should be inclined to propose an increase, if it were not that one large village in the circle requires careful treatment on account of the strained relations between the new tenants (*ex-proprietors*) and an alien landlord, and on the whole I think it will be sufficient to maintain the present revenue. I would not disturb the proportion between Mr Gibson's carefully thought out rates, but would raise them by 9 pies per rupee so as to obtain this result.

16. Judged by the standard of assumed yields the Dahar Khari is the

Circle Dahar Khari

best of these circles, and, although there  
has been a decrease of over 3,000 acres in

the area recorded as flooded, about 100 new masonry wells have been sunk since settlement. Mr Gibson admits that the circle is not overassessed, and his proposed reduction of Rs 1,500 is meant to allow for the congested population and the large mortgaged area. These considerations may be sufficient to restrain us from enhancing the present demand, but, as it is no more than 80 per cent of the half asset estimate, I would certainly maintain it. This result may be attained without altering Mr Gibson's proposed rates, otherwise than by raising the rate on superior *barani* soil from Re 1-12-0 to Re 1-13-0.

17 In the Chiknot circle the well irrigation is insignificant and in

Circle Chiknot area under fixed assessment

the area under fixed assessment the  
flooded area has diminished by 2,000

acres, and in this, the lowest part of the two tahsils, the diminution is likely to be in great part permanent. The pitch of the assessment is certainly

higher here than in the other circles and it amounts to 87 per cent of the half asset estimate, but I do not think it need be reduced. I would raise Mr. Gibson's *barani* rate to Re. 1-4-6 so as to obtain an assessment of Rs 14,066 for the portion of the circle under fixed assessment. The *abi* rate is sufficiently high.\*

18. It almost follows from the above that no change should be made either in the rates or in the system of fluctuating assessment in force in the Kotla Jhal villages of the Chiknot and the Nuh Dahar circles. The system is described on pages 38 and 45 of the Nuh report and on page 63 of the Firozpur report, and with reference to the remark at the end of paragraph 46 of the latter, Mr Gibson informs me that he has no further report to make and that his proposals stand. I recommend that the rate of Rs 2 per acre of matured crops be maintained in these villages, and that, as now, land which has paid for a Kharif crop should not be charged for a crop sown in the following Rabi. The villages in the Chiknot circle which are subject to this system should, I think, be transferred from the Firozpur to the Nuh tahsil. Mr. Gibson agrees with me in this, and will submit proposals to that effect. I have also asked him to consider whether the whole of the Chiknot circle might not appropriately be transferred to the latter tahsil and merged in its Dahar circle.

19. In the portion of the Nuh Dahar circle which is under a fixed assessment, the area recorded as flooded shows no diminution as compared with last settlement, the total of *dahri* and *abi* being nearly equal to the *dahri* area of settlement. Similarly, little change is shown in the area recorded as *chahi*, although 110 new masonry wells have been sunk during the term of settlement. The chief reason for the reduction proposed by Mr. Boughey is the large area under mortgage. The present demand is 90 per cent. of the half asset estimate, but the latter includes a deduction of 25 per cent. from the amount of cash rents to allow for non-realization. I would not increase the demand, but I think the present revenue may be maintained. To attain this result I would accept the *bhur* rate proposed by Mr. Boughey, and adopt Re. 1-8-0 as the rate for *chahi* and flooded land and Re. 1-5-0 as that for superior *barani* soil.

20. The Taoru table land receives drainage from the hills which nearly surround it, and has 13 per cent of its area protected by sweet-water wells. There has been a slight increase in cultivation, and the *chahi* area has risen greatly, 74 new masonry wells having been constructed during the term of settlement in addition to 33 old wells repaired and brought into use. The state of mortgage is not serious, and the people are not in distress. The present demand is 74 per cent. of the half asset estimate based on cash rents, which is the proper one to adopt for guidance in this circle. The remark on page 27 of Mr. Boughey's report, that cash rents are not common in Taoru scarcely expresses what is meant. Cash rents are common enough in the circle but Mr. Boughey thinks that although the best land is not given out on rent, the competition for the land that is so given out is very keen, and the rents run very high. For this reason he is rather disposed to distrust his rent estimate, and this may have influenced him in proposing the moderate enhancement of 14 per cent. on the present demand. The proposed demand, Rs. 42,214, amounts to 85 per cent. (and not 82 as given on page 44 of the report) of the half asset estimate of Rs. 49,507, and we should not, I think, go higher, though this amount can safely be taken. The revenue rates proposed by the Assistant Settlement Officer are suitable.

21. The strips of land forming the Bhuder circle are differently situated from the Taoru plateau, and the prevailing soil is the light sandy *bhur*. It has 22 per cent of its area protected by wells, and the *chahi* area has increased since last settlement, 122 new masonry wells having been sunk and 65 repaired. The

\* Mr. Gibson, who has seen this review, writes — "If the present assessment is maintained in this circle, I think it can only be successfully maintained, if the proposal which I shall make of giving initial remissions (at 27 1/2 up to a certain percentage of the demand), instead of suspensions, be accepted."

circle is in a prosperous condition, but the existing demand (Rs. 44,420 by Statement XVI) is 85 per cent of the half asset estimate based on cash rents, and I agree with the Settlement Officer that it would not be prudent to take any enhancement. The rate of 11½ annas an acre is sufficiently high for the *bhar* which is the chief soil of the circle, and the other rates are suitable. The result of maintaining the present demand unaltered will be that a considerable portion of it will be remitted for a time on account of protective certificates granted to new wells, but this position is in accordance with the Government policy of affording encouragement to well-sinkers.

22 The following is the composition of the three canal irrigated circles of the district:—

The Bangar circle of Nuh

Name of Circle	Palwal Bangar	Nuh Bangar	Ferozpur Bangar
Percentage of <i>Chahi</i> soil to cultivation . .	10	6	8
Percentage of <i>Nahri</i> . . . . .	34	27	16
Percentage of Superior <i>Barani</i> . . . . .	48	59	65
Percentage of <i>Bhar</i> . . . . .	8	8	6
Percentage of <i>Abi</i> and <i>Dahri</i> . . . . .	.	..	5*

It would have simplified the assessment of the Nuh Bangar if the circle had been sub-divided into two, the eastern containing the canal irrigated villages, and the western those which are not commanded by the canal. Mr. Boughey notes that the former, before the introduction of the canal, were inferior to the latter and consequently received at last settlement comparatively light assessments which have become lighter still now that the villages have the advantage of canal irrigation. The western villages on the other hand are akin to the neighbouring villages of the Dahar circle, though stronger because of their thrifty Jat population. It may be noted that wells are little used in the tract commanded by the canal, and the large increase which has occurred in the number of wells has been confined to the western belt of villages. The latter can bear a slight enhancement while in the former a very substantial increase is justified. Mr. Boughey's tentative village-to-village assessments have been framed on this principle, but when the results are brought together in the total for the circle the only way to judge them is by examining the rates proposed for the different soils.† As regards the most important rate in this circle, that for *nahri* soil, it has been observed in paragraph 3 above that the cash rents do not give a true indication of the letting value of this class of lands. The rates deduced on page 34 of the report from the produce estimate are not open to the same objection, but they are crop rates and not soil rates. From them, however, Mr. Boughey has worked out for me (*see* Appendix to this review) the corresponding soil rates for *chahi* and *nahri* land. The result justifies the assumption made on pages 36 and 48 of the report that the true half asset rate for *nahri* soil is Rs 2-4-0 per acre. The other half assets based on each rent may be accepted. The revenue rates which Mr. Boughey has proposed on the assumption that the whole revenue of the circle will be fixed compare as follows with the half asset rates —

1	2	3	4
Soil	Half asset rates (or their product)	Proposed rate (or product)	Percentage of column 3 on column 2
	Rs a p	Rs a p	
<i>Chahi</i> . . . . .	1 13 9	1 8 0	77
<i>Nahri</i> . . . . .	2 9 5	1 11 0	76
<i>Barani</i> . . . . .	Rs 71,340	Rs 63,322	88
<i>Bhar</i> . . . . .	0 11 6	0 10 0	87

\* Properly speaking not more than one per cent belongs to this class (p 14 of report)

† The present demand amounts to Rs 46,047 for the 33 villages commanded by the canal and to Rs 54,313 for the 66 uncommanded villages

From the percentage of half assets taken on *barani* and *bhur* soils it is clear that the revenue of the uncommanded villages will be maintained at a sufficiently high pitch. The pitch of the assessment on *nahri* land will be nearly the same as has been proposed by Mr. Doue for Palwal. The assessment for the circle proposed by Mr. Boughey, Rs. 1,14,207, therefore appears to me to be suitable. If Mr. Doue's recommendation in his Palwal review is accepted, that the *nahri* soil should be given a fixed assessment in its unirrigated aspect and that a fluctuating canal advantage revenue should be charged in addition on the land actually irrigated in each harvest, the fixed land revenue on *nahri* soil at Re. 1-3-6 per acre, the *barani* rate approved above, will be Rs. 28,364, as compared with Mr. Boughey's proposed fixed assessment of Rs. 39,273, so that to attain the latter pitch it is necessary that the canal advantage rate should yield Rs. 10,209. This result would be given by applying a rate of 10 annas an acre to the average area annually irrigated, which is 17,675 acres according to the upper table on page 12 of the report, and 17,290 according to the lower. In view, however, of the fact that Mr. Boughey felt himself limited, in proposing an assessment of a fixed nature, to a moderate enhancement only, I think that with a fluctuating assessment a rather larger increase can be taken and I propose that in this circle the rate of fluctuating assessment should be 11 annas an acre, which would yield an average of Rs. 11,152. As contemplated by Mr. Doue in his explanation of his proposed system in his reviews of the Karnal and Gohana reports, while the income from the rate should average 11 annas per acre for the circle, the actual rates framed for different villages may be greater or less than this, as the Settlement Officer may consider appropriate, and the area under millets should be exempted from payment of the rate.

23 The difference between commanded and uncommanded villages is less

The Bangar circle of Firozpur,

marked in the Firozpur Bangar, for Mr. Gibson reports that the expiring

assessment is light for the circle as a whole. The large increase of wells has here also been confined to the uncommanded villages. The half asset estimate based on cash rents should in this circle be a more suitable guide to the assessment than the produce estimate. It is remarkable, however, that the rent should distinguish so little between the various classes of soil other than *bhur* and from his remarks on the *barani* rate on page 57, Mr. Gibson seems to have come to the conclusion that the process of correction of which the results are given in the table on page 32 of the report was carried too far in the direction of lowering the *chahi* and *nahri* rent rates. He has consequently, in his proposed revenue rates, proposed to take a much larger proportion of the half assets estimate in the case of these soils than in the case of *barani* and *bhur*, as the following table shows, thus giving a result of an opposite nature to that shown by the analysis above of the Nuh Bangar rates;—

1	2	3	4
Soil	Half asset rate	Rate proposed by Settlement Officer	Percentage of column 3 on column 2
	Rs a p	Rs a p	
Chahi ... ..	1 12 6	1 9 0	88
Nahri .. ...	1 12 6	1 9 0	88
Barani ... ..	1 9 6	1 4 0	78
Bhur ... ..	0 12 6	0 10 0	80

It is a question whether in these circumstances the produce estimate of Rs. 1,11,586 is not a more reliable guide than the cash rent estimate of Rs. 1,06,810 for the circle (although in respect of differentiation between soils it goes no further than the latter), and whether the revenue should not be enhanced further than the Settlement Officer has proposed. If the difference of 5 annas

between the proposed *nahri* and *barani* rates is applied to the 10,675 acres of *nahri* soil and the result, Rs. 9,336, is distributed over the average canal irrigation of 8,985 acres (page 18 of the report), the quotient gives a rate of 6 annas only for application as the canal advantage fluctuating rate for the circle. This is certainly too low. The rate should not average less than 8 annas an acre for the circle. It should be differentiated from village to village as proposed by Mr. Dome, and the area under millots should be exempted from payment of the rate. The rate proposed by the Settlement Officer for *barani* soil, which will also under the system proposed by Mr. Dome be applied to *nahri* soil, might be slightly increased, and the assessment which I would propose for the circle is—

Soil				Rate.	Area	Demand	Total
				Rs. a p	Acres	Rs.	Rs.
Chabi	..	...	..	1 9 0	5,690	8,891	...
Nahri	.	..	...	1 9 0	754	1,178	..
Barani	.	...	..	1 4 6	45,941	58,987	...
Bhar	..	...	...	0 10 0	4,147	2,592	..
Nahri fixed	...	...	..	1 4 6	10,675	13,677	...
Nahri fluctuating	..	..	.	0 8 0	8,985	4,493	89,818

This would give 84 per cent of the half asset estimate based on cash rents and 80 per cent of that based on collection in kind, and would be an enhancement of the present demand by 13 per cent.

24. The Settlement Officer's instructions for the assessment of the areas benefited by the *bands* constructed by the District Board or by Government are contained in Punjab Government letter No 2825-S, dated 8th October 1907. Mr Gibson proposes in regard to most of the *bands* to avail himself of the permission there given to impose a fixed wet revenue on such land instead of a fluctuating *abiana*. The fixed rates proposed for *abi* land in all circles are high enough to take account of the benefit derived from the *bands* except in the following instances —

- (1) *Ferozpur Tahsil*.—Irrigation from the Mau *band* and the sluice at Hassanpur Nuh. To be charged at 10 annas per pakka bigha, or Re. 1 per acre, of mature crops \*
- (2) *Ferozpur Tahsil*.—Irrigation from the Lobinga Valley Canal, and the Shakrawa and Shahboka *bands*. To be charged as above †
- (3) *Nuh Tahsil*.—The land classed as *abi* in the Taoru circle. To be charged at 8 annas per pakka bigha or Re 0-12-9 per acre of matured crops ‡
- (4) *Nuh Tahsil*.—Irrigation from the sluices on the Khalipur and Qatabgarh *bands*. To be charged at 10 annas a pakka bigha §

I support these proposals, except that, in view of the lightness of the assessment of the Taoru circle I think the *abiana* rate to be charged there on *abi* land should be the same as that proposed in the other cases. The *abiana* would thus be uniform for the two tahsils. The water rates sanctioned will have to be notified under Section 29, Punjab Act III of 1905, and cesses will not be chargeable upon them. I support the proposal on page 59 of the Ferozpur report that *abiana* should not be charged on any land in the Bhuder or other circles that may be irrigated from the Kotla *band*, and the question of imposing a rate on irrigation from the Gheta Shamsabad and Rawa *bands* must, as explained on that page, be over for decision till irrigation from them becomes an accomplished fact, which is not likely to be the case for some time. The general effect of the proposals is discussed at the end of paragraph 47 of the Ferozpur

\* Page 65, Ferozpur report.  
† Pages 58—57, Ferozpur report

‡ Paragraph 40, Nuh report  
§ Page 47, Nuh report.

report and in paragraph 44 of the Nuh report. In regard to the rules for the annual assessment of *abiana* framed in paragraph 52 of the Ferozpur report, it is sufficient to say at present that, with the modification to suit the Nuh tahsil proposed in paragraph 43 of Mr. Boughey's report, they are generally suitable. The principles on which they have been framed appear to me to be sound, but they will have to be recast when the assessment of the Gurgaoon tahsil is completed, and an opportunity will then occur of finally considering them before they are published under Section 74 of Punjab Act III of 1905.

25. The following are the proposals which I put forward for the assessment of the various circles:—

Revenue.

Circle.	Present demand.	REVENUE PROPOSED BY		INCREASE OR DECREASE PROPOSED BY	
		Settlement Officer.	Settlement Commissioner.	Settlement Officer.	Settlement Commissioner.
	Rs.	Rs.	Rs.	Rs.	Rs.
Dahar Mitha . . . . .	47,276	45,345	47,276	-1,931	...
„ Khan . . . . .	37,411	35,911	37,411	-1,500	...
Chiknot fixed .. ...	14,151	12,503	14,151	-1,648	..
Bhuder . . . . .	44,420	44,420	44,420	.	...
Bangar . . . . .	{ Fixed . . . . .	72,651	86,767	} +7,106	-16,117
	{ Fluctuating .. ..	...	4,493		
Total Ferozpur tahsil ..	2,22,919	2,24,949	2,33,075	+2,050	+10,157
Dahar ... .. .	1,01,651	95,672	1,01,251	-5,379	...
Tsorn . . . . .	36,601	42,214	42,214	+5,713	+5,713
Bangar . . . . .	{ Fixed ... ..	1,00,250	1,14,207	} +13,957	+15,051
	{ Fluctuating . . .	..	12,152		
Total Nuh tahsil ...	2,38,112	2,52,093	2,58,816	+12,957	+20,504

I have taken the present demand, and the Settlement Officer's proposed demand where he proposes no change, from Statement XVI, to secure uniformity; the above figures therefore differ to a small extent from those given in the body of the reports. The fluctuating assessments of the Kotla Jhil villages in the Chiknot and the Nuh Dahar circles and the *abiana* to be levied on the areas benefited by *bands*, are not shown in the above table, as the amounts will vary so from year to year that it is difficult to frame accurate estimates. It will be necessary for the Settlement Officer, however, to frame forecasts of the income from each before the new assessments are introduced. And he has also to prepare an estimate of the portion of the fixed assessment which should be credited to the *bands*.

26 It has been suggested above that the Chiknot circle might be transferred to the Nuh tahsil. The Settlement Officer now thinks that the division of the Dahar tract of Ferozpur into two was unnecessary for assessment purposes, and I agree with him and am of opinion that the Dahar Khan and Dahar Mitha should in future be treated as one circle. The minute sub-division of superior *barani* soil into the three classes of *chiknot*, *tsorn* and *thar*, which was adopted at the beginning of the settlement, was found to be superfluous for the purposes of the settlement, as will have been observed from the rates proposed in the various circles, and under Mr. Douie's order it has been arranged to show them under one heading in future, and this has been provided for in the village note-book forms.

27. The subject of protective leases for wells in this district is being discussed in separate correspondence with the Financial Commissioner. The general rules for remission on wells falling out of use should be extended to the tahsil; the system of distribution of the assessment over wells has been touched on in paragraph 15 above. The rules referred to in paragraph 51 may be approved, as recommended by Mr. Dune in paragraph 12 of his Palwal review.

28. The new demand should be introduced with effect from the Kharif harvest of 1908. The cesses should be as at present (paragraph 54 of the Settlement Officer's report). The term of Settlement will be determined later for the district as a whole. The question of the remission of the land revenue at present held under suspension should be referred separately in accordance with the orders of Government on the proposals in that regard for the Rewari tahsil.

29. Mr Gibson's report is a very thorough piece of work and it bears marks of his strong sympathy with the people. Mr Boughhey has carefully followed the Settlement Officer's methods but his report shows originality also, and is a good one.

*Dated 8th January, 1908.*

A. H. DIACK,

## APPENDIX.

In order to work out a soil rate for the irrigated soils (*chahi* and *nahri*) in the Bangar circle I have adopted as far as possible the same calculation as that given in paragraph 36 of the Rewari report. For the *chahi* rate I have taken the areas in Statement III. This gives a *pskka chahi* area of 4,868 acres of which only 2,187 acres are annually irrigated. The remaining 2,681 acres are sown with *barani* crops. In the Rewari circle with a light soil Mr. Gibson could fairly assume that either *jowar* or *bajra* would be grown. I do not think it would be safe to make this assumption in the Bangar circle, where *rabi* crops are grown *barani* on well lands, and I have accordingly taken the rate per acre matured given in column 33 of Statement XIII. In paragraph 27 I have assumed an unirrigated failed area of 28 per cent. This is nearer  $\frac{1}{3}$  than  $\frac{1}{2}$ , but for the purposes of a calculation such as this I prefer to regard the figure 28 as a minimum and I therefore assume that only  $\frac{2}{3}$  of the *barani* area matures. The calculation is therefore:—

$\frac{2187 \times Rs. 2-8-0 + 2681 \times \frac{2}{3} \times Rs. 1-13-0}{4868} = 1-12-3$  per acre. For the *nahri* area there is no statement corresponding to Statement III and I have therefore taken the average area irrigated as shown in paragraph 11, while for the whole *nahri* area I have been obliged to take the figures in Statement II, which are those for the year 1905-06. This is not very satisfactory, but it is, I think, the nearest approach to accuracy which we can get. The calculation in this case is  $\frac{17233 \times Rs. 2-3-0 + 5846 \times \frac{2}{3} \times 1-13-0}{23236} = 2-3-5$  per acre. In each case the irrigation rate is that shown in the table given in paragraph 34. The following table compares these rates with the cash rents and my proposals:—

	Chahi.			Nahri.			
	Rs.	a.	p.	Rs.	a.	p.	
Soil rate by land rents ..	1	12	3	2	3	5	
Cash rent rates .. ..	1	13	9	3	4	0	A assumed
Proposed rates .. ..	1	8	0	1	11	0	

The two *chahi* rates agree very closely, and so do the *nahri* rates, but the comparison there is of course vitiated by the fact that the rate shown is an assumed and not an actual rent, and also because the calculation is not quite so accurate as that for the *chahi*, still I think we may say that the difference would not be strikingly great and that consequently the correspondence is there, too, fairly close.

18th December 1907.

G. M. BOUGHEY.



ASSESSMENT REPORT  
OF THE  
FIROZPUR JHIRKA TAHSIL  
OF THE  
GURGAON DISTRICT.  
PART I.—PRELIMINARY.

CHAPTER I.—PHYSICAL DESCRIPTION.

1. The Firozpur Tahsil is the most southern of the tahsils of the district  
Boundaries and Dimensions
it is bounded on the north and east by the Nuh and Palwal Tahsils, on the south by the Mathra District of the United Provinces and by the State of Bhatpur, and on the south-west and west by the State of Alwar The area of the tahsil is 316 square miles, and the population at the Census of 1901 was 132,287 It contains 244 estates as compared with 229 at last settlement, 15 villages having been transferred from the Nuh Tahsil at the end of the settlement operations

2 The tahsil is divided into two parts by a spur of the Aravalli range  
Physical Characteristics
which traverses its centre in an unbroken line from south to north Between this and another nearly parallel spur of the same range, which forms the western boundary of the tahsil, lies the Firozpur valley, famous from the earliest times for its fertility and for the beauty of its cultivation

The lands lying under the hills are sandy and very inferior, but those in the centre of the valley lie low and are flooded during the rainy season by water from the Landoha stream which enters the south-west corner of the tahsil from the Alwar State and by numerous torrents flowing from the hills which enclose the valley on either side. The prosperity of this part of the tahsil depends mainly on regular flooding from the Landoha, which brings down a most fertile silt and causes the land which it floods to yield astonishingly heavy crops of wheat The smaller torrents deposit sand, and their water is not nearly so beneficial as that of the Landoha.

As this stream rises in Alwar and irrigates a large area in the Ramgarh Tahsil of that State before entering the Firozpur Tahsil, considerable difficulty has always been experienced in maintaining fairly the respective rights of the Alwar and Firozpur zamindars.

Full details of the arrangement arrived at at last settlement are given in Section 300 of the Gurgaon Settlement Report, and the correspondence on the subject was forwarded to the Punjab Government with No 799 S, dated Lahore, 7th August 1877, from the Settlement Secretary to Financial Commissioner, Punjab, to the Secretary to Government, Punjab The history of the management of the stream is brought up to date in paragraph 8 of Mr O'Dwyer's Assessment Report of the Ramgarh Tahsil of the Alwar State, which summarises the whole case and which I quote *in extenso*

"The Landoha Nala, so named from the Landawat Meos in whose villages it rises, has already been referred to It has its origin in the Tijara hills, and after a course of about 6 miles through that tahsil runs for a distance of about 3 miles through Kisbangarh, irrigating five villages and is joined by several other nalas draining the country east of the Ismailpur range.

" It then enters the Ramgarh Tahsil, flowing at first due south under the hills to Bandoh. At Kharkhari it is joined by the drainage of the considerable valley formed by what has been called the Landoha range. From this point the stream ran originally due east to Naugaun, and thence north-east into the Firozpur valley which thus got most of the water.

" The Jats when they held sway over this tract towards the end of last century (see page 200, Gurgaon Settlement Report) made a large earthen embankment at this point, which diverted the water to the south and then by a semi-circular sweep brought it back to rejoin its old channel near Naugaun; but before reaching this point the Jats constructed another embankment across the new channel at Karaoh, which gave them the power of diverting the supply through the hills at Karaoh to the south-east of the Ramgarh Tahsil, or of turning it north through the old channel into Firozpur. The result of this measure was to considerably extend the irrigation in the Ramgarh villages and reduce the supply for Firozpur.

" No difficulty arose as long as both Firozpur and Ramgarh remained under Jat rule, but immediately they came under rival and separate interests, disputes began and continued till the Settlement of the Gurgaon District in 1877, when a joint decision for the future distribution of the water was arrived at by Mr. Channing, the Settlement Officer of Gurgaon, and Major Cadell, Political Agent of Alwar. This was sanctioned in the Punjab Government letter No. 1639, dated 1st September 1877; and as the dispute may crop up again, the understanding come to may be explained here by reference to the attached plan.

" (1). No obstruction is to be placed by Alwar in the channel D-D through which the water passes on to Firozpur.

" (2). The Jat Bund No. 2 is to be maintained by Alwar so as to prevent in all seasons any portion of the stream passing to the east at that point through the channel C-C.

" (3) A small masonry dam has been constructed F. at the mouth of the channel E-E (through which the stream could formerly be diverted south-east) 2 feet higher than the level of the main channel at the point marked G, which is also defined by a masonry floor, so that the stream should ordinarily follow the channel D-D and thus re-enter its old channel north-east to Firozpur instead of being diverted south-east to Ramgarh

" (4). The Gurgaon authorities to have right of inspection so as to assure themselves of the observance of the arrangement arrived at.

" I have more than once inspected the place, and am satisfied that in the working of the above arrangements the Ramgarh villages have not suffered. At present more water seems to find its way through the channel E-E than through D-D, and there is also sometimes a spill through the embankment C-C by means of a sluice provided for the purpose. The latter, however, seems a precaution necessary for the safety of the "bund."

" The value of the Landoha, from an Alwar point of view, depends on the maintenance of the Landoha Jat Bund No 1 at Kharkhari opposite the gap in the hills to prevent the stream breaching the banks and taking a direct course east to Naugaun and Firozpur through its old channel. Accordingly, of recent years the embankment known as the Atria Bund has been much strengthened and extended north and south, parallel to the hills, at a cost of over Rs. 76,000 and is now  $6\frac{1}{2}$  miles long, of which 4,059 yards are faced with masonry. Notwithstanding these measures, in seasons of high flood the water escapes round the northern extremity or through the outlets in the masonry embankment towards Akhampur, Mubarakpur, and Naugaun, where they rejoin the channel D-D."

It is difficult to ensure the maintenance of the masonry wall at F. When I inspected this point of the works last April, I found the wall breached, and this was the case in 1902 when it was inspected by the District Engineer of Gurgaon under the orders of the Deputy Commissioner. Instead of seeing that the works were inspected regularly every year the Gurgaon authorities have very rarely exercised their right of inspection, and the local Tahsildar has generally been ignorant of the fact that there ~~was~~ <sup>64</sup> anything for him to inspect.

The important fact from the Ferozpur point of view, is the recent lengthening and strengthening of the Atria Bund, which instead of being a low earthen "dhol" as at settlement is now a dam  $6\frac{1}{2}$  miles long faced throughout half its length with masonry. This alteration which was completed I believe in 1897 was first brought to the notice of the Deputy Commissioner, Gurgaon, through a visit paid to the spot in 1902 by Mr. Macgregor, District Engineer. Extracts from the correspondence which ensued between the Political Agent, Alwar, and the Deputy Commissioner, Gurgaon, will be found at the end of this report. The Deputy Commissioner apparently acquiesced in the view taken by the Alwar authorities, and no further representation was made.

As since the commencement of the settlement operations numerous petitions have been presented by Gurgaon zamindars against the new bund, to the construction of which they attribute the almost total cessation of flooding since 1897, I inspected the bund on August 11th in company with the Chief Revenue Officer of the Alwar State. I rode along the bund from its southern extremity opposite Bandoh up to the opening in front of Kharkhari where the small earthen bund shewn in Mr. Channing's map used to be. For the first mile the bund is of earth only, thence onwards up to Kharkhari, and for some distance north of Kharkhari, the inner face of the bund is strengthened with a strong masonry wall. Near Kharkhari there are a number of masonry outlets, which when the floods run very high allow some of the water to escape over into the old channel, and thence due east to Naugaon. No one in Alwar seems to know when the original Atria Bund, shewn in Mr. Channing's map, was lengthened, but it must have been done gradually after last settlement, as from papers which I was shewn in Alwar it is clear that what was done in 1892 when Mr. Macdonald, the then State Engineer, began the work which has given rise to the present enquiry, was to strengthen and improve what already existed.

After reading the report of Mr. Macgregor and from information received from my own subordinates, I went to the bund expecting to find that the extension so far south of the original bund had driven the Landoha out of the course marked on Mr. Channing's map and caused it to flow further south before rejoining its old course below Bijwa, thereby injuriously affecting the rights of Ferozpur. I do not, however, think that this is the case. As far as I could judge, without seeing the stream actually in flood, its present course is much the same as indicated by Mr. Channing. To clear up the point the Alwar authorities have kindly consented to have a survey of the present channel made, and I am in correspondence with them on one or two minor points connected with the extension of the bund. The result of these enquiries will, if sufficiently important, be reported separately, but I do not anticipate that I shall have anything to add to the opinion which I have just expressed. The stream is being very carefully watched, and if it comes down in flood during the present rainy season, it should be possible to come to a definite conclusion. There can be no doubt that owing to the strengthening of the Atria Bund and to the recent drought there has been a serious decrease of flooding in Ferozpur. In the past a large part of the flood water which entered the Ferozpur Tahsil must have escaped down the old channel east to Naugaon and then along the new channel to Gurgaon. The object of the alterations to the bund was to prevent this and it cannot now happen unless the bund bursts (as it still does with fair regularity) or unless water passes over the outlets. Flooding cannot now be expected in Ferozpur except when the stream flows along the full length of the course shewn in Mr. Channing's map. Even in normal years this must mean a decrease of flooding for Gurgaon as from Kharkhari to beyond Bijwa the floods pass over cultivated land and not in any well-defined bed which would carry the water along without much absorption. When it is considered that since the completion of the alterations to the bund, there has been almost continuous drought, it is not surprising that there has been an almost total cessation of flooding, which the Ferozpur zamindars of course ascribe wholly to the action of the bund. As a matter of fact good rain fell during this period in 1900, 1904 and 1906, and in each of these years the Ferozpur Tahsil was flooded. I cannot say how much flooding was received in 1900, but in 1904 and 1906 the area was carefully measured, and was very large. In both the later years, however, the bund was breached, and so far therefore the effect of the new bund has never been properly tested. I think, however, whenever really heavy continuous

rain falls the Firozpur Tahsil will receive a fair amount of flooding, and more than this cannot be expected. The present rains have up to the time of writing been excellent, but they have fallen in short showers, and so far three inches is the most that has fallen at one time in the Landoha catchment area. Nothing less than 5 or 6 inches is sufficient to bring the Landoha floods into the Firozpur valley.

Since last settlement there has been correspondence with Alwar about the obstruction of a small stream called the Thek Nala, which eventually flows into Gurgaon. A satisfactory arrangement was come to which is at present properly maintained. Its future maintenance should be watched together with the arrangements sanctioned in connection with the Landoha.

After it reaches the Firozpur Tahsil the Landoha is joined by a number of smaller streams.

The largest of these—"the Tirbani"—rises in Bhartpur territory, flows through Alwar and thence into the Firozpur Tahsil where it joins the Landoha at Doha a few miles from the southern boundary of the tahsil. The other streams are small hill torrents which flow from the hills on each side of the valley. The most important are on the west, the Bhond, the Jhir which rises just above the headquarters town of the tahsil and gives the town its name of Firozpur Jhirka, and the Balauj on the east, the Ghata and the Darur are the chief streams. All these torrents, except the Balauj, flow down into the centre of the valley and eventually join the Landoha, swelling its floods, but they also bring down sand from the inferior bhur lands lying under the hill sides and do a serious amount of damage en route. The steps taken to dam or divert the most destructive of these streams will be described in the paragraph on bunds.

The slope of the valley is from south to north and the accumulated water of the Landoha and of the local hill torrents drained formerly into a deep depression called the Kotla Jhil which is situated on the north-west boundary of the tahsil, lying partly in Firozpur and partly in the adjoining tahsil of Nuh. In years of heavy rainfall this basin which received also the drainage of the whole Nuh and part of the Gurgaon Tahsils was submerged for long periods, and early in the history of the British administration of the district steps were taken to protect and drain it. The protective works and their result will be described in the paragraph on bunds.

Under the eastern side of the central range of hills is a strip of inferior sandy soil similar to that on the west.

(b) The Eastern Uplands

It is much cut up by ravines and the Darur, which flows east as well as west of the central range, does considerable damage. This belt of sand ends in a depression or drainage channel which enters from the Nuh Tahsil at Shakhrava and carries off the drainage from the hills (and in years of exceptionally heavy rainfall from the Nuh Tahsil) past Lohnga Kalan into the Bhartpur State.

Beyond this depression is a high-lying plain of good, firm loam which is a continuation of the great plain of loam characterising the Bangar circles of the Palwal and Nuh Tahsils. Here and there it is broken up by detached hills, but in the main it is level, and well adapted to canal irrigation which was introduced in 1875 from the Agra Canal.

3. With so many hills and hill streams, inside (and outside but influencing)

Bunds and Drainage Canals  
(a) Landoha Bunds

the tahsil it is obvious that the control of their drainage water is of considerable importance, and a number of bunds have been constructed with this object. I will first describe the scheme of bunds which affect the distribution of the Landoha floods after they reach this tahsil. These are not District Board bunds, having been constructed by or at the expense of the zamindars, and their sole object is to utilise to the best advantage the Landoha floods. The three most important are Kanmaida, Madapur and Nagh, which are mentioned in section 303 of the Gurgaon Settlement Report, and are notified under Schedule II of Act III of 1905 (Punjab Minor Canals Act).

*Kanmaida.*—This bund is situated close to the eastern boundary of the town of Firozpur Jhirka: it holds up the floods and forces them to spread over the lands of Kanmaida and Bilakpur before resuming their normal course.

*Madapur and Nagli.*—These are important bunds as their object is to divide the floods at Nagli and send half the water in a north-eastern direction, thereby flooding the land of 17 villages which but for the action of these bunds would receive no flooding at all. Mr Channing's advice at the end of paragraph 303 has not been carried out. The bunds have not been carefully maintained and inspected, all are breached, and in 1899 it was discovered that the Tahsildar did not know of their existence. The Madapur and Nagli Bunds broke in 1896-97, but as the Landoha did not come down in flood again until 1904, not much harm has been done. I have applied separately to be permitted to take action under section 52 of the Minor Canals Act in respect of these bunds. If their repair is promptly undertaken it will be possible to judge of the result before the end of settlement.

The above three bunds are the only bunds on the Landoha mentioned by Mr Channing, but a number of others exist, which were, presumably, not considered of sufficient importance to mention. Most of them were in existence at last settlement, and are mentioned in the village administration papers. They are generally low embankments of earth which break when heavy floods come. As these village bunds lead to constant disputes and as it is desirable that the Collector should adjudicate on these disputes and prevent fresh ones from arising, I have proposed separately that Government should take action under section 49 of the Minor Canals Act, and I do not propose to deal further with these bunds here.

The remaining bunds are all under the control of the District Board and

Dis not Board Bunds

are notified under Schedule I of Act III of 1905. They may be divided into

two classes—A, bunds which form part of a general district drainage scheme, B, isolated bunds designed to check damage from hill torrents.

A *Kotla Bund*—This important bund takes off from the hills near the source of the Balauj and consists of a canal on the up-stream and an embankment on the down-stream side. After following a north-western direction for 12 miles it joins the Chandam Drain in the Nuh Tahsil and there ends. It was originally constructed by Lieutenant (afterwards Sir Henry) Durand, and its object was, and is, to divert the floods of the Landoha, Balauj and other local streams from the Kotla basin. This object was not successfully attained until 1865-66, when the embankment was carried on until it joined the Chandam Drain. Since then the flood water of the Ferozpur valley has been completely cut off from access to the Kotla Jhil, passing away into the Nuh Tahsil and irrigating in its course the land on the up-stream side of the bund. Before 1898 large areas used to be, or at any rate were recorded by the patwaris as so irrigated, but the cessation of flooding from the Landoha and the many years of drought have seriously decreased the effectiveness of the bund. It is not probable that the Landoha floods will ever again reach the bund, and the decrease in irrigation is probably permanent. The benefits due to the bund are—

- (a) Protection of the Kotla Jhil from submersion;
- (b) Protection from sand deposits of the villages which lie in the former path of the Balauj, *i.e.*, inside the southern end of the bund,
- (c) A small amount of beneficial irrigation.

Against these benefits must be set the following.—

- (a) 270 acres at the southern end of the bund have been severely damaged by recent sand deposits. The Balauj brings down much sand and has begun to deposit it over Nagina, converting first class loam into inferior bbur. This land is classed as abri and has upto now been paying abiana whenever flooded. The damage is serious, and the revenue of the villages affected will have to be reduced. It might be worth while attempting to check further damage by preventing the water of the Balauj spreading out at the point where the bund begins.
- (b) The villages inside the bund at its northern end are suffering from loss of moisture. Their soil is a stiff, black clay which requires flooding or abundant rain to render it productive, and the loss of moisture due to the absence of flooding and percolation

is serious Mr. Machonochie (vide paragraph 7 of his printed note on this bund) recognised this defect and to remedy it had a sluice constructed at Hasanpur to allow the flood water to pass inside the bund, but the volume of water collected by the bund has been too small of recent years to permit of this remedy being effective.

On the whole the Kotla Bund is a valuable work, and I do not think that any idea of abandoning it can be entertained. It is true that owing to the network of bunds constructed in the Nuh Tahsil and to the recent dry seasons the Kotla Jhil instead of being submerged has lately suffered from a lack of moisture, but this is an abnormal state of things and in years of good rainfall the Jhil will probably still require the protection which this bund affords.

*Mau.*—This is a small bund inside the Kotla Bund which was constructed by Mr Machonochie in 1890 to hold up for the benefit of Mau village any water turned inside the Kotla Bund through the Hasanpur sluice (vide supra) and to prevent it pouring direct into the Jhil. As Mr Halifax has recorded in his printed note, this bund worked well until 1897, but since then no water has passed through the Hasanpur sluice. For reasons which I have already recorded I do not think that in future flood water will ever reach this bund, but it had better be retained by the District Board for the present until the effect of a return of normal seasons has been ascertained.

The drainage of the Firozpur valley and of the Nuh Tahsil, diverted from the Kotla Jhil, collects at Sangel and Ujna in the Nuh Tahsil. The only escape for this water is into the Firozpur Tahsil down the depression between Shakrawa and Lohunga Kalan mentioned in paragraph 2. A shallow canal has been in existence for many years which facilitates the passage of the water, and in years of exceptionally heavy rainfall a large volume of water passes down it. Mr Channing describes, in paragraph 9 of the Assessment Report of the Firozpur Tahsil, the arrangements which were in force at last settlement and notes that the overflow from the Nuh Tahsil is of very rare occurrence. At last settlement the canal was in charge of the Canal Department, and a water-rate of annas 4 per pacca bigha was collected on all flooded land but the Canal Department abandoned charge of the work soon after last settlement. The water after flowing down the Lohunga valley eventually passed off into the Bhartpur State, but much of it was left behind in the pools and hollows round Lohunga. To drain these pools and to better utilise the supply of water two bunds were erected by Mr Machonochie across the canal at Shakrawa and Shah Choka in 1887 and 1888, respectively. They were formed by raising the level of two District Board roads which cross the canal at these points and they thus served a double purpose, raising above flood level roads which had previously been impassable for months in the rainy season and causing the flood-water to spread over a much larger area than was formerly irrigated. Each bund is supplied with a sluice, which is opened as soon the water collects, and allows it to pass on down the canal. Since the bunds were constructed there has, I believe, only twice been an overflow, and no water has come down since 1897. As it is improbable that the Landoha floods will ever again reach the Nuh Tahsil, and as the surplus water of the Nuh Tahsil has been decreased by the network of bunds constructed there since 1885 an overflow from that tahsil will probably be an even rarer occurrence than before, and it would hardly be worthwhile to maintain these bunds as irrigation works, but as they are useful as roads they should be maintained.

B. The above are the only District Board bunds in this tahsil which form part of the district drainage scheme.

The remainder are isolated bunds constructed to control the destructive action of hill torrents.

*Ghata Shamsabad Bund.*—The stream, which issues from the hills at Ghata Shamsabad and has a fairly large catchment area, pours sand over the lands of Kanmaida, Hurwari, Madapur, Allpur and Tigra. The damage is very serious and to check it a masonry bund was constructed by Mr. Machonochie in 1890 at the point where the stream leaves the

hills, but the force of the stream at this point is tremendous, and the bund was breached in 1903-04 and has not since been repaired. The bunding of this stream is a most necessary work and should be undertaken as soon as possible. A bund would probably be more effective a little lower down stream than the spot previously selected.

*Rawa Bund*—The Darur stream mentioned in paragraph 2 rises a few miles north of Ghata Shamsabad. The branch which flows west of the central range was formerly very destructive, and caused great damage to Ramala, Ramali, Dughri, Hamzapur, and one or two other villages. On account of the damage reductions of land revenue were necessary at last settlement and at the revision. An embankment was devised by Mr. Machonochio at Rawa where the water issues from the hills, and was completed in 1892. The work seems impregnable and has never been breached, with the result that the position of the villages formerly damaged has greatly improved, and it has been possible to re-impose most of the revenue remitted. The Rawa Bund is a most useful work and should be carefully maintained. Like the Ghata Bund it is purely protective and there is no assessable irrigation from it. Its value lies in the improvement which it has effected in the soil of the estates which it benefits.

*Dangocha Bund*—This bund is on the branch of the Darur which flows east of the central range of hills towards the Lohinga valley. The site is a naturally good one, as the bund completely blocks the path of the stream which, at the point where the bund is constructed, passes between two spurs. The bund benefits the village of Dangocha, and helps to drain the Lohinga valley, but it was breached in 1896-97 and has not since been repaired. The Darur does a great deal of damage before it reaches Dangocha, and a dam nearer the source would be more beneficial, if it could be successfully constructed. I do not think the existing bund ought to be repaired, unless it will be directly profitable, as it is essentially a "productive" and not a "protective" work. If constructed nearer the source of the Darur, it would be "protective."

Hitherto a fluctuating water-advantage rate (abiana) has been levied on all lands flooded or recorded by the patwaris as flooded from these bunds, and the rates formerly levied and now sanctioned under No 58, dated 19th March 1906, from the Chief Secretary to Government, Punjab, to the Senior Secretary to Financial Commissioner, Punjab, are as follows—

Bund	Former rate per acre	NEW RATE	
		Per bigha.	Per acre
		Rs a p	Rs a p
Kotla	0 10 0	1 0 0	1 9 7
Mau	0 12 10	0 12 0	1 3 2
Shakrawa	0 12 10	1 0 0	1 9 7
Shah Choka	0 12 10	1 0 0	1 9 7
Ghata Shamsabad	1 9 7	1 0 0	1 9 7
Rawa	0 12 10	0 12 0	1 3 2
Dangocha	1 9 7	1 0 0	1 9 7

The rates in column 3 have been sanctioned temporarily pending the report of the Settlement Officer, but they have not, as a matter of fact, been levied yet, and the old rate is still being collected. There has never been any irrigation from the Ghata Shamsabad and Rawa Bunds, and from the latter of the two there is never likely to be any. I append a statement showing the area

recorded as irrigated, and the abiana levied on the remaining five bunds since 1891-92:—

1 Year	2 KOTLA		3 MAU.		4 SHAKRAWA.		5 SHAH CHOKA			6 DANGOCHA			
	Area. Acres	Demand. Rs	Area Acres	Demand Rs	Area Acres	Demand. Rs	Area Acres	Demand.			Area. Acres	Demand.	
								Rs	a	p		Rs	a
1891-92	..	3,486	..	..	..	..	..	..	..	..	..	..	..
1892-93	862	539	29	24	..	..	..	..	..	..	28	44	11 6
1893-94	8,723	5,499	139	112	923	739	3,237	2,753	0 0	0	118	188	14 6
1894-95	8,716	5,226	162	124	1,017	772	3,524	2,753	0 0	0	94	144	0 0
1895-96	6,920	4,102	302	230	892	688	3,455	2,598	0 0	0	68	103	0 0
1896-97	664	415	33	27	296	237	1,077	961	14 9	9	50	80	0 0
1897-98	81	17	..	..	..	..	..	..	..	..	..	..	..
1898-99	396	82	..	..	..	..	..	..	..	..	..	..	..
1899-00	165	34	..	..	..	..	..	..	..	..	..	..	..
1900-01	3,029	631	..	..	..	..	..	..	..	..	..	..	..
1901-02	361	75	..	..	..	..	..	..	..	..	..	..	..
1902-03	3,755	782	..	..	..	..	..	..	..	..	..	..	..
1903-04	..	..	..	..	..	..	..	..	..	..	..	..	..
1904-05	976	187	..	..	..	..	..	..	..	..	..	..	..
1905-06	1,004	192	..	..	..	..	..	..	..	..	..	..	..
1906-07	186	36	..	..	..	..	..	..	..	..	..	..	..

\* Not available.

The above statement shows that since 1897 there has been no flooding—except on the Kotla Bund and even on that bund the flooded area has largely decreased. This is due partly to the dry seasons, but partly, as I have already pointed out, to the fact that the Landoha floods never now reach the north of the Firozpur valley, and so much of the decrease as is due to the latter cause is likely to be permanent. The present rates of abiana and the method of assessing irrigation from bunds will be discussed in the chapter on assessment.

4. At last settlement Mr Channing constituted 5 Assessment circles.

Assessment Circle

The highlying loam plain to the east formed one circle called Punahana. The belts of bhur on both sides of the central range and east of the western range formed a second circle called Bhuder, while three circles were formed out of the valley proper. The southern portion of the valley which was flooded by the Landoha in years of ordinary rainfall was formed into a separate circle under the name of Landoha. The central portion which was not reached by the Landoha except in years of exceptionally heavy rainfall, but which benefited by drainage water from the land to the south and from the hills on either side was Mr. Channing's Mandikbera circle, while the lowlying area in the north of the tahsil, characterised by the presence of a hard black clay soil and by the saltiness of the subsoil water formed a third circle called Chiknot. As already noted 15 villages were transferred from the Nuh Tahsil at the end of last settlement.

The preliminary report on Assessment Circles was submitted by Mr. Hamilton, and his proposals were sanctioned in No. 3163, dated 6th September 1904, from the Settlement Commissioner.

The former five circles were reduced to four. The Punahana circle was retained under the name of Bangar and now includes also 14 out of the 15 villages transferred from Nuh. The characteristic of this circle is the prevalence of the hard dry loam which resembles but is inferior to the loam of the Palwal Tahsil. It is capable of producing excellent crops when irrigated or when moistened by abundant rain, but it requires more rain than it usually receives. Sixteen per cent. of the cultivated area of this circle is now canal irrigated and further extensions are possible. This is fortunate as well as irrigation is very inferior, the wells being generally salt and being only used in dry seasons, as

the salt water if applied regularly to the hard soil, which in the case of the well lands is often clay, would cause it to seriously deteriorate

The Bhuder Circle was maintained under the same name

The characteristic feature of this circle is the inferior sandy soil, which near the hills is hardly worth cultivating, but improves further from the hills and often ends in good low-lying loam or clay. The inferiority of the *barani* soil and the comparative absence of natural flooding makes well-irrigation compulsory, and the wells are regularly used. The water is almost invariably sweet, though those wells which are in close proximity to the hills are generally rather deep.

The three former circles of the valley were combined into two on the basis of the quality of the well water. In the former Landoha Circle the well-water is generally sweet, the wells are regularly used and the irrigation is the best in the taluk. In the old Mandikhera Circle there is less flooding from the Landoha, and the wells are consequently salt, though the *barani* soil is as good as, if not better, than in the Landoha Circle, while in the Chiknot Circle the sub-soil water is so salt that hardly any irrigation is possible at all. The Mandikhera and Chiknot Circles were, therefore, combined into one circle under the name of Dahar Khari, while the Landoha Circle was kept as a separate circle and called Dahar Mitha.

I regret to say that after carefully considering the question, I have been unable to maintain the Dahar Khari Circle in the form proposed by Mr Hamilton. The clubbing together of the old Mandikhera and Chiknot Circles is from the point of view of Assessment statistics and future revenue management unworkable. It is true that the water in both is salt and that the predominant soil is chiknot, which were Mr Hamilton's reasons for combining Mr Channings' two northern circles and keeping them separate from the Landoha Circle, but in the old Mandikhera Circle the soil though chiknot is the best in the district, while in the Chiknot Circle it is almost the worst.

I quote from section 61, paragraph 7 of Mr Wilson's Revision Report the following remarks:—

"It is true that the original Landoha floods do not often reach farther north than Sakrag, but the Landoha supplies only a part of the moisture which benefits the Mandikhera villages. Even should none of the Landoha floods reach so far, the rainfall of the whole Ferozpur Valley, an area of 150 square miles, must (so much of it as does not sink into the ground) flow over Chak Mandikhera on its way to the low country about Sangel and Bajhera, and as the greater part of Chak Mandikhera is low-lying, the soil even when not directly flooded seems to be kept moist by percolation from the higher parts of the valley and seldom to suffer from drought, so that even in these last few years these villages have seldom failed in getting a crop. Much of the land entered as *barani* is a good, moist valuable soil."

This is an excellent description of the wonderfully moist, fertile, semi-dahar land of the Mandikhera Circle. Further, water is found at a depth of only 13 feet, and though in ordinary years wells are not much used, as being superfluous, in years of drought the area of irrigation is enormously extended by means of *hachcha* wells and *dhenklus*. The circle is therefore exceptionally secure. In the Chiknot Circle, on the other hand, the subsoil water is so salt that no irrigation at all is possible, and the chiknot is of a hard black variety, suitable only for the growth of jowar and wheat, and producing little or nothing unless flooded, or moistened by copious rain. This circle is the most insecure in the taluk and requires the most careful revenue management. I have therefore been obliged to separate off from the sanctioned Dahar Khari Circle the 18 insecure villages of the character described, and have formed them into a separate circle, called Chiknot. Mr Channings' Chiknot Circle contained 23 villages, and one village was transferred from Nuh at the end of settlement, but the marginally noted villages resemble the Mandikhera rather than the Chiknot villages, and I have left them in the

Maraors  
Mahamadnagar  
Balai

Danars  
Baderpur  
Bukharska

Dahar Khari Circle. I regret that this change in the sanctioned circles has not been previously reported for orders, but it was only recently decided on, and I have not delayed this report on account of the change. I think my proposals will be found to be justified by the assessment statistics—specially Statement, X and XV, and for the purposes of future revenue management I consider that they are absolutely necessary.

Soils,

5. The classes of soil recorded at last settlement were as follows :—

Chahi	..	...	Land irrigated from wells.
Dahri	.	...	Land which received the drainage from the hills or higher-lying lands.
Chiknot	...	...	Hard clay soil
Narmot	...	..	Hard loam soil
Magda	...		Light loam soil.
Bhur	...	.	Sandy soil

There were, of course, in addition the usual classes of uncultivated lands.

The classification of soils sanctioned for this settlement is as follows :—

(1). *Chahi*—All land regularly irrigated from a well, whether the well is constructed with masonry or not, and whether it is worked by bullocks or by lift (*dhenkli*). Land will be regarded as regularly irrigated if it has received water in two different years in the period 1898-99 to 1902-03, provided the means of irrigation are still in existence.

(2). *Nahri*.—All land regularly irrigated from the Agra Canal. Land will be regarded as regularly irrigated if it has received canal water in any two years from 1898-99 to 1902-03, or is irrigated at the time of measurement.

(3). *Chahi-Nahri*.—All land which is regularly irrigated both from the canal and from a well, whether the canal and well are used in the same harvest or in different harvests. All land which has been irrigated from the canal in two years out of the five years 1898-99 to 1902-03, and has also been irrigated from a well in 2 years during the same period will be regarded as *Chahi-Nahri*.

(4). *Abi*.—All land which is irrigated from tanks, *ghils*, springs or from river branches or by District Board bunds. Both the lands flooded by water held up within the bund and also the lands irrigated by cuts from the bund will be included.

(5) *Dahri*—All land which in years of normal rainfall receives the drainage from the hills or from higher-lying lands

(6) *Chiknot*—Hard clay unirrigated soil which does not usually receive flood-water.

(7) *Narmot*.—Fairly hard loam soil which receives no irrigation.

(8). *Magda*.—Light and somewhat sandy unirrigated loam soil.

(9). *Bhur*—Sandy unirrigated soil.

The uncultivated lands are recorded as laid down in the Land Revenue Rules.

Comparing the classification of last settlement and now, it will be seen that the subdivision of *chahi* by soils has been abolished, as where the land receives irrigation the nature of the soil is of minor importance, while the definition of *chahi* has been altered so as to conform with the prescribed rules.

The classes of *nahri*, *chahi-nahri* and of the *barani* soils (*chiknot*, *narmot*, *magda* and *bhur*) have been discussed in the Palwal Assessment Report, and the same remarks apply. It may be noted that the argument for reducing the classes of *barani* soil applies with even greater force in this tahsil, as cash-cents will show.

*Abi*—In this tahsil *abi* is land which is irrigated by the District Board bunds mentioned in paragraph 3. Owing to the abnormal character of the seasons the work of classification has been extremely difficult. The statement in paragraph 3 shows that there has been no flooding from any bund since 1897, except the Kotla Bund, and this is the only bund which has a recorded *abi* area. It was found after many attempts impracticable to adopt the area irrigated in any particular year or years, and the classification was based on a careful examination of the land, and to a certain extent on the admissions of the zamindars. It may, I think, be accepted as correctly representing the area which in a normal series of years will be fairly regularly flooded.

*Dahri*—As already explained, the classification of *dahri* is one of the problems of the assessment of this tahsil. The area flooded by hill-torrents as distinct from the Landoha has been fixed by the Tahsildar and Naib-Tahsildars after careful observations on the spot. As regards flooding from the Landoha, I have ordered all *barani* land which was flooded, both in 1904 and 1906, to be recorded as *dahri*. The area actually flooded in these two years was carefully measured, and there is no doubt as to the correctness of the recorded area.

Owing to the almost total cessation of flooding after 1897, and to the possible connection therewith of the alterations to the Atria Bund, Mr Hamilton, in 1904, ordered all lands flooded by the Landoha to be recorded as *barani*, but I do not think that such a pessimistic attitude is justified, and it does not appear oversanguine to anticipate that the moderate area now classed as *dahri* will be flooded whenever really heavy rain falls. It must be borne in mind that a fairly large part of this area is flooded by local drainage independently of the Landoha.

6 Statement I gives details of the rainfall for the past 21 years. There are two gauges in the tahsil—one at Punahana and one at Ferozpur Jhirka. Both give exactly the same average, and the rainfall of the whole tahsil may, therefore, be taken to be uniform. The year has been divided into two periods—the months of monsoon rainfall and the rest of the year. The following table compares the former and the present figures, and the figures of the adjoining tracts are included for purposes of comparison.—

	Inches
Final Settlement Report (section 7)	81 1
Revision Report (section 2)	22 3
Statement I { Rain Registers	24 6
{ Gazette Average	23 6
Tahsil Ramgarh, Alwar State (1876-77 to 1897-98)	18 59
Tahsil Pahari, Bhartpur State (1886-87 to 1900-01)	21 9
Tahsil Kama, Bhartpur State	34 1

I can find no mention of the rainfall in Mr Channing's Assessment Report.

The average given in the Final Settlement Report was based on the rainfall of the ten years preceding 1876, and as pointed out by Mr Wilson (Revision Report, paragraph 2), this average is useless, as the years were years of exceptionally good rainfall. Mr Wilson's figures are for the eighteen years from 1865-66 to 1882-83, and are nearly average.

The Bangar and Bhuder Circles depend mainly on their *khari* harvest while in the Dahar and Chiknot Circles the *rabt* harvest is of equal if not greater importance. The chief feature therefore of the rainfall statistics from an agricultural point of view is the serious decrease of rain since 1895-96. This has affected the Dahar and Chiknot Circles with their preponderance of *rabt* crops far more than the other two, because while, except in 1899 and 1905, there has generally been sufficient rain to mature a moderate *khari* crop there has not been enough heavy rain to flood the *dahri* lands, and the September and winter rains, on which the *rabt* crops depend, have been generally deficient.

Area

7. The following table compares the total areas of the present and two preceding settlements :—

1	2	3	4	5	6
		PERCENTAGE ON TOTAL AREA OF			
	Total area in acres	Unculturable	Culturable		REMARKS
			Uncultivated	Cultivated	
First regular settlement	1,92,924	17	31	52	The difference between the areas of the 1st and 2nd regular settlements is due to the transfer at the end of the second settlement of 15 villages from the Nuh Tahsil
2nd do ...	2,02,644	16	2	82	
1905 06 ...	2,01,966	16	2	82	

The figures of the first regular settlement are taken from Form A of Mr. Channings' Assessment Report of the tahsil, and the figures in column 4 include fallow. There was a large increase of cultivation between the 1st and 2nd settlements, but cultivation had reached its utmost limit at last settlement, and very little change has taken place during the last thirty years

But for a considerable decrease of cultivation in the Kotla Basin there would have been no change. As it is there has been a small decrease, as the statement which will shortly be put in shows.

In the *Mewat* the pressure of population on the soil is exceptionally severe, and it is impossible for the people to maintain even a moderate area of culturable waste for grazing purposes. The percentage of culturable waste is largest in the Bangar and Chiknot Circles, because in the former the hill area is smallest and in the latter a large part of the Kotla Basin is left uncultivated. In the Bhuder, Dahar Mitba and Dahar Khari Circles it amounts to a very small percentage, but the first two of these circles have a moderately large hill area which affords fairly good grazing, and they are therefore not so badly off in this respect as they appear to be.

The areas of each class of cultivated and uncultivated soil at last settlement, and now, are compared in the following statement.—

1	2	3	4	5	6	7	8	9	10	11	12	PERCENTAGE ON											
												TOTAL AREA OF						CULTIVATED AREA OF					
Assessment Circle.	Unculturable.	Culturable		Chahr	Nahr	Ahr	Dahr	Chiknot	Narnot	Maga	Bhar	Unculturable		Culturable									
		Unculturable	Cultivated									Unculturable	Cultivated										
Banger	80	30	89.0	60	...	...	1.0	30	64.0	14.0	7.0	...	...	...	...								
{ Settlement	80	30	89.0	80	160	40	1.0	50	48.0	12.0	6.0	...	...	...	...								
{ Now	300	1.0	69.0	100	...	...	6.0	20	7.0	15.0	60.0	...	...	...	...								
Bhuder	300	1.0	69.0	120	...	10	3.0	30	7.0	16.0	58.0	...	...	...	...								
{ Settlement	22.0	1.0	77.0	120	...	...	31.0	20	26.0	14.0	15.0	...	...	...	...								
{ Now	22.0	2.0	76.0	180	...	...	12.0	30	29.0	22.0	16.0	...	...	...	...								
Dahar Mitha	7.0	1.0	92.0	60	...	...	29.0	11.0	28.0	16.0	10.0	...	...	...	...								
{ Settlement	7.0	1.0	92.0	80	...	30	9.0	21.0	34.0	15.0	10.0	...	...	...	...								
{ Now	5.0	3.0	92.0	1.0	...	...	47.0	25.0	22.0	2.0	3.0	...	...	...	...								
Dahar Khari	6.0	7.0	87.0	...	...	10	29.0	41.0	24.0	2.0	3.0	...	...	...	...								
{ Settlement	16.0	2.0	82.0	80	...	...	14.0	7.0	37.0	13.0	21.0	...	...	...	...								
{ Now	16.0	2.0	82.0	100	70	20	6.0	9.0	32.0	11.0	20.0	...	...	...	...								
Total Tahsil	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...								
{ Settlement	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...								
{ Now	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...								

The present figures are taken from the measurement papers in the case of finished villages, and from the *jamabandis* of 1902-03 in the case of unfinished villages. The classification of soils is very easy in this tahsil, and was very carefully made at last settlement. No correction has been necessary, and the changes in the distribution of the various soils are due to the different method of classifying *chahi*, to the introduction of the new classes of *nahri* and *abi* and to the all-round decrease of the *dahri* or flooded area. The recorded *abi* and *dahri* areas are by no means final, as no reliance can be placed on the classification of these soils in the *jamabandis*, and even in the case of finished villages many alterations were made when the villages were inspected for assessment. The correct areas and percentages in each circle of *abi* and *dahri*, which have now been classified according to the principles stated in paragraph 5, are as follows —

1  Circle.	2		3	
	AREA IN ACRES		PERCENTAGE ON CULTIVATED AREA	
	<i>Abi</i>	<i>Dahri</i>	<i>Abi</i>	<i>Dahri</i>
Bangar	...	754	...	1
Bhuder	82	943	...	2
Dahar Mitha	...	4,364	...	18
Dahar Kharri	614	875	3	4
Chiknot	361	152	3	1
Total Tahsil	1,057	7,088	1	4

The *dahri* area in the Chiknot Circle does not include 842 acres flooded by the water which collects in the Kotla Jhul, and which are under fluctuating assessment

The chief features of the statistics of cultivation are—(a) the great improvement in the Bangar Circle, effected by the introduction of canal irrigation, (b) the serious decrease of flooding in the Dahar and Chiknot circles, due to causes which I have already explained. The enormous decrease in the Chiknot Circle is due partly to an overestimate of the *dahri* area at settlement, partly to the action of the Kotla Bund in placing out of the reach of floods the villages which lie inside it, but chiefly to the breaching of the Madapur and Nagli Bunds, and to the fact that the Landoha floods do not now reach the north of the valley.

8. Well-irrigation is not of much importance in this tahsil, the area classed as *chahi* amounting to only 10 per cent. of the cultivated area. In the

Irrigation.  
(a) Wells

Bangar and Dahar Kharri Circles, where the soil is hard and the water generally salt, wells, if possible at all, are used only when the rainfall is insufficient to mature a *barani* crop. In normal years the difference between the yield of an irrigated and unirrigated crop on wells of this class is not sufficiently large to compensate for the extra expense of irrigation, and the lazy and poverty-stricken Meo naturally avoids the labour and expense of working his well as far as possible. In these two circles irrigation is inferior and is purely protective. In the Bhuder Circle the wells are sweet, and in villages where the *barani* soil is too weak to permit of *rabi* sowings they are regularly used. In the Dahar Mitha Circle also there is a good deal of light soil, and as the water is sweet and very near, and as most of the villages adjoin the market town of Firozpur Jhirka, well irrigation is easy and profitable. In consequence the wells are regularly used, except in years when the *chahi* lands happen to be flooded. Statement XV illustrates the above remarks; in the Bangar and Dahar Kharri Circles the *chahi* cash-rent is little higher than that of good *barani*, while in the other two circles there is a considerable difference.

In the Chiknot Circle the sub soil water is so salt that well irrigation may be said to be non-existent.

A feature of the well irrigation of the Dahar Kharri Circle is the enormous expansion by means of earthen wells and *dhenklis* which takes place in dry years.

In the low-lying lands of the valley water is so near that temporary wells can be sunk at a nominal cost. 76 They fall in with the first flood or heavy

of the wells can be constructed whenever necessary, and are freely resorted to in case of drought. This is a considerable source of strength to these circles, and does not come out in the irrigation data given in Statement III, as the extent of the wells is not shown in that statement as those which happened to be in use at the time of measurement. It is brought out by a comparison of the irrigated area of Statement III with the area of average irrigation in the wells for the years 1900-01 to 1904-05 given in Statement II. The areas are as follows:

	2
	Cost of well
	Rs.
	750
	600
	500
	300
	450

The figures are for a well of average diameter on which two buckets can work, and it is assumed that the unskilled labour is provided by the owners of the well, as wells built by contract cost much more.

A *barand* well costs from Rs. 200 to Rs. 300.

In this table the average depth to water is nearer than in any other in the district. In the two Dahur Circles water is very near, and there has been no change since settlement, as the level is kept up by flooding and percolation. The rise of the water-level in the Bangar Circle is due to the Agra Canal, while the sinking in the Bhuder Circle is due to the recent dry seasons, which have injuriously affected the wells of this circle, which are of necessity in constant use. There has been a somewhat serious change in the Chiknot Circle, due to the fact that the drainage of the valley does not now reach the villages of this circle. The depth of water is everywhere much the same as at settlement. The effect of the various kinds of water has been described in the Rewari Assessment Report, and need not be discussed here. Speaking generally, the water of the Bhuder and Dahur Mitha Circles is sweet, while that of the other three circles is salt. As pointed out by Mr. Boughiey in the Nuh Report the statistics in Statement III do not indicate the full extent of the saltiness of the water, as many wells remain sweet when not in use, but turn salt as soon as they are worked. Such wells have been recorded as sweet in our papers

The wells are all worked on the *charas* and *lao* system, and two yokes of oxen are invariably used. For the cost of the well-gear and of the bullocks I would refer to my Rewari Report, simply noting the fact here that the cost of these accessories has increased enormously in recent years.

Detailed statistics of wells and irrigation are given in Statement III. In a tahsil like this, where the wells are not regularly used, a comparison of the figures of last settlement and now is not of much use. The settlement figures are only for one year, which happened to be a year of exceptionally good rainfall, and consequently the number of wells in use and the area irrigated are much below average. To obtain a more reliable estimate, Mr. Wilson took the average of the year of settlement, of 1881-82 and of 1882-83. The irrigated area of settlement compares with this average area as follows:—

1	2	3
Circle	Settlement area	Average of the three years
Bangar	885	1,556
Bhuder	2,200	2,262
Dahar Mitha	1,528	1,164
Dahar Khari } Chiknot }	765	653
Total Tahsil	5,378	5,635

The large decrease in the Dahar Circles was no doubt due to lack of resources, as they suffered severely in the bad seasons between 1878—1883. But for the effect of the famine Mr. Wilson's figures would probably have shown an increase of irrigation in these circles as in the other two. The present figures are the average of the 8 years 1898-99 to 1905-06, but as these years contain an unduly large proportion of bad *rabis*, the number of wells in use and the area irrigated is probably much above average. It is obvious from the above remarks that it is extremely difficult to make any reliable comparison of irrigation at settlement and now, and the figures in Statement III are of very little use. There appears to have been a considerable increase in all circles except Chiknot, and this supposition is borne out by the large increase in the number of wells, at the same time, for reasons already given, the increase is probably not as large as it appears to be.

The average area irrigated per *lao* is very small. The area irrigable, and actually irrigated, in a year when a well is used averages 5 acres, but is a little less in the Bhuder Circle, where the wells are somewhat deep and the soil sandy, and a little more in the Dahar Mitha Circle, where the lift is easy. As the wells are not regularly used the average area irrigated is less than the area irrigable and irrigated in any one year.

The information required by correction slip No. 3 to Settlement Commissioner's Circular No. 21 is as follows:—

1	2	2	4
Assessment Circle.	Number of masonry wells in use at the beginning of the expiring settlement which have fallen out of use during its term.	Number of new masonry wells sunk during the term of expiring settlement and still in use	Number of masonry wells which were not in use at the beginning of the expiring settlement but were repaired during its term and are still in use
Bangar	44	102	69
Bhuder	45	122	65
Dahar Mitha	33	62	20
Dahar Khari	13	80	37
Chiknot	4	2	6
Total	139	369	197

Most of the remarks in paragraph 8 (b) of the Palwal Assessment Report apply to canal irrigation in this tahsil

(b) *Arva Canal*

also, and I need not repeat them here

Irrigation was introduced in 1875 and had been extended to five villages in the year in which Mr Channing wrote his Assessment Report, though there was none in the year of measurement (*vide* Assessment Report, paragraph 8).

The following statement shows the areas irrigated in each year since 1881-82. The figures for the first two years are taken from the Revision Report, paragraph 9, and for the remaining years from the tahsil note-book —

1 Year	2			3	4
	ARVA IRRIGATED BY CANAL				
	Kharif	Rabi	Total		
1881-82				2,297	
1882-83				2,414	
1883-84	2,163	3,613		5,776	
1884-85	2,746	2,174		4,920	
1885-86	1,929	3,782		5,711	
1886-87	1,315	2,780		4,095	
1887-88	1,989	1,559		3,548	
1888-89	1,605	2,186		3,791	
1889-90	2,149	3,826		6,175	
1890-91	1,397	2,732		4,129	
1891-92	2,081	3,325		5,409	
1892-93	1,292	1,432		2,724	
1893-94	1,883	1,920		3,803	
1894-95	2,765	1,115		3,880	
1895-96	1,578	3,668		5,246	
1896-97	2,520	5,152		7,672	
1897-98	3,060	3,635		6,704	
1898-99	2,357	5,988		8,345	
1899-1900	4,839	6,689		11,528	
1900-01	5,174	2,556		7,730	
1901-02	3,501	6,446		9,950	
1902-03	4,226	5,325		9,551	
1903-04	3,463	6,041		9,507	
1904-05	5,972	727		6,699	
1905-06	3,132	4,219		7,651	

The above statement shows that there has been a large increase of irrigation since 1896-97 this is due partly to extensions and partly to the dry seasons. The Meo does not make nearly such a prudent use of canal irrigation as does the Palwal Jat. In Palwal less than three quarters of the nahri area is annually irrigated, while in this tahsil, which is situated at the end of the rajbaha, and where consequently water is much less abundant, 82 per cent is annually irrigated. This means that a very large area gets one watering and the maturing of the crop is left to chance. By irrigating such a large area and by getting as many crops, irrigated and unirrigated, off his nahri land as he possibly can, the Meo exhausts the soil, and if the supply of water were abundant "reh" would be very serious. As it is, there is very little water-logging and "reh" has developed seriously in only one or two villages, whose lands adjoin the rajbaha. The rajbaha comes to an end at Punabana, and at present there is no method of carrying off the surplus water from the canal irrigated area. To obviate this defect and to relieve the villages where water-logging has appeared, a drain is about to be constructed which will carry off all surplus water into the Bhartpur State. This drain is marked on the map, which accompanies this report.

It starts from Ali Meo in the Nuh Tahsil and passes through Barka and Poman Khera, the two villages in the Ferozpur Tahsil where reh is really serious. The position of these two villages is exceptionally bad. The depth to water is only 5 or 6 feet, and in seasons of heavy rain the whole kharif crop is swamped, as happened in 1904. The construction of the proposed drain, which will be commenced shortly, will much improve the position of these villages.

Another project which has already been sanctioned and will be completed this year is the Hathin-Bhartpur escape. This will also relieve water-logging. It takes off from Paosar in the Nuh Tahsil where the water-logged area on the Hathin Rájba commences, and after making a semi-circular sweep through the Firozpur Tahsil ends in Bhartpur territory where it will be joined by the Paosar Drain. The removal by means of this escape of all surplus water will considerably benefit the villages below Paosar.

As the map shows, it is proposed to make small extensions of irrigation on most of the existing minors, and these will probably be carried out within the next three or four years.

The canal dues in force were detailed in the Palwal report.

The following table shows the areas irrigated during the five years selected for the produce estimate according to the records of the Canal Department :—

1 YEAR	2   3   4 AREA IN ACRES			5 Occupier's rate.	6 Owner's rate	7 Total
	Flow	Lift	Total			
	Rs	Rs	Rs			
1900-01 ...	7,006	689	8,195	23,671	7,554	31,245
1901-02 ..	9,240	945	10,185	31,262	10,052	41,314
1902-03 ... ..	8,637	891	9,531	28,887	9,235	38,122
1903-04 ... ..	9,010	895	9,905	29,964	9,630	39,594
1904-05 . ...	6,488	620	7,108	22,605	7,257	29,862
Average ...	8,176	809	8,985	27,278	8,749	36,027

The canal dues are at the scale in column 2 of the comparative table of rates given in the Palwal report and average Rs. 4 per acre on the area recorded by the Canal Department. This area is 548 acres or 6½ per cent. larger than the matured area in Statement II. Canal dues at the present scale average exactly the same as at the old scale.

9. This tahsil has always been the worst in the district as regards

**Communications and marts**

communications. It contains no metalled road, though one is about to be constructed from the town of Firozpur-Jhirka to the town of Nuh (24 miles), and as a metalled road from Nuh to Palwal (22 miles) is also under construction, the villages situated in the north of the valley will get direct communication by metalled road with the Agra-Delhi-Chord Railway at Palwal. The villages in the south of the valley are connected by a metalled road with the town of Alwar on the Rajputana-Malwa Railway. Formerly the road was in a very bad state of repair, but it has recently been repaired and is now in very good order. If possible the road from Nuh to Firozpur should be extended up to the Alwar border. Most of the produce of the Bangar Circle finds its way to Kosi in the Mathra District. This important market town is now on the Agra-Delhi-Chord Railway, the opening of which in 1904 has immensely improved the position of this tahsil. The town of Hodal, which is on the same Railway, is also within easy reach of the villages of the Bangar Circle. A "feeder" road to Hodal or Kosi, if possible from Firozpur-Jhirka, or if this is impracticable, from the eastern side of the central range, would still further improve communications.

Within the tahsil itself Firozpur-Jhirka serves as a mart for the produce of the valley, while the produce of the Bangar Circle is disposed of at Punahana, if it is not conveyed direct to Hodal or Kosi. Cotton, wheat and oilseeds are the chief articles exported. Cotton is, if possible, conveyed direct by the cultivator to Palwal, Hodal or Kosi, and sold at the ginning mills. Wheat and oilseeds are disposed of locally to the bania.

10. The former and present figures of cattle are given in Statement IV.

**Cattle**

The changes in the number of ploughs and bullocks correspond with the changes in the material condition of the various circles: the Bangar and Bhuder Circles have prospered, while the Dahar and Chiknot Circles have deteriorated, and in the

two first circles we find that ploughs and oxen have increased, while in the three last they have decreased. The following statement shows in each circle the area cultivated per pair of bullocks at settlement and now, and the increase and decrease per cent of ploughs and bullocks I have made a deduction from column 6 for bulls at the rate of one bull for every 50 cows —

1 Circle	2		3		4		5	
	AREA CULTIVATED PER TORE OF BULLOCKS IN ACRES				INCREASE OR DECREASE PER CENT OF			
	Settlement		Now		Bullocks		Ploughs	
Bangar .. .	16		16		..		+2	
Bhuder .. .	17½		16		+9		+15	
Dahar Mitha ...	16		18		-12		-5	
" Khari . . .	14		16		-15		-17	
Chiknot ...	18		25		-33		-34	

The settlement area may be taken to represent the proper area culturable per plough in each circle, except Chiknot, where the settlement area is too high, and the increase in the present area in the Dahar and Chiknot Circles resulting from the decrease in bullocks and ploughs is very serious. In the Bangar Circle ploughs and bullocks are sufficient, while in the Bhuder Circle they are more than sufficient.

In a tahsil where the area available for grazing is so limited, the number of cattle other than plough cattle is necessarily very small, and only a sufficient number are kept to supply milk and ghí for domestic purposes, and these are nearly all stall-fed. The hills afford grazing for a large number of sheep and goats, but these are not generally kept by agriculturists as so few cattle are kept the supply of manure is less than the soil requires, and the tahsil is not nearly so well off in this respect as Palwal.

11 The following table shows the totals of the general population at different periods —

1 Year		2 Population		3 Incidence per square mile		4 REMARKS	
1845	..	79,987				} Area not available	
1868	... ..	126,601					
1881	.. .	114,340		361			
1883	.. .	102,964		325			
1891	. . .	113,874		359			
1901	... ..	132,287		417			

The increase between 1845 and 1868 was enormous and coincides with the increase of cultivation which took place during the same period. The causes of the decrease between 1868 and 1883 have been explained in the Assessment Report of the Rewari and Palwal Tahsils. There was a large rise between 1891 and 1901, but even now the population is little larger than it was in 1862.

Details by circles of the last three enumerations are given in Statement IV. The large rise in the Bangar Circle is presumably due to the prosperity of the canal irrigated area, while the decrease in the Dahar Khari and Chiknot Circles is due to deterioration.

The population of the tahsil is almost entirely agricultural, but in calculating the incidence of the rural population on cultivation it is necessary to exclude the populations and cultivated areas of Firozpur-Jhirka, Nagina, Biwan,

Pinangwan and Punahana. The resulting incidence per square mile of cultivation in each circle is as follows:—

Bangar .. .	...	..	.	..	..	517
Bhuder .. .						468
Dahar Mitha .. .						491
"    Khari .. .						465
Chiknot .. .						295
Total Tahsil .. .						478

These would not be very high rates for fertile, well cultivated and well irrigated soil, but they are high for this tahsil with its small proportion of artificial irrigation and for Meo cultivators. The improvident Meo has always been notorious for the number of his children (*vide* Section 56 (2) of the Final Settlement Report of Gurgaon) and the population question is a serious one in the Mewat. Cultivation had reached its limit 30 years ago, population is already pressing very heavily on the soil, and given normal seasons, it must continue to increase, yet so great is the attachment of the Meo to his native land that no relief can be looked for from emigration.

Tenures and holdings

12. The following table shows the prevailing forms of tenure:—

1	2	3	4	5	6
Assessment Circle.	ZAMINDARI		Imperfect pattidari	Imperfect bhayachara.	Total.
	Single landlord	Communal			
Bangar .. .		4	38	61	103
Bhuder .. .		4	7	47	58
Dahar Mitha .. .	1	1	4	25	31
"    Khari .. .			3	31	34
Chiknot .. .			1	17	18
Total	1	9	53	181	244

Statement XI shows that nearly 60 per cent of the cultivated area is cultivated by the owners themselves, and the percentage would be much larger but for the large area transferred to outsiders. The owners are almost without exception small peasant proprietors, holding the minimum area necessary for their maintenance.

The following statement shows the average area per holding, the average area per owner and the net area per owner free for profit after deducting the area transferred to outsiders and cultivated by tenants free of rent or paying at revenue rates. Villages owned by a single owner and land owned by Government have been excluded from the calculation of the area in column 7 —

1	2		3	4	5	6	7
Assessment Circle.	Year		Number of proprietary holdings	Cultivated area	Area per holding	Area per owner	Net area per owner available for profit
				Acres	Acres	Acres	Acres
Bangar .. .	Present	Settlement	11,048	67,241	6 1	7 2	5 4
Bhuder .. .	..	..	5,889	38,688	6 6	8 7	6
Dahar Mitha .. .			4,885	25,490	5 2	9	5 6
"    Khari .. .			7,298	20,908	2 9	5 9	3 9
Chiknot .. .			3,206	11,950	3 7	6 4	4 2
Total .. .	..	..	32,326	164,277	5 1	7 5	5 1

The area in column 7 is sufficient in the first three circles, but even in them the distribution is very uneven, and there are many villages where the area per owner free for profit is not more than 2 acres. In the Dahar Khari and Chiknot Circles land is altogether insufficient and the pressure of population on the soil is excessively severe. In these circles there are many villages where the area free for profit is less than 1 acre per owner, and the problem of how to assess such villages is a very difficult one.

It should be noted that in calculating the area in column 7 I have only deducted the area transferred to "others." If I had deducted the whole area transferred the net area per owner would be still smaller, as the area transferred to "others" is little more than one-third of the whole area transferred.

13. Statement V shows the distribution of ownership by tribes. The

Tribes of owners and tenants

proprietary body is composed almost without exception of Meos, who are a lazy, thriftless and improvident tribe, though to quote the words of Mr Channing (Assessment Report, paragraph 16) "how to characterize them as cultivators I hardly know." As a cultivator the Meo is generally what his surroundings make him. In the valley, where the assessment is high and the pressure of population on the soil severe, the cultivation is of a high class and the people are industrious. Similarly in the Palwal Tahsil, where the assessment is severe for Meos, and the standard of cultivation set by the surrounding Jats high, the few Meo villages are noted for their industry and good cultivation. In the Bangar Circle of this tahsil, on the other hand, where the assessment is somewhat light, the cultivation is slovenly and more in accordance with the traditional habits of the tribe.

As Mr. O'Dwyer has pointed out in paragraph 22 of the Assessment Report of Tahsils Kishengarh and Ramgarh. "While the men are lazy the women are energetic and industrious and do most of the field work except the ploughing." Mr. O'Dwyer sums up the character of the Meo as follows.—

"All are a like impulsive, short-sighted, easily led, especially in the wrong direction, litigious, not hospitable for Musalmans, but ruinously extravagant on certain occasions, such as weddings and funerals. They want the stamina of the Jats. Prosperity turns the head of a Meo, adversity makes him lose it, and as they themselves freely admit they are only good while kept well under. Their faculties are however sharper than those of any other tribe except perhaps the Ahns, and this makes them keen defenders of their own interests and quick to observe and resent any injustice."

To this description I would add as an instance of their improvidence that they are addicted to a practice of "badni." They borrow from the money-lender a sum which is to be repaid at harvest time in cotton or oilseed, the rate at which the produce is to be disposed of being fixed low. Should the season be unfavourable, as often happens, and the debtor unable to pay up the amount of produce agreed upon, he is debited with the value of the amount in default, calculated at the market rate, which is probably twice as high as the rate originally agreed upon.

As an instance of the demoralizing effect of prosperity on this tribe I would instance the canal villages. The extravagance and idleness of the proprietors in these villages is deplorable, and canal irrigation instead of proving a blessing to them is a curse.

In assessing agriculturists of this character the problem is as pointed out by Mr. Channing "how to choose a middle course between an unduly light assessment which will leave them idle and, in spite of it, poor, and an unduly heavy assessment which it would be beyond their capacity to pay."

Khanzadas own a few villages, they resemble Meos but as cultivators are very inferior to them. The one Sheikh owner is Khan Bahadur Mahamud Ikramulla Khan, Honorary Extra Assistant Commissioner of D. Div., who owns the large village of Doha in the Dahar Mitha Circle.

The tenants, both occupant and non-occupant, are mostly of the same class as a few Malis and Chumars are found in the areas where the Meos are not found.

14 Detailed statistics relating to transfers in cases VI and VII. The former shows the land sold since 1880 and the latter the land

Transfers and the Price of Land

mortgage, and the latter gives the annual total of sales, mortgages and redemptions from 1885 to 1905-06. Reliable figures are not available before 1885. The following table compares the state of transfers at last settlement and now. The top figure is the percentage of the cultivated area transferred and underneath in brackets the price per acre is shown in even rupees: the settlement figures are taken from paragraph 13 of Mr Channing's Assessment Report and Table II appended to the Report. I am unable to give details of sales before settlement by circles as Table I is missing. The percentage of transfers before settlement is calculated on the total area and of existing transfers on the cultivated area.

As the present Dahar Khari and Chiknot Circles do not agree with Mr. Channing's Mandikbera and Chiknot Circles, I have given the total percentage of mortgage in the two former circles:—

1	2		3		4		5	
	SALES				MORTGAGES			
	Before Settlement (1857-75)		Since Settlement		At Settlement		Now	
Bangar ...	...	1 (Rs 111)	6 (Rs 17)	29 (Rs 49)				
Bhuder		5 (Rs 43)	6 (Rs 22)	27 (Rs 42)				
Dahar Mitha . . .	..	14 (Rs 20)	8 (Rs 22)	37 (Rs 37)				
„ Khari ...		5 (Rs 116)	16 (Rs 32)	53 (Rs 58)				
Chiknot .. ...	...	2 (Rs 50)		47 (Rs 38)				
Total Tahsil		1 (Rs 32)	4 (Rs 38)	8 (Rs 24)	34 (Rs 46)			

The area sold is very small. The attachment of the Meo to his native soil is extraordinarily strong and he would rather mortgage 100 acres than sell one. The large percentage of sale in the Dahar Mitha Circle is due to the sale among relations of the whole village of Doha (paragraph 12). Excluding the area of this village the percentage is reduced to 3, while the average price is raised to Rs. 33 per acre.

The area mortgaged is on the other hand very large and is worst in the two Dahar and Chiknot Circles. As regards mortgage the condition of this tahsil is bad, but not as bad as it appears to be. The extravagant and improvident Meo, though averse to selling thinks nothing of mortgaging his land, especially if he has a little more than the bare minimum required for the maintenance of his family; a bad harvest or a wedding will involve him temporarily in a mortgage, but he expects if the seasons are favourable to be able in a few years to redeem his land, and Statement VII shows that he does so: in the second and third periods which were years of prosperity the area redeemed equals the area mortgaged. Another satisfactory feature is the large proportion of mortgage to members of an agricultural tribe it amounts to nearly two-thirds of the whole, and most of it is in the hands of co-sharers. Extensive mortgage therefore does not necessarily mean anything when the mortgagors are Meos, and in the Bangar and Budher Circles mortgage is not serious. In the other circles, however—especially in Dahar Khari and Chiknot—the state of affairs could not very well be worse.

In many villages in these circles the area mortgaged is so large that no margin is left for comfort or even for the bare maintenance of the mortgagor. Most of the mortgage to "others" took place in the bad years immediately after last settlement, when bannas acquired possession of large areas.

In the Mewat the Land Alienation Act has proved of immense benefit to the people. As Mr. Wilson says, their careless habit of contracting debt for marriages, funerals and petty luxuries even in average years formerly placed them

absolutely at the mercy of the money-lender when a year of drought came. When once a Meo has mortgaged his land to a money-lender, he is rarely able to redeem it. He usually cultivates it himself at a rack rent, which can only be paid in favourable seasons, and before the passing of the Land Alienation Act the penalty attached to default of payment was further mortgaging.

This state of affairs is now at an end, and the decrease of mortgage in the two Dabar Circles since 1901 is most satisfactory. The following table shows the totals of unsecured debt in each circle —

1	2	3	4	5
Assessment Circle	UNSECURED DEBT			Total
	Due to co-sharers	Due to other owners	Due to money-lenders	
	Rs.	Rs.	Rs.	Rs.
Bangar	27,957	21,860	1,98,579	2,48,396
Bhuder	10,595	13,502	1,00,153	1,24,250
Dabar Mitha	5,846	1,407	91,514	98,767
Kharri	10,276	13,512	65,300	89,088
Chiknot	3,364	8,254	19,568	31,186
Total Tahsil	58,038	58,535	4,75,114	5,91,687

The amount of unsecured debt varies inversely with the amount of mortgage. In the circles where mortgage is heaviest, unsecured debt is least, which means that there the people cannot borrow without the security of land. Debt is largest in the Bangar Circle, where it is more than three times the land revenue, because there the assessment is highest and the introduction of canal irrigation has improved credit. For the whole tahsil unsecured debt only amounts to twice the land revenue, which is less than in tahsils Rewari or Palwal and indicates the small amount of confidence which the Meo inspires as a debtor.

From the statement at the beginning of this paragraph it would appear that the price of land has nearly doubled, but very little reliance can be placed on such figures. The sale price in column 3 is obviously unreliable, while the mortgage price is too high, as the best lands are always mortgaged. The value of land has certainly risen considerably in the Bangar Circle owing to the canal, and has probably risen in the Bhuder and Dabar Mitha Circles. While in the Dabar Kharri and Chiknot Circles it does not appear to have risen at all.

The only land acquired of recent years under the Land Acquisition Act is in the Bangar Circle, where land has been acquired for the Canal Department.

On 36 acres of land acquired in recent years Rs 1,680 compensation has been paid. This is exclusive of the 15 per cent. paid for compulsory acquisition, and the rate per acre works out at Rs 45. The rates at which compensation was awarded were Rs 50 on good and Rs 32 on inferior land. As the soil of at least half the Bangar Circle is inferior, the average sale price would be about Rs 40 per acre.

15. There is no miscellaneous income which need be assessed in addition to the assessment on cultivation.

Miscellaneous income. Some of the villages near the hills derive a large income from pulis (munj grass), but where necessary these miscellaneous sources of income have been taken into account in fixing the village assessments, and no separate estimate of their value is necessary.

### CHAPTER III — CROP STATISTICS

16. The average cropping by soils for the years selected for the produce estimate is given in Statements VIII and IX. In the case of the barani

Crop returns. soils the details had to be obtained by exception from the khasra girdawari as in the junswar returns the various classes of barani soil were not shown separately. The cropping on the chahi and nahri soils is the irrigated cropping only, and the unirrigated crops grown on these soils have of necessity had to be thrown into the barani class — this makes the produce estimate useless for the purpose of deducing soil rates.

In this statement the barani soil classification is that of last settlement with the modifications introduced by patwaris at crop inspections.

17. Statement X shows the area matured at each harvest in each circle during the last 21 years, and the percentage which the matured area bears to the cultivated area. Periodical averages have been struck which show that in all circles the first two periods were above and the last two below the average. The kharifs are nearly average all through and the deficiency in the last two periods is due entirely to the long series of bad rains since 1896.

In the Bangar Circle owing to the influence of the canal the recorded percentage of matured to cultivated area exceeds 100. but as will be shown later the failed area in this circle has been considerably underestimated and the percentage is not nearly so large as Statement X shows. In the Bhuder and Dahar Circles the percentage is also high. In the first named circle the lightness of the soil permits of a crop being matured with very little rain, while the other two circles are secure owing to the moistness and fertility of their soil. The percentage in the Dahar Kharif Circle is probably the highest in the tahsil while it is lowest in the insecure Chiknot Circle where the proportion of black chiknot is very large and in the greater part of the circle the soil is dependent entirely on the rainfall. The figures of the last ten years in this circle speak for themselves and constitute the chief justification for the separation of the Chiknot from the Dahar Kharif Circle

18. The following statement shows in percentages the average area of each important crop sown, matured or failed, on 100 acres of each class of land during the years selected for the produce estimate.—

1	2	3	4	5	6	7	8	9	10	
Assessment Circle	Harvest	Crop	Chahi	Nahra	Abi	Dahri	Barani	Bhur	Total	
BANGAB	KHARIF	Jowar				16.00	14.81	1.18	10.83	
		Bajra ..				3.70	34.85	53.22	27.23	
		Pulsees				..	35	2.76	3.01	2.08
		Fodder				..	88	10.64	10.44	7.95
		Cotton	72	25.13	..	4.39	8.48	2.29	10.06	
		Sugarcane		5.87	..				.93	
		Others	62	9.53		1.04	2.83	87	3.57	
		Area harvested	1.34	40.53		26.38	74.37	71.01	62.20	
		Area failed	05	1.33		88	14.77	23.27	11.80	
		Area sown	1.39	41.86		27.24	89.14	94.28	74.00	
	RABI	Wheat		7.83	8.28		2.46	1.37	19	2.96
		Barley		29.52	13.69		3.16	7.54	6.10	10.23
		Gojra and gochnr		2.25	6.35		5.27	2.26	27	2.65
		Gram			8.64		6.15	25.38	18.07	19.66
		Oilseeds		1.13	1.47		1.76	2.22	2.00	1.89
		Others		2.18	1.07	..		20	02	50
		Area harvested	42.99	33.50	..	18.80	38.97	21.65	37.99	
		Area failed	1.88	1.04		4.89	12.28	7.50	9.26	
	Area sown	44.87	34.54		23.19	51.25	29.15	47.25		
	TOTAL	Area harvested		44.83	79.03		45.16	113.34	92.66	100.19
		Area failed		1.83	2.37		5.27	27.05	30.77	31.06
Area sown			46.26	81.40	..	50.43	140.39	123.43	121.25	

Government		1	2	3	4	5	6	7	8	9	10	
District		Comp.	Chahl	Nabri	Abi	Dahri	Darani	Dhur	Total			
BULOCH	Kharif	Jowar	.	.	...	6 11	8 02	1 28	8 03			
		Pigeon	.	.	5 74	9 02	46 84	85 38				
		Pulses	.	.	75	1 29	4 52	9 81	6 61			
		Cotton	2 02	.	1 13	3 85	6 20	3 17	4 89			
		Fodder	1 7	.	1 70	5 09	12 39	13 20	11 06			
		Others	3	.	39	1 09	2 22	50	1 07			
		Area harvested	2 77	.	0 40	27 26	65 86	74 39	61 54			
		Area failed	15	.	3 76	11 37	12 69	20 02	15 33			
		Area sown	1 02	.	13 16	35 03	78 76	94 41	76 86			
	Rabi	Wheat	1 16	.	.	.	5 07	4 31	1 46	2 69		
		Barley	77 01	.	.	1 50	6 67	0 64	6 29	10 47		
		Gojra and pochni	3 29	.	.	3 29	9 06	6 80	2 33	4 08		
		Gram	.	.	.	1 83	5 83	11 18	4 28	5 60		
		Oilseeds	1 70	.	.	75	2 16	6 69	6 14	5 59		
		Others	4 19	.	.	...	09	1 48	20	76		
		Area harvested	69 07	.	.	7 15	29 99	40 10	20 69	29 38		
		Area failed	4 16	.	.	4 50	7 43	16 33	10 63	11 74		
		Area sown	62 27	.	.	11 67	77 11	59 43	31 81	41 13		
	Faisal	Area harvested	60 02	.	.	10 55	67 24	105 96	95 08	90 09		
		Area failed	4 77	.	.	6 26	16 80	31 22	30 04	27 06		
		Area sown	57 25	.	.	21 61	76 04	137 18	125 72	117 98		
	DAHAR MITHA	Kharif	Jowar	.	.	.	3 00	16 63	2 20	9 84		
			Pigeon	.	.	.	10 80	26 36	50 98	23 78		
			Pulses	.	.	.	1 20	6 21	9 17	4 99		
			Cotton	1 78	..	.	5 66	6 53	5 71	6 58		
			Fodder	.	.	.	.	9 80	10 88	7 01		
			Others	1 80	.	.	.	8 10	4 51	1 29	8 84	
Area harvested			7 56	.	.	...	23 46	72 30	79 62	65 49		
Area failed			22	.	.	..	4 40	20 02	24 85	15 41		
Area sown			3 80	.	.	.	27 86	92 32	104 87	70 90		
Rabi		Wheat	6 75	.	.	.	3 87	2 29	1 89	3 05		
		Barley	21 71	.	.	.	6 79	12 82	8 06	13 14		
		Gojra and pochni	1 40	.	.	...	7 68	4 88	6 66	4 60		
		Gram	.	.	.	.	3 27	9 61	3 74	6 30		
		Oilseeds	1 86	.	.	..	8 13	7 06	12 28	6 59		
		Others	4 17	.	.	...	42	25	02	92		
		Area harvested	85 49	..	.	.	27 11	86 08	82 14	84 72		
		Area failed	4 17	.	.	.	4 81	19 66	21 78	15 41		
		Area sown	39 66	.	.	.	31 92	66 49	68 92	50 13		
Faisal		Area harvested	39 07	.	.	.	50 57	109 29	111 86	80 21		
		Area failed	4 39	.	.	.	9 21	39 59	46 63	30 82		
		Area sown	47 46	.	.	.	59 79	149 81	158 59	131 03		

1	2	3	4	5	6	7	8	9	10	
Assessment Circle	Harvest.	Crop	Chahi	Nahri	Abri	Dahr.	Barani	Dhur	Total.	
DAHAR, KHARI.	KHARIF.	Jowar	...		4 47	26	10 44	3 15	7 74	
		Bajra	...		12 85	71	17 09	42 34	16 44	
		Pulses ..	...	..	1 87	05	2 27	7 20	2 34	
		Cotton .	..	..	2 96	..	9 19	7 44	7 22	
		Fodder	...	..	3 78	..	12 75	15 15	10 49	
		Others ..	..	1 57	..	56	2 94	1 13	2 34	
		Area harvested	..	1 87	..	26 44	1 02	54 68	76 44	46 56
		Area failed	..	06	..	8 38	05	10 26	14 24	8 78
		Area sown	..	1 93	..	34 82	1 07	64 94	90 68	55 34
	RADI.	Wheat	..	5 96	..	6 57	30	2 55	2 02	3 43
		Barley	..	31 21	..	6 57	..	15 70	13 60	15 14
		Gojra and gochni	..	2 33	..	8 94	26	11 34	6 26	8 98
		Gram	..	..	..	9 87	05	10 13	9 86	8 29
		Oilseeds	..	2 85	..	..	..	5 30	11 18	5 39
		Others	..	5 22	..	2 60	05	24	20	70
		Area harvested	..	47 67	..	38 55	66	46 76	43 12	41 88
		Area failed	..	6 42	..	15 46	..	22 81	24 44	19 25
		Area sown	..	54 09	..	54 01	66	69 57	67 56	61 18
	TOTAL	Area harvested	..	49 54	..	64 99	1 66	101 44	119 58	68 49
		Area failed	..	6 48	..	28 84	05	38 07	38 68	28 03
		Area sown	..	56 12	..	89 83	1 73	134 51	156 24	116 52
	OHINKOT.	KHARIF	Jowar	..	..	4 48	1 43	14 53	2 98	10 26
			Bajra	..	..	1 49	1 92	12 96	22 02	9 86
			Pulses ..	..	..	..	58	1 72	3 27	1 40
			Cotton	..	..	74	1 89	7 60	3 57	5 59
			Fodder	..	..	4 48	2 04	10 76	8 04	8 05
			Others	..	3 85	..	75	35	3 50	..
Area harvested			..	3 85	..	11 94	7 71	51 06	39 88	37 63
Area failed			..	..	..	4 48	2 41	13 48	3 87	9 86
Area sown			..	3 85	..	16 42	10 12	64 54	43 75	47 49
RADI		Wheat	..	3 85	..	30 60	3 11	5 59	29	5 00
		Barley	..	69 23	..	7 46	52	3 92	1 79	3 21
		Gojra and gochni	..	5 77	..	47 02	1 95	18 43	6 84	18 63
		Gram	..	..	..	5 22	17	7 28	6 85	5 17
		Oilseeds	..	..	..	..	..	2 18	60	1 47
		Others ..	..	28 84	..	41 79	1 31	1 08	..	1 66
		Area harvested	..	107 69	..	132 09	7 08	38 43	6 37	30 14
		Area failed	..	46 16	..	44 08	3 98	19 62	5 06	15 09
		Area sown	..	153 85	..	176 12	10 99	58 05	21 43	45 23
TOTAL		Area harvested	..	111 54	..	144 03	14 77	88 49	56 25	67 77
		Area failed	..	46 16	..	48 51	6 34	38 10	8 98	24 95
		Area sown	..	157 70	..	192 54	21 11	122 59	65 18	92 72

As pointed out in paragraph 15 the crops on the barani soils include those grown without irrigation on the chahi and nahri soils, and there is not really the large area of double cropping on the barani soils which the figures indicate

The results for abri and dahri are also vitiated by the percentages being worked out on the abri and dahri areas entered in the Area Statement which are very different from the final area of these soils given in paragraph 7

The statement will be referred to in the succeeding paragraphs.

19. The system of chahi cultivation is very simple wheat and barley are almost the only irrigated crops grown, the proportion of wheat being about one-fifth. In the Bhuder and Dahar Mitha Circles, where the wells are sweet, a little cotton and tobacco are also grown, and in all circles except Bangar and Chiknot a fairly large area of miscellaneous crops is irrigated from temporary wells. In the Rewari and Palwal Assessment Reports I have described in detail the method of cultivating the principal chahi crops, and I need not repeat the description here. Speaking generally the Meo is inferior both in industry and resources to the Ahir and the Jat, and as these are the two most important factors in determining the quality of chahi cultivation, the chahi produce of this tahsil is in consequence inferior.

20. The system of nahri cultivation has been fully described in paragraph 20 of the Palwal Assessment Report. The system in this tahsil is broadly similar, and I shall only notice in this paragraph the respects in which the nahri cultivation of this tahsil differs from that of Palwal. In the first place the soil, water-supply and character of the cultivators are all inferior to those of Palwal. The custom of irrigating nearly the whole nahri area annually and of excessive cropping have been already alluded to, in consequence we expect and find inferiority in the nahri produce of this tahsil. Again, while the principal crops grown are the same, the proportions which they bear to each other differ, there is a larger proportion of rabi crops than in Palwal and barley takes the place of wheat as the chief rabi cereal, a certain amount of irrigated gram is also grown, though it is admitted to give a very poor yield. The preference for barley and gram over wheat and cotton seems due to the following reasons:—The cultivation of the latter demands more labour than the former, wheat requires more water and manure than is probably available, while the pressure of population on the soil makes a larger area of food-crops necessary. The above facts taken in conjunction with the increased canal rate on rabi cereals (*vide* Palwal Assessment Report, paragraph 8) make it clear that the Meo does not derive any thing like the profit from canal irrigation that the Jat does, and this fact is brought out in the nahri cash rents

21. Owing to the cessation of flooding during the years selected for the produce estimate, the dahri cropping in the statement in paragraph 18 is not representative. The area under kharif crops is nearly as large as that under rabi crops, and among the rabi crops there is a large percentage of barley. This is not characteristic dahri cropping. The abri cropping in the Chiknot Circle may be taken as a fair type of what the cropping on flooded land ought to be. The system of cultivation of dahri and abri land is much the same. Land which has been well flooded during the kharif either by water from hill streams or from a bund is generally sown with a crop of gochni (wheat and gram), wheat alone is only sown in the best flooded lands. The land is ploughed 4 or 5 times if the water dries off in time, and sown, if possible, during the first fortnight in November. Much more wheat is sown than gram, the proportion being generally three parts of wheat to one of gram. The total amount of seed sown is about 40 sers. The crop ripens generally in the middle of April. The land would then be left unsown until the following rabi. If it has again been flooded during the kharif gochni would again be sown, while if there has been no flooding, but the rainfall is sufficient to permit of rabi sowings, the crop would be bejhar or gram except in especially moist land where a crop of gochni can be successfully grown without flooding. Kharif crops are not generally sown unless the rabi has been a failure as they are, of course, liable to be swamped.

22 The cultivation of the barani soils differs considerably in the various circles. In the Bangar Circle the soil is generally too dry and in the

Barani.

Bhuder Circle too light for the successful growth of unirrigated rabi crops, consequently in both these circles nearly the whole barani area is put under kharif crops consisting of jowar where the soil is Chiknot, bajra, jowar, and cotton where the soil is narmot, and magda and bajra only where the soil is bhur. In these two circles the proportion of unirrigated cotton is smaller than in the more fertile lands of the valley. At the rabi, if the September rainfall is good, the best land which has been kept fallow is put under bejhar (barley and gram), while the remaining area which has already borne a crop of bajra or jowar and is strong enough to grow rabi crops is sown with "dofasi" gram. This area is of necessity small in the Bhuder Circle. These remarks as to double cropping do not apply to the chiknot of these circles, as Chiknot unless moistened by flooding or percolation cannot be double cropped. In the Dahar Mitha Circle, owing to the natural fertility of the soil, the area under rabi crops is larger and the proportion of wheat, barley and mixtures to gram sown alone is much larger, similarly at the kharif the proportions of jowar and cotton to bajra are larger than in the two previously mentioned circles.

The Dahar Khar and Chiknot Circles are distinguished from the other circles by the large proportion of Chiknot in the soils. Statement X shows that in these circles there is normally a large preponderance of rabi over kharif crops, though owing to the recent dry rabis the areas under kharif and rabi crops during the years selected for the produce estimate are nearly equal.

In the Dahar Khar Circle the cultivation resembles that of the Dahar Mitha Circle, but there is more cotton, wheat and gochni. In the strong soil of the Chiknot circle the area under jowar is equal to that under bajra, while wheat and gochni are almost the only rabi crops.

In the Palwal Assessment Report I have described the method of cultivating jowar, bajra, cotton, bejhar and gram on the various barani soils, and the system of cultivating these crops in this tahsil is the same, except that in the Dahar and Chiknot Circles jowar is not generally sown thickly to yield half grain and half fodder, but is sown sparsely for gram. Pulses are as usual grown with jowar and bajra, and til and hemp with cotton. The method of cultivating gochni has been described in the preceding paragraph. On the harder soils oilseeds are always sown in lines, but in light moist magda and bhur, chiefly in the Bhuder and Dahar Circles, sarson is frequently grown alone in soil which has been well fertilized by cattle which are penned out during the rainy season. Owing to the scarcity of cattle there is very little manuring. In the case of ordinary barani land fallows take the place of manure, but the soil of the low-lying lands is so naturally fertile that it is able to stand without exhaustion a large amount of double cropping.

23. The following table compares the percentages of the chief staples at last settlement and now. As already stated, the settlement figures are worked

Changes of Cropping

out from Form D while the present figures are arrived at by calculating the percentage which the matured area of each crop bears to the total matured area. It was impossible to make the calculation on sown areas, as though the total sown area is given in the crop statement the sown area of each crop is not available.

The comparison is a very rough one because the settlement areas are the sown areas of the year of measurement, and are neither the figures of a series of years nor even of one year, as the villages were measured in different years.

Some of the results of the comparison are astonishing and show what serious errors were introduced into the produce estimate by mistakes of classification and by taking the figures of only one harvest. The area under cereals (especially kharif cereals) and cotton was much overestimated, as the miscellaneous crops (pulses, hemp, sesame and oilseeds) which are grown with them were not recorded at all, the whole area being shown as under the superior crop. Similarly the large decrease of the area under cotton, which is due partly to the cause just explained, must have been due partly to the area being that of one harvest only, which happened to be exceptionally favourable to the cultivation of cotton. Owing to the lateness of the rains in recent years there probably has

been some real decrease of cotton in favour of bajra, but it has not been so large as the figures indicate. The serious underestimate of the area under fodder crops (guar-char) is due to the fact that the area shown as under guar is that of guar sown alone, which forms a very small proportion of the total area under this crop —

1	2	3	4	5	6	7	8	9	10	11	12	
CROP	BANGAR		BHUDER		DAHAR MITHA		DAHAR KHARI		CHIKLOT		TOTAL TAHSIL.	
	Settlement	Now	Settlement	Now	Settlement	Now	Settlement	Now	Settlement	Now	Settlement	Now.
Jowar	80	10	4	3	14	11	9	9	15	15	18	9
Bajra	20	27	56	39	28	27	16	19	6	15	28	28
Cane		1										1
Cotton	10	10	11	5	12	7	34	8	25	8	15	8
Guar Char	1	8	3	12	2	8	9	12	6	11	3	9
Wheat	2	3	3	3	8	3	4	4	33	7	7	4
Barley	3	10	12	12	14	15	24	17	9	5	10	12
Bejhar	12		2		2				2		6	
Gram	17	20	3	6	5	6	1	9	2	5	8	13
Gojra Gochni	2	3	3	4	11	5	2	10	2	20	4	5
Oilseeds		2		7		10		8		5		4
Others	3	6	3	9	4	8	1	4		6	1	7
Total	100	100	100	100	100	100	100	100	100	100	100	100

I proceed to discuss the comparison circle by circle —

(1) *Bangar Circle* — The first noticeable feature is the substitution of bajra for jowar as the chief kharif cereal. There has probably been some change in this direction owing partly to the increase of population (bajra being the chief food crop of the year), partly to the dry seasons in which bajra does much better than jowar, and partly to the introduction of canal irrigation, which produces a change in the subsoil unfavourable to jowar, but I do not believe the change has been anything like so great as the figures indicate. The area under jowar at settlement of course includes some chari and a great deal of guar and other pulses, which are now recorded separately. The only other changes in the cropping in this circle are due to the introduction of canal irrigation, which has led to the cultivation of cane and to an increase in the area under cotton. On paper this area is the same as at settlement, but, as in all other circles, there has been a large decrease, in this circle the figures must represent a considerable increase. There has also been a small increase in the area under wheat and gochni.

(2) *Bhuder Circle* — In this circle the only real change is probably an increase in the area under rabi oilseeds. All the other apparent changes are due to the causes explained above.

(3) *Dahar Mittha Circle* — In this circle also there has been an increase in the area under rabi oilseeds. The only other change is that there has been a considerable decrease in the area under wheat and gochni. This is due to the fact that, except in 1904-05, there was no flooding from the Landoha during the years selected for the produce estimate.

As explained in paragraph 2, I do not think that this is to be considered a permanent change, and the present cropping figures are not representative.

(4) *Dahar Khari Circle* — There has probably not been much real change in this circle, and the difference in the figures is due to the fact that in the year of measurement at last settlement an abnormal proportion of kharif crops was sown, and as the season was exceptionally favourable an enormous area was put under cotton. The present percentage of cotton is much below average owing to the intensity and scantiness of the rains. As in the Bhuder and Dahar Mittha Circles there has probably been an increase of the area under rabi oilseeds.

(5). *Chiknot Circle.*—The same remarks apply with regard to cotton as in the Dahar Khari Circle. Otherwise there seems to have been little change, and the large percentage of wheat at settlement as against gochni now is probably due to a misclassification.

The serious overestimate of the area under the more valuable crops at the expense of the less valuable, and the underestimate of the area under guar, the value of which was not included in the Produce Estimate, all tended to make Mr. Channing's estimate of the value of the produce excessive.

CHAPTER IV.—RENTS AND TENANCIES.

24. The following statement shows the percentages on total cultivation of the land held by the owners themselves and by the various classes of tenants at settlement and now. The figures are abstracted from Form B of Mr. Channing's Report and Statement XI of this Report:—

1 Circles.	2 CULTIVATED BY THE OWNERS OR HELD RENT FREE.		4 HELD BY CONTRACT TENANTS PAYING				8 HELD BY NON-CONTRACT TENANTS PAYING				12 & 13 Area under Cultivation in each class.	
	3		5 Cash rents.		6 Batai rents.		9 Cash rents.		10 Batai rents.		12 Settlement.	13 Now.
	Settlement.	Now.	Settlement.	Now.	Settlement.	Now.	Settlement.	Now.	Settlement.	Now.		
											Settlement.	Now.
Bangar ...	23	24	...	...	...	...	23	22	...	...	23	23
Banjar ...	23	24	13	14	...	...	23	22	...	...	23	23
Dahar Mirba...	23	24	...	...	...	...	23	22	...	...	23	21
Dahar Khari...	23	24	...	...	...	...	23	22	2	13	23	21
Chiknot ...	23	24	...	...	...	...	23	22	1	13	23	23
Total Tehsil...	23	24	...	...	...	...	23	22	...	...	23	23

The decrease in the area cultivated by the owners themselves and the increase in the area held by non-occupancy tenants paying cash rents is due to the large area under mortgage. Batai is an increasingly popular form of rent—especially on the hard black clay soil of the Chiknot Circle, where the produce is very precarious and cash rents are almost unknown.

The area paying competitive cash rents is, as we should expect, much larger than at settlement, but owing to the pressure of population on the soil is not very large. The large percentage in the Dahar Mirba Circle is due to the whole of the large village of Doha being cash rented. Most of the rents in column 13 are unfortunately paid to mortgagees.

25. Statement XI shows the mode in which kind rents are paid. As the area under batai is so small, the data are very meagre. Here, as in Palwal, the share of an irrigated chahi crop is one-third. From the statement it appears as if the share were one-half, but this is because most of the rents are of unirrigated crops grown on chahi land.

The landlord's share of an irrigated canal crop is, as in Palwal, one-half, but he pays half the cost of the seed and half the canal dues. In this tehsil no exception is made in the case of sugarcane, of which the share is also one-half, but here the landlord shares all the expenses of cultivation instead of only the expenses specified in paragraph 24 of the Palwal Report. The landlord's share of cane is therefore no higher than in Palwal. The share of all crops other than irrigated crops grown on chahi and batai land is one-half, as in Palwal, and as in

this tahsil at last settlement. It seems a high rate for all but the most low-lying soils, but it is the prevailing rate on similar soils in other tahsils of the district. Mr. O'Dwyer assumed a rate of two-fifths in Alwar, and this is certainly a fairer all-round rate, but to adopt it in this tahsil would be opposed to the clearest evidence. A share of the straw is always taken of chahi, nahri and barani crops alike, but no *kharch* or *seri* are exacted.

Zabti rents are unknown.

26 The percentage of the total cultivated area which is cultivated by tenants paying at other than revenue rates (with or without *malikána*) is given in the table in paragraph 24. At last settlement no attempt was made to frame cash rent rates. Mr. Channing wrote (Assessment Report paragraph 26) . . . . "The vast majority of tenants are connected with the cultivating proprietary brother-hoods and pay merely customary rates. In only a very few villages do the tenants pay rates at all representing the letting value of the land these rates will be hereafter compared with the proposed assessments." In all circles, except the Bangar, the jama proposed was well above the jama at half-rent rates.

Mr. Wilson in the Revision Report went into the subject of cash rents at considerable length (*vide* paragraphs 54—56), and he appended a statement (Appendix VIII) showing the incidence of more or less competitive cash rents at settlement for each circle and the whole tahsil. I reproduce it here for facility of reference, adding the incidence of the rents given by Mr. Channing in his Assessment Report, which agrees with the incidence of Mr. Wilson's rents in all circles except the Bangar —

1	2	3	4	5	6	7	8
Assessment Circle	Total number of villages	Number of villages in which competitive rents were paid	Area in acres	Rent	Rate per acre	Incidence of selected rents given by Mr. Channing in his Assessment Report	Incidence of revenue on cultivated area at Settlement
				Rs	Rs a p	Rs a p	Rs a p
Pannaha	89	5	1,472	4,111	2 13 0	2 7 0	1 4 0
Bhnder	58	5	825	1,823	2 3 0	2 1 0	1 4 0
Landoha	31	2	3,082	9,617	3 2 0	3 1 0	2 0 0
Mandikhera	28	2	149	530	3 9 0	3 9 0	1 14 0
Chikuot	23	...					1 7 0
Transferred from Nuh	15	1	320	506	1 9 0		1 1 0
Total	244	15	5,848	16,587	2 13 0	2 14 0	1 7 0

The rent rate in the Bangar Circle in 1881-82 and 1882-83 (*vide* Appendix VIII) seems to show that Mr. Channing's rent rate was more correct than Mr. Wilson's.

The area under these competitive rents is not very large, but as far as they go they indicate that in all circles the assessment was above the half-net-assets. As the data in Appendix VIII show, rents rose rapidly after settlement. This was partly due to the mortgage which followed on the famine of 1878 and partly to the increase in the value of land which resulted from the new settlement, landlords knowing exactly what their position would be for the next thirty years.

No reliable statistics are available between 1881-82 and 1890-91, but from 1891-92 onwards the rent rates given in the circle and tahsil note-books are as follows. As separate note-books were not maintained for the Landoha,

Mandkhara and Chiknot Circles, separate figures for the present Dabar and Chiknot Circles are not available.

1	2	3	4	5
Year	INCIDENCE OF CASH RENTS PAID BY TENANTS-AT-WILL NOT BEING AT REVENUE RENTS			
	Bangar	Bhuder	Dabar	Total Tahsil
	Rs a p	Rs a p	Rs a p	Rs a p
1891-92	4 1 0	3 8 0	4 3 0	4 0 0
1892-93	3 1 0	3 2 0	4 6 0	3 10 0
1893-94	3 2 0	2 15 0	4 11 0	3 13 0
1894-95	3 2 0	2 13 0	4 10 0	3 12 0
1895-96	3 3 0	2 8 0	4 11 0	3 12 0
1896-97	3 4 0	2 9 0	4 13 0	3 13 0
1897-98	3 7 0	2 9 0	5 3 0	4 1 0
1898-99	3 9 0	2 13 0	3 2 0	3 3 0
1899-00	3 11 0	2 11 0	5 6 0	4 3 0
1900-01	3 12 0	2 12 0	5 8 0	4 5 0
1901-02	3 9 0	2 12 0	5 11 0	4 6 0
1902-03	3 3 0	2 8 0	6 7 0	4 8 0
1903-04	3 9 0	2 8 0	5 6 0	4 3 0
1904-05	3 12 0	2 9 0	5 9 0	4 4 0
1905-06	3 12 0	2 10 0	5 13 0	4 7 0
Rise per cent since settlement	54	24	86	80

The percentage of increase is enormous, and in the Dabar Circle does not correspond to an equivalent increase in the value of land. There the rents have been forced up by rack-renting mortgagees and by the severe pressure of population on the soil. I proceed to put in the usual table abstracted from statements XIV and XV shewing the result of the attestation of competitive rents at village inspections:—

1	2	3	4	5	6	7	8	9
Circle	Detail	Chahi	Nahri	Abi	Dabri	Chiknot Narmot	Magda	Bhur
		Rs a p	Rs a p	Rs a p				
Bangar	Total rents	4 11 0	4 10 0		...	3 10 0	3 10 0	2 0 0
	Corrected	4 3 0	4 3 0			3 13 0	3 10 0	1 14 0
Bhuder	Total rents	4 13 0	.	7 14 0	5 13 0	3 9 0	3 9 0	2 2 0
	Corrected	5 11 0		6 2 0	5 9 0	3 10 0	3 10 0	1 15 0
Dabar	Total rents	7 14 0			7 12 0	4 4 0	6 1 0	3 6 0
Mitha	Corrected	7 11 0			6 15 0	3 14 0	4 6 0	2 7 0
Dabar	Total rents	7 0 0		6 3 0	6 11 0	6 8 0	6 8 0	5 14 0
Khari	Corrected	7 3 0	..	6 4 0	6 10 0	6 7 0	6 7 0	5 10 0
Chiknot	Total rents	2 11 0				3 10 0	...	.
	Corrected	3 2 0				3 9 0		.

Note—Nahri includes chahi nahri

There has not therefore been very much alteration in any circle except Dabar Mitha where the whole rents of the rack-rented village of Doha have been excluded.

In the Bangar Circle there is very little difference in the rent of any soil except bhur. The chahi and nahri are both inferior, and as a rule the same rent is taken on them as on loam. The prevailing rent rate on all soils, except bhur, is Rs. 2 per pakka bigha = Rs. 3-5-0 per acre. In canal villages and in villages with a better class of barani soil Rs. 3 per pakka bigha is often taken. On bhur the rate is Re. 1 on inferior and Re. 1-8-0 on average land. In this circle most of the recorded rents are full fair rents, and the corrected rents adequately represent the letting value of the land.

In the Bhuder Circle the customary rates on bhur and loam are the same as in the Bangar Circle, and are fair for the soils, but the chahi is superior, and, as we should expect, a much higher chahi rent is taken. The customary chahi

rent varies from Rs. 3 to Rs 4 per pakka bigha, and the corrected chahi rent adequately represents the letting value of chahi land in this circle. The dahri rent is the same as the chahi

On the fertile soils of the Dahar Circles much higher rents are taken than in the other two circles. In the Dahar Mitha Circle the customary chahi rent rate varies from Rs 4 to Rs 5 and averages nearly Rs. 5 per pakka bigha = Rs 5 per acre. This is a high chahi rate for the Mewat and testifies to the excellence of the chahi of this circle. The dahri rate is as usual nearly the same as the chahi, the value of these soils being considered equal by the zamindars of this tahsil. The customary rate on loam is Rs 3 per pakka bigha = Rs 4-12-0 per acre, which is the rate on all good fertile loam in this district (e.g., the Bangar Circle of Palwal). The corrected rents on this soil give a much lower rate, because in the south of the circle under the western range of hills there is a strip of dry loam which lies high and is out of the reach of flooding; this loam resembles the dry Bangar loam, and the same rent (Rs. 2 per pakka bigha) is taken on it. An unduly large proportion of the narmot rents happen to be on this soil, and hence the average narmot rent is much lower than it ought to be, it should be at least Rs 4-6-0 per acre, which is the magda rate. The bhur in this circle is moist and good, and the customary rent rate on bhur is from Re. 1-8-0 to Rs 2-0-0 per pakka bigha. In this circle, with the exception of the narmot rate, the corrected rents fairly represent the proper letting value of the land.

The soil of the Dahar Khar Circle is, as I have already said, the best in the tahsil, and even including the bhur is all very much of one quality—a moist fertile soil almost, if not quite, equal to dahri.

The well water is salt, and as a rule no higher rent is taken on chahi than on loam. The almost universal rent rate on all soils alike is Rs 4 per pakka bigha = Rs 6-6-0 per acre. Bania mortgagees take Rs. 5 = Rs 8 per acre, but this is generally a rack rent, and rents at this rate have been excluded. The corrected rents of dahri, abi, narmot and magda give practically the customary rate. The rent on chahi is raised slightly by the higher rents taken on dhenkhs, while that of bhur is slightly lower. With these exceptions the rents are practically at an all-round rate, and the high rate indicates the fertility of the soil. On the very precarious soil of the Chiknot Circle batai is the prevailing rent, and there are practically no cash rents. Where cash rents are taken the customary rate is Rs 2 per pakka bigha on all soils or the same as on the dry Bangar loam. This is a fair rate for the soil, but there are so few rents in this circle that they do not form such a reliable estimate as in the other circles.

In Alwar and Bhartpur Mr O'Dwyer made a full enquiry into cash rents, the results of which are given in Chapters VII of the reports of the tahsils concerned. For reasons given in these chapters cash rents were not generally competitive, but enough data were available for framing rent rates. I append below the rent rates adopted in the adjoining tracts, which may be compared with the corrected rents of this tahsil.—

1	2	3	4	5	6	7
Circle.	State	Chahi	Dahri present.	Chiknot Narmot.	Magda	Bhur
		Rs a p	Rs a p	Rs a p	Rs a p	Rs a p
Tahsil Ramgarh	Alwar	8 0 0	6 6 2	{ 4 3 0 to 4 12 0 }	2 11 0	{ 2 6 0 to 1 1 0 }
" Kama	Bhartpur	6 11 0	6 11 0	3 11 0		1 2 4 0
" Pahari	"	7 10 0	9 1 0	4 12 0		
" Gopalgarh	"	5 11 0	5 5 0	3 11 0		

Allowing for possible differences of soil classification the rent rates in tahsil Ramgarh correspond very closely with those in the Dahar Mitha Circle. The bhur rates are lower, but Mr O'Dwyer reduced the rates as they stood to allow for years in which this soil was not cultivated. The attested rents on this soil ranged from Rs 1-11-0 to Rs 5, and the average rent rate was probably not lower than ours.

Tahsil Kama adjoins the Bangar Circle and though the chahi and dahri rates are much higher, the barani rates correspond with remarkable closeness the difference in the chahi and dahri is probably due to a difference of classification. Tahsil Pabari adjoins the Bangar and Bhuder Circles and Tahsil Gopalgarh the Bhuder Circle. The rates in Gopalgarh correspond with extraordinary closeness to those of the Bhuder Circle, but those of Pabari are very much higher, and resemble the rates in Dahar Mitha. From Mr. O'Dwyer's description on pages 9 and 10 of his Assessment Report of the northern tahsils of the Bhartpur state I gather that all these tahsils are physically superior to the Bangar and Bhuder Circles of the Firozpur tahsil, and the correspondence in the rents may therefore be accidental, being due in Kama and Gopalgarh to the absence, as stated by Mr. O'Dwyer, of competition.

## CHAPTER V.—HALF-NET-ASSETS BASED ON BATAI.

27 In the Rewari and Palwal tahsils the years selected for the produce estimate were the years 1898-99 to 1903-04, excluding the famine year of 1899-1900, but in this tahsil, where the rabi cropping is so important, these years are not representative owing to the series of bad rabis. With the approval of the Settlement Commissioner I have substituted the five years 1900-01 to 1904-05, which give a much better average. The following is a brief description of the harvests

*Khari* 1900 — Well distributed rain in June, July and August was followed by a deluge in September which gave a bumper harvest in all parts of the tahsil.

*Rabi* 1901 — Very large sowings were made as the result of the heavy rain in September, the winter rains were excellent, and a fine harvest was reaped. wells and the canal were very little used

*Khari* 1901 — Sowings were normal, and as good rain fell in July and August, the crop promised well, but the monsoon withdrew at the end of August and, except on canal lands, the crops failed and only an eight-anna harvest was reaped.

*Rabi* 1902 — As no rain fell in September the area sown was very small, and as the winter rains entirely failed the crop was nowhere better than an eight-anna one, and in parts of the tahsil conditions approaching scarcity prevailed

*Khari* 1902 — Good rain in June made large sowings possible. excellent rain fell in July and August, and sufficient in September: the result was a good harvest in all circles

*Rabi* 1903 — A fairly large area was sown, but as the winter rains again failed the crop was everywhere below average

*Khari* 1903 — The rains began late and were scanty; sowings were not extensive, but as rain was very well distributed most of the crops matured: the harvest was slightly below average in all circles except Dahar Khari and Chiknot, where for some reason or other it was good.

*Rabi* 1904 — Very little rain fell until the first week in March, when there was a good shower, which saved the irrigated crops, but was too late to save the barani crops, most of which completely failed in all circles; the harvest was only eight annas.

*Kharif* 1904.—Good rain in May, June and July permitted of early and extensive sowings. There was a long break at the end of August and beginning of September, but a cyclonic storm on September 9th gave excellent rain and saved the harvest. The cereals and pulses were damaged by excessive rain, but the outturn of cotton was excellent, and on the whole the harvest was everywhere much above average.

*Rabi* 1905.—The heavy rain in September made extensive sowings possible, and very unusual rain in November led to a further extension of the area. Good rain was received at intervals, and the harvest promised to exceed the record both as regards quality and quantity, but severe and unprecedented frost at the end of January did great damage, from which the oil-seeds and early-sown barley never recovered. The other crops recovered after a good shower in March, and in this tahsil, which owing to its hills is more sheltered from frost than any other, the harvest was a good one.

The character of the harvests may be summarized in the following table —

1	2	3
Year	<i>Kharif</i>	<i>Rabi</i>
1900-01	Very good	Very good
1901-02	Bad	Bad
1902-03	Good	Below average
1903-04	Below average	Bad
1904-05	Good	Good

Referring to Statement X, it will be seen that these years give a result which is nearly average in the Bangar and Bhuder Circles, where the *kharif* is the chief crop, but which is 4, 5 and 6 per cent below average in the other circles respectively, where the percentage of *rabi* crops is much larger, and the bad *rabis* have more than counterbalanced the good *kharifs*.

28. The recorded percentages of crops failed to the total area sown may be taken to be correct in all circles, except the Bangar, where, as in the Palwal Tahsil (*vide* Assessment Report, paragraph 27), the under-estimate of the failed area of irrigated and unirrigated crops in canal villages seriously affects the reliability of the cropping figures. I compare below the recorded percentages of failed crops in this circle with what I think it ought to be —

1	2	3
Class of crop	PERCENTAGE	
	Recorded	Real
Irrigated from wells	4	8
"    "    Canal	3	15
Unirrigated	20	30

The recorded percentage of failed *chahi* crops is less than in the Bhuder and Dahar Mitha Circles, where the water is much sweeter, and I do not think the correct percentage can really be less than 8. I took 10 per cent as the correct percentage of failed *nahri* crops in the Palwal Tahsil. In this tahsil, where all the conditions make for inferiority, I do not think it can be less than 15 per

cent. Similarly, 20 per cent. is much too low a percentage for the dry loam of this circle, and 30 per cent. is a moderate estimate. The same remarks apply in regard to mixed crops as in the Palwal tahsil (*vide* Assessment Report, paragraph 27 (b).).

29 Statement XII gives the data on which the assumed yields are based.

Yields

In many cases the results of experiments are satisfactory, but in others they are not owing either to the abnormal nature of the harvests under observation or to the ineradicable tendency of subordinate officials to select the best fields

I am not inclined to attach much value to any experiment which I have not myself inspected, and I have supplemented the information derived from experiments by constant enquiries from the people at village inspections. The yields assumed by Mr Channing at last settlement are entered in Statement XII for reference. They seem to me in most cases rather too high.

I proceed to discuss the yield of each important crop separately, taking them in the order in which they are entered in Statement XII as there is very little difference in the yield of chiknot, narmot and magda, I have classed these soils together under the name of barani.

This crop is well suited to the soil of all circles except Bhuder. It grows especially well in the rich clay soil of the centre of the valley. In inferior or sandy soil it is sown rather thick and grown half for grain and half for fodder, and this custom must be borne in mind in considering the yield in the various circles. Unfortunately experiments give very little help in determining the yield. Excessive September rainfall seriously reduced the yield of grain both in 1904 and 1906, and in 1905 owing to the total failure of the rains there was no crop at all. In estimating the yield of this crop therefore I am dependent entirely on enquiries from zamindars and officials, and on experiments conducted in neighbouring tracts.

Jowar, 9 per cent

Jowar is grown to such a very small extent on irrigated chahi and nahr lands, on dahri and on bhur, that the assumed yields on these soils are of very little importance, and do not require discussion. On barani land in the Bangar Circle I have adopted a yield of 200 sers. This is the same as the yield assumed for the Bangar Circle of the Palwal Tahsil. It is a lower yield than I have adopted in the Dahar Circles because canal irrigation by saturating the subsoil affects the yield of jowar, and as the soil is inferior, the crop is sown rather thick and yields less grain. In the Bhuder Circle the loam is light, and I have adopted the same yield as in the Bangar Circle. In the Dahar Mitha Circle I have assumed 260 sers, as the soil is of better quality, and in the Dahar Khari Circle, where the barani soil is a rich loam or clay, and a really heavy yield is obtained—280 sers. In the Chiknot Circle I have assumed 240 sers. Mr Channing took 320 sers in all circles except Bhuder, but I do not think such a high estimate is justified, and it is certainly never admitted to be an average yield by the zamindars. Jowar is a delicate crop and its liability to suffer from the effects of drought in bad years and of excessive rain in good years makes moderation in fixing the yield essential.

Bajra 28 per cent

This is the chief crop of the year, and it is most important to determine its yield accurately. In this tahsil experiments give very little assistance in determining the yield, but in other parts of the district a number of reliable experiments have been performed

The average yield of unmanured bajra is about 200 sers on all light barani soils, except inferior bhur. I have assumed a yield of 160 sers on barani and 140 sers on bhur in the Bangar and Bhuder Circles, where the loam and bhur are both inferior.

In the Dahar Circles, where the best bajra grows, I have assumed 220 and 240 sers, respectively, on barani and 200 sers on bhur. Bajra does not do well in a stiff clay soil, and in the Chiknot Circle I have assumed 160 sers on barani, which is the same as the bhur yield in that circle.

For the irrigated soils and for abt and dahri I have taken slighter higher yields than on barani

Mr Channing took 240 sers in all circles except Chiknot, where he took 160 sers. His experiments only gave an average of 200 sers, but the season in which they were performed was unfavourable on account of excessive rain, and he consequently went above the result of his experiments. In the Bangar and Bhuder Circles, especially Bhuder, the estimate seems much too high for unmanured bajra.

The area under this crop is very small, and no experiment has ever been performed. I assume 320 sers as the irrigated and 240 as the barani yield in all circles where maize is grown for bhur I assume 200 sers.

The area under pulses other than guar, which is grown exclusively for fodder, and for which no yield is assumed, is very small. Urd is grown with jowar and mung, and moth with bajra. In the Bangar, Bhuder and Chiknot Circles I have taken the same yields for these pulses as in the Bangar Circle of Palwal, while in the Dahar Circles I have taken 40 sers more. Chaula is grown either with bajra or in very inferior bhur alone. It is of importance only in the Bhuder Circle. In the Bangar, Bhuder and Chiknot Circles I have taken the same yield as in Palwal, and in the other two circles 40 sers more. These estimates are low as compared with Mr Channing's, but moderation is essential in view of the method of cultivating and of recording these mixed crops.

Til is generally grown with cotton or jowar, but it is also sometimes grown alone. Experiments in the Dahar Mitha Circle indicate a yield of 180 sers, but as it is generally grown as a mixed crop, I think a low yield should be assumed, and I propose 140 sers on all soils and in all circles. This is the same yield as I assumed in the Bangar Circle of Palwal.

No experiment has ever been performed in this tahsil, but in the Bangar Circle of Palwal experiments indicate an average yield of 936 sers for irrigated cane, and in that tahsil I assumed a yield of 840 sers. In this tahsil the cultivation of cane is very inferior, and I do not think it would be safe to assume a higher yield than 640 sers, which is the highest yield ever admitted by the zamindars.

Cotton requires good cultivation, and as the Meos are inferior as cultivators to the Jats, the yield of cotton in this tahsil is, other things being equal, inferior to that of the Palwal tahsil. In the Bangar Circle the soil and cultivation are both inferior to those of Palwal. For barani cotton in this circle I assume a yield of 160 sers, or 40 sers less than in Palwal. In this circle I do not think there is any difference between the yield of canal irrigated and barani cotton, and I assume the same yield. This assumption is justified by the result of experiments which give an average yield of only 184 sers for canal cotton. For the inferior bhur of this circle I assume a yield of 100 sers only. In the Bhuder Circle I adopt the same yields on barani and bhur as in the Bangar Circle.

The best cotton grows in the low-lying, fertile lands of the valley. In the Dahar Mitha Circle I assume 200 sers for barani and 120 sers for bhur. Both these estimates are justified by experiments and are exactly the same as I made in the Bangar Circle of Palwal, which, as regards produce, this circle closely resembles. The yield of cotton in the Dahar Khari Circle is superior to that of the Dahar Mitha Circle, and I assume 20 sers more on barani than in that circle. For bhur I take the same yield. The yield of cotton is very poor in the stiff clay of the Chiknot Circle, and I assume 140 sers only, which is less than in any other circle. For the bhur of this circle I assume 100 sers, as in Bangar and Bhuder.

I have generally taken the same yields on *chahi* and flooded land, and the yield on these soils is in nearly all circles assumed to be 40 sers more than the *barani* yield. Mr. Channing made no distinction between irrigated and unirrigated cotton. He took 200 sers in the Landoha and Mandikhera Circles, 160 sers in the Chiknot and Bangar Circles, and 140 sers in the Bhuder Circle. These seem to me very fair estimates, and they agree closely with the yields which I have now assumed.

The dry soil of the Bangar Circle is not suited to wheat. It is somewhat difficult to estimate the average yield of *chahi* wheat in this circle, because the quality of the *chahi* varies greatly. In the east of the circle the wells are nearly all salt, and irrigation is very inferior, while under the hills on the west the soil is better, and benefits by drainage water from the hills. The *chahi* of the villages lying in the bed of the Lohinga drainage canal is especially good. I assume a *chahi* yield of 400 sers, which is 80 sers less than the assumed yield in the Palwal Bangar, where the *chahi* is much superior. Mr. Channing took 520 sers, but this seems too high an estimate for the inferior *chahi* of this circle. The yield of canal wheat is very inferior, and I assume a yield of 320 sers. Experiments only indicate a yield of 300 sers, but the years in which the experiments were made were both below average. The assumed yield is 20 per cent. below that assumed in Palwal, and seems a sufficiently moderate estimate. The *dahri* of this circle is inferior, and I assume a yield of 360 sers only. For *barani* and *bhur* I assume 240 and 200 sers respectively.

In the Bhuder Circle the *chahi* and *dahri* are both better than in the Bangar Circle, and I assume 80 sers more for the *chahi* and 40 sers more for the *dahri*. For *barani* and *bhur* I take the same yields.

The *chahi* wheat of the Dahar Mitha Circle is the best in the tahsil, and Mr. Channing assumed the very high yield of 600 sers. I think this was a slight over-estimate. I assume 560. An experiment conducted this *rabi* (1907) yielded only 409 sers per acre but the produce was severely damaged by rust and by dry hot winds which blew in the first week of April. In this circle the yield of *dahri* is very good, and I assume 440 sers. The *dahri* experiment conducted this harvest was below average for the same reason as the *chahi* experiment. For *barani* and *bhur* I assume 280 and 200 sers respectively.

In the Dahar Khar Circle the *chahi* is good, though as the water is salt, it is inferior to that of the Dahar Mitha Circle, and I assume 40 sers less than in that circle. The *dahri* is also inferior to that of the Dahar Mitha Circle, and so I assume a lower *dahri* yield, while the yield of *barani* wheat is better than anywhere else in the tahsil, as the strong moist clay soil is especially suited to wheat: for *barani* I assume 320 sers and for *bhur* 240 sers.

In the Chiknot Circle the *chahi* is very inferior, and I have assumed a very low *chahi* yield (320 sers). For *abi* and *dahri* I assume 360 sers, for *barani* and *bhur* 280 and 200 sers respectively. The *barani* yield may seem high, but wheat is the crop best suited to the black *chiknot* of this circle, and either alone or in the form of *gochni* is almost the only *barani rabi* crop grown.

After *bajra* this is the most important crop of the year. As an irrigated crop it is almost always grown alone, while as an unirrigated crop it is, except on inferior *bhur*, generally grown in the form of *bejhar*. Experiments are again of very little use, and in estimating the various yields I have been guided chiefly by enquiry and observation. Where the soil is dry or light, as in the Bangar and Bhuder Circles, the yield of barley is considerably higher than that of wheat, while in the moist, low-lying soils of the valley, which are especially suited to wheat, there is much less difference between the yields of the two crops.

For the *chahi* yield I have taken 480 sers in the Bangar Circle, 600 sers in the Bhuder, 640 sers in the Dahar Khar Circle and 680 sers in the Dahar Mitha Circle. In the Chiknot Circle I have taken 400 sers only. For the *nabri* yield I have taken 400 sers, which is 80 sers less than in Palwal; experiments indicate a much higher yield of canal *barley*, but the crops of both the years

under experiment were much above average. For the *abi* and *dabri* yields I have taken 40 sers more than the wheat yield in the Bangar, Bhuder and Dahar Mitha Circles, 80 sers more in the Dahar Khari Circle, and the same as the wheat yield in the Chiknot Circle. For the *barani* yield I have taken 280 sers in the Bangar, Bhuder and Chiknot Circles, 360 in the Dahar Mitha Circle, and 400 in the Dahar Khari Circle. For *bhur* I have taken 240 sers in all circles except Dahar Khari, where I have assumed 280 sers.

**Gram, 18 per cent** — Except in the Bangar Circle, gram is chiefly grown in the form of *bejhar*. In the Bangar Circle it is generally grown alone as a second crop after *bajra*, but the yield of "*dofash*" gram does not seem to be much less than when it is grown in fallow land, as it is only grown as a second crop in seasons which are above the average. The fact that the crop statistics do not distinguish between *bejhar* and gram grown alone, or between gram grown in fallow land and "*dofash*" gram makes it somewhat difficult to estimate the yield. It is very heavy in the moist low-lying lands of the valley, but is not so good in the Bangar, Bhuder and Chiknot Circles. In the Bangar and Bhuder Circles, I assume a *barani* yield of 230 sers, in the Dahar Mitha Circle 360 sers, in the Dahar Khari Circle 400 sers, and in the Chiknot Circle, where the soil is not suited to gram, 240 sers. In the inferior *bhur* of the Bangar, Bhuder and Chiknot Circles I assume 200 sers, and in the good *bhur* of the two Dahar Circles 240 sers. In all circles I have assumed about 40 sers more on *chahi*, *abi* and *dabri* than on *barani*. There is a small area of canal irrigated gram, but the yield of this is very inferior, and I assume only 280 sers, or the same as the *barani* yield.

**Gojra and Gochni, 5 per cent** — The yield of *gojra* is assumed to be half the combined yields of wheat and barley. On *dabri* and *barani* land wheat is almost invariably sown in the form of *gochni*; for *gochni* yields intermediate between those of wheat and gram have been assumed, but approximating nearer to the wheat yield as the proportion of wheat is larger than that of gram.

**Rabi oil-seeds, 4 per cent** — *Sarson* and *taramira* are the only oil-seeds grown. I assume the same yields for both. On *chahi*, *nabri* and *dabri* I assume 200 sers and on *barani* and *bhur* 160 sers in all circles. The *barani* yields are supported by the results of a number of experiments, which indicate a yield of 180 sers in all circles and on all soils. A good field of these crops will yield 240 sers, but they—especially *sarson*—are delicate and precarious crops, liable to suffer from the effects of drought, frost and excessive rain, and a full yield is very rarely obtained. I do not think it would be safe to go above the assumed yields, which are the same as I adopted in Palwal.

**Others, 11 per cent** — It is impossible to assume yields for the miscellaneous crops grown at both harvests, and to these and to the fodder crops I have assigned cash values.

For purposes of comparison I append below, in sers per acre, the yields of the principal crops assumed by Mr. O'Dwyer in the Ramgarh tahsil of the Alwar State, which adjoins and resembles the Dahar Mitha Circle of this tahsil, and the three adjoining tahsils of Buarthpur.

1	2 3 4			5 6 7 8				9 10 11 12				13 14 15 16			
	RANGARH (ALWAR)			GOPALGARH (BHARATPUR)				PARBETI (BHARATPUR)				KANA (BHARATPUR)			
	Chahi	Dabri	Barani	Chahi	Dabri	Barani	Bhur	Chahi	Dabri	Barani	Bhur	Chahi	Dabri	Barani	Bhur
Jowar	640	480	320	400	400	400	400	400	400	300	300	350	300	300	250
Bajra	512	384	256	500	400	300	250	500	400	300	250	500	300	300	250
Cotton	320	272	150	400	300	300	300	400	250	250	250	400	250	250	150
Pulses		320	208	250	250	250	150	250	250	250	150		250	250	
Wheat	608	528	256	800	600	400	400	700	600	400	400	750	600	400	
Barley	978	640	384	900	700	400	400	700	700	400	400	850	700	450	400
Gram	384	336	256	700	700	400	400	700	700	400	400	700	700	400	400
Mixtures	736	592	320	600	600	500	500	600	600	500		700		500	500

Comparing first the yields of the Ramgarh tahsil and of the Dahar Mitha Circle it will be seen that there are considerable differences between these yields and those which I have assumed. The yields of jowar, bajra and pulses assumed by Mr. O'Dwyer are higher than mine and agree with Mr. Channing's. I cannot however help thinking that for unmanured jowar and bajra my yields are not too low. Of the remaining barani yields Mr. O'Dwyer's estimates for wheat, barley and mixtures are about the same as mine, while those for cotton and gram are lower. The chief difference however lies in the chahi and dahri yields, which are in the case of barley enormously high as compared with mine. The dahri of Ramgarh is no doubt superior owing to the action of the Atria Bund, which ensures more regular flooding in Alwar, but I cannot believe that 24 maunds is an average chahi barley yield for Meo cultivators. The Bhartpur yields are enormously high all round as compared with those of Gurgaon, and the soil must be remarkably good to produce crops giving such a high average yield. The cotton, wheat and gram yields are almost incredible. With all due deference to such an authority as Mr. O'Dwyer I cannot help thinking that the Bhartpur and Alwar yields are too high, and it is a significant fact that in every case the net assets based on kind-rents largely exceeded the estimate based on cash-rents.

At the same time it must be admitted that the standard of Meo cultivation is much higher in Alwar and Bhartpur than in Gurgaon. The high assessment, the solidarity of the village communities, and the absence of demoralizing influences, such as facilities for mortgaging and borrowing, combine to make the Meo a much more industrious cultivator in a Native State than in British India.

As a share of the straw is always taken when the rent is batai, I have included the value of the straw in the Produce Estimate. I have assumed the following cash-rates per maund for the straw.—

Jowar and rabi cereals	...	...	Rs	a	p
All other crops of which the straw is shared	...	..	0	3	0
			0	2	0

The outturn of straw is assumed to be equal to the outturn of gram in the case of all crops except jowar, bajra and wheat. The outturn of jowar is assumed to be three times, of bajra twice and of wheat one-and-a-quarter times that of the gram.

30. The sanctioned prices of the present settlement are given below in annas per maund and compared with those assumed at last settlement:—

1	2	3	4	5	6	7	8	9	10	11	12	13
	Jowar	Bajra	Mung	Moth	Til	Cane.	Cotton	Wheat	Barley	Gram.	Sarson	Taramra.
Prices at last settlement	16	18	18	15	40	..	53	21	14 <sup>1</sup> / <sub>2</sub>	16	27	17
Prices sanctioned now	20	23	30	22	60	45	64	32	22 <sup>1</sup> / <sub>2</sub>	23	45	32
Rise per cent	25	28	67	47	50	..	21	52	52	44	67	68
Assumed by Mr. O'Dwyer for tahsil Ramgarh	21	26	22		58	..	58	32	23	24	43	
Assumed by Mr. O'Dwyer for Northern tahsils, Bhartpur State	21	25	26		..	..	58	30	34	21	46	

Mr. Channing's assumed prices were the average harvest prices of the twenty years 1854-1873, while those sanctioned now are based chiefly on the harvest prices of the last ten years extracted from banias' books, excluding years of scarcity, in both cases therefore they are the prices at which the zamindar actually disposed of his produce. The prices now sanctioned are for the whole district. The prices current in each tahsil are given in Statements III and IV of Mr. Hamilton's report.

Mr. Channing's prices were on the whole lower in Ferozpur than in any other part of the district, and we should have expected the present prices to be lower than in the other tahsils which are much better off as regards communica-

tions As remarked however by Mr. Hamilton we can only accept the fact that they are not That the assumed prices are not too high is, I think, indicated by the comparison with Mr. O'Dwyer's prices which are equal to, or higher than, our prices in the case of all important crops except cotton

The reason of the low price of cotton is not explained, and the Gurgaon price of this staple is fully justified by the data given in Statement III of the Preliminary Report on prices.

The all-round rise in prices according to the method employed by Mr. Hamilton in the Preliminary Report, which is in effect the same as that described in paragraph 376 of the Settlement Manual, is 39 per cent., or higher than anywhere else in the district

Wheat, cotton, oilseeds, and in the Bangar Circle cane, are the chief revenue-paying crops, and they only occupy about 17 per cent of the total area under crops in this tahsil, where the Meos are thriftless and improvident, and are in the habit of speculating with their produce, where the pressure of population on the soil is severe, and where more than four-fifths of the crops are food crops, which in years of scarcity have to be bought from the bania at famine prices, the effective rise of prices cannot be very large, although as pointed out in previous reports the question of the effective rise of prices is not of much importance in this district where the assessment is based on cash rents.

31. I propose to deal with fodder crops as in the Palwal Tahsil (Assessment Report, paragraph 30) Here also the kind rent data are so meagre that it

Fodder crops is impossible to say what crops or portions of crops would, if batai rents were general, be appropriated by tenants before division I propose therefore, as in Palwal, to make no deduction of any kind from the landlord's share, but in estimating the value of the Government share to deduct those crops or portions of crops which are consumed for fodder and form part of the cost of production

The whole value of guar, chari, carrots and turnips, which are fodder crops pure and simple, as well as of all miscellaneous crops classed as fodder, will be deducted The straw which I have taken into account in framing my Gross Produce Estimate is nearly always consumed for fodder, and its value will therefore not be included in the Government share the above constitute the fodder supply proper, in years of scarcity, when the ordinary fodder crops prove insufficient, they are supplemented by portions of the food crops. In this tahsil, where grazing is so scarce, the extent to which gram crops have to be cut for fodder is considerable Oilseeds and pulses are the crops most largely sacrificed, but a certain amount of jowar, barley and gram is also cut

I estimate the percentages as follows --

1	2	3	4	5	6
	Bangar	Bhuder	Dahar Mitba	Dahar Khari	Chiknot
Sarson	50	50	50	50	50
Pulses	33½	33½	33½	33½	33½
Jowar	12½	15	12½	15	15
Barley	5	5	5	10	10
Gram	5	5	5	10	10

In the Bhuder Circle the soil is light and in the Dahar Khari and Chiknot Circles grazing is exceptionally scarce, hence the jowar deduction is larger in these circles than in the others Owing to the scarcity of grazing I have also made a larger barley and gram deduction in the two last named circles These deductions compare with the following deductions made by Mr. O'Dwyer in the Ramgarh tahsil of Alwar --

	Per cent
Rabi oilseeds, moth and masina	25
Roots	50
Jowar	10
Barley	5

In Alwar sarson and tara were not recorded separately. Tara is never cut for fodder, and a deduction of 25 per cent from the total area under *rabi* oilseeds is equivalent to my 50 per cent. deduction from sarson. The other deductions agree fairly closely. My gram deduction is supported by the testimony of the zamindars, who say that gram and barley are cut equally for fodder.

32. In this tahsil, where the rents are in kind, the menials are invariably paid by the tenants. Whether this would be the case if kind rents were the rule instead of the exception is doubtful, but it was the case at last settlement in all the tahsils with good soil, and as it is the case now no deduction can properly be made from the Produce Estimate on account of menials' dues. In view however of the fact that more than half the land is cultivated by self-cultivating owners, who have to pay kamins' dues, allowance must be made in assessing.

The only agricultural kamins are the *kháti* (carpenter), *lohar* (blacksmith), and *chumar* (leather-worker), the last of whom helps to some extent in the field. As it is not proposed to make any deduction on their account from the Produce Estimate it is unnecessary to state their dues in detail, but the percentages of the produce of each harvest which they absorb are as follows:—

1										2	3
Circle										<i>Kharaf</i>	<i>Ras</i>
Bangar	..	...	...	.	...	...	..			4	14
Bhuder	...	...	.	.	..	...	...			44	17
Dahar Mitha	..	...	...	...	.	...	..			31	12
Dahar Khari	...	...	..	...	..	...	...			31	13
Chiknot	..	...	.	...	...	...	...			31	19
Total Tahsil	..	.	...	.	.	..	..			35	15

The Meo generally has a large family, and is much too poor to employ hired labour. The only agricultural operations which are performed by hired labourers are the picking of cotton, the hoeing of sugarcane, and the making of *gur*.

Cotton-pickers receive one-tenth of the pickings. The cost of making *gur* is, as given in paragraph 20 of the Palwal Assessment Report, Rs. 7-12-0 per acre, and the same share of the cost of hoeing may be allowed as in Palwal, viz., Rs. 3 per acre. With these exceptions the ordinary Meo zamindar never employs hired labour, and no allowance need be made on this account.

33. In tahsil Rewari I made a deduction from the landlord's share of *chahi* produce on account of annual repairs to the woodwork and the occasional cleaning of wells. In this tahsil this expenditure falls on the tenant, and no deduction is therefore legitimate.

34. The landlord's share of the produce on the various classes of soil was stated in paragraph 24, and is shown in percentages in the following table:—

Irrigated ...	...	...	{ <i>Chahi</i> ...	33½
			{ <i>Nahri</i> ...	50
Unirrigated	...	...	...	50

As in the case of *chahi* and unirrigated crops, no further deductions have to be made, the Government share is half that of the landlord's. On *nahri* land the landlord pays half the cost of the seed and half the canal dues, and in the case of cotton he shares the cost of the picking, and in the case of cane the cost of cultivation, which is per acre as follows:—

Cost of seed	..	...	..	...	Rs a
Share of cost of hoeing	...	...	..	...	9 0
Hire of press (including oil)	.	...	...	..	3 0
Pay and food of <i>jhoka</i> and tara who prepare the <i>gur</i>	..	...	..	..	6 4
					7 12
					-----
					Total ... ..
					26 0
					-----

To avoid unduly complicating the Produce Estimate I have worked out separately the value per acre of the Government share of each nahri crop, and to obtain the total value of the Government share it is only necessary to multiply the area by the value per acre. These rates per acre are obtained by working out the value of a matured acre of each crop (less fodder allowance, vide paragraph 31) at the yields assumed in paragraph 29 and the sanctioned prices given in paragraph 30. After deducting the value of the seed sown, the canal dues and the expenditure mentioned in paragraph 32, the Government share is one-fourth of the remainder.

The gross produce and half-net-asset estimates are worked out in detail in Statement XIII.

Before abstracting the results here it is necessary to make allowance in the Bangar Circle for the serious underestimate of kharaba alluded to in paragraph 28. In that paragraph I compared the recorded percentages of failed crops with what I considered they ought to be.

I propose to deduct 4 per cent from the chahi, 12 per cent from the nahri and 10 per cent from the unirrigated crops on account of insufficient kharaba. The resulting areas and rates are shown below —

1	2	3	4	5	6	7	8	9	10	11		
Circle	Detail	Chahi Irrigation	Nahri Irrigation	Abi	Dahri	Barani	Total	Value of ½th gross produce	Present assessment	Increase per cent. of column 8 on column 10.		
BANJAR	Matured area in acres	2,622	8,437			257	56,119	67,835				
	Value of gross produce	16,743	1,26,807			2,468	4,64,094	6,41,112				
	Half net assets	6,614	14,594			675	80,703	111,586	1,06,862	78,661	40	
DHODAR	Matured area in acres	2-10-0	1 12 0			2 10-0	1-10 0	1 10-0				
	Value of gross produce	2,448				609	32,199	35,800				
	Half net assets	56,556			44	568	2,40,768	2,08,719		44,420	85	
DARAR MITRA	Matured area in acres	2-4-8				8,832	45,716	55,650				
	Value of gross produce	56,556				1,113	1,768	45,716	1-9-0	51,120	44,420	85
	Half net assets	8,053				2-9-0	2-14-0	1-7-0				
DARAR KHARI	Matured area in acres	1,765				1,670	19,875	23,000				
	Value of gross produce	44,535				25,788	2,15,802	2,85,625		47,604	47,276	18
	Half net assets	6,306				5,476	41,795	53,679	2-6 0			
CHIKYOT	Matured area in acres	3-9 1				3 8-0	2 2-0	2 8-0				
	Value of gross produce	873				349	38	17,288	18,438			
	Half net assets	21,086				5,704	478	2,22,544	2,49,812	41,635	37,411	85
TOTAL TARBIL	Matured area in acres	21,086	2,860			1,160	8-5-0	2 15-0	2 8-0			
	Value of gross produce	2,860				198	128	7,334	7,718			
	Half net assets	2 4 0				3,428	2,000	79,994	86,862	14,394	14,151	14
TOTAL TARBIL	Matured area in acres	58				970	768	8-2-0	2 2 0			
	Value of gross produce	135				4 0-0	403	14,862	16,188			
	Half net assets	2 5				588	2,697	1,32,565	1,51,841	2,81,605	2,22,919	27
TOTAL TARBIL	Matured area in acres	7,656	8,437			9,700	8,419	2,34,754	2,63,778	2,81,605	2,22,919	27
	Value of gross produce	1,69,890	1,26,807			2,041	2,041	8,419	2,34,754	2,63,778	2,81,605	2,22,919
	Half net assets	23,970	14,594			3 8 0	3 8 0	3-4-0	1-12 0	1-14 0		

It will be observed that in all circles the half-net-assets are considerably higher than the value of one-sixth of the gross produce. This is due to the high rate of batai of unirrigated crops. As I pointed out in paragraph 24, there can, I think, be little doubt that a rate of one half is too high for all except the best barani land, and the proper rate lies between one-half and one-third, and should probably be two-fifths, as taken by Mr. O'Dwyer in Alwar

In the Dahar Mitha Circle the estimate seems unduly low, and this is due probably to the fact that the cropping is unrepresentative. There ought to be a much larger area under dahri crops (*vide* paragraph 22), and the chahi cropping is somewhat below the average (*vide* comparative statement in paragraph 8). In this circle also the yields may perhaps have been somewhat underestimated.

In the Dahar Khar. Circle the chahi cropping is, as noted in paragraph 8, considerably above average, but the dahri cropping is much below average, and the total result is probably a correct estimate.

## CHAPTER VI.—HALF-NET-ASSETS BASED ON CASH RENTS.

35. The results of the examination of cash rents have been described in paragraph 26. It only remains to decide what share of the corrected rents may be taken as equivalent to half the net assets. In the Palwal Assessment Report (paragraph 34) I pointed out that in using cash rents we can either take the average realisations of a term of years (if available), or the rent demand of a single year, and that if we took the former we should find that we had to make an allowance for the expenses of management, while if we took the latter, we should have to allow for non-realizations, for land which goes out of cultivation or is not let regularly every year, and for fluctuations in the rent rate. In this tahsil unfortunately there are very few villages owned by non-cultivating owners who take cash rents, and we are therefore unable to take average realisations as the basis of our cash rent net assets, and have to fall back on the cash rent demand of the year of measurement. The rates given by these rents after correction are detailed in paragraph 26, and we have to consider what deduction must be made from them on account of non-realizations &c. In the Rewari tahsil I made a deduction of 5 per cent. on this account and in the Palwal tahsil of 12 per cent, but the Meo is a very different tenant from the Ahir or Jat, and I do not think there can be any doubt that in this tahsil the percentage of unrealised rents is much larger than in Rewari or Palwal. It varies of course with the pitch of the rents and with the security of the cultivation. I think a deduction of 15 per cent. ought to be made in the Baugar, Dahar Mitha and Chiknot Circles, of 10 per cent. in the Bhuder Circle, where the soil requires very little rain to mature a moderate crop, and of 30 per cent in the Dahar Khar Circle. In the last circle rents are so high that I am convinced that they cannot be realised at all fully over a series of years. These percentages are below what is indicated by the very meagre evidence as to realisations which is obtainable. In the Dahar Mitha circle the whole of the village of Doha is cash rented: the percentage of realisations during the ten years 1896-97 to 1905-06 is only 71, but the tenants are the dispossessed proprietors, who have always been at feud with the owner by purchase, and further, in 1900-01 the rents, which were already high, were raised to a pitch which justifies their being characterized as rack rents. During the four years previous to 1900-01 realisations averaged 80 per cent of the demand, and as these years were below average, I have assumed that over a series of years 85 per cent of the demand would be realised. In the Dahar Khar Circle a Meo owns nearly the whole of two villages and half of a third. The average demand of his rents in these three villages during the last ten years amounts to Rs 1,494 while realisations only average Rs 989, or 66 per cent. of the demand. The owner however is careless, the villages are not well managed, and the percentage of non-realizations must be above the average, though, with the very high rents taken in this circle, it is no doubt large, and my estimate of 30 per cent is probably moderate.

Beyond the deduction of these percentages the rates as they stand require no alteration except in the Dahar Mitha and Chiknot Circles. In the former I propose to take the Magda rate (Rs 4-6-0) as the average barani rate for the reasons given in the paragraph 26.

In the Chiknot Circle there are so few rents that a reliable cash rent estimate cannot be framed. The rents are only on *chahi* and *baram*, and in the former case the rent is too low and in the latter case too high, as it is on the best land. To obtain an estimate the best we can do is to apply the customary rate (Rs. 2 per *bigha* *pakka*, *vide* paragraph 26) to the cultivated area. This rate is too low for *chahi*, *abi* and *dabri*, but this is counterbalanced by the fact that it is too high for *baram*, and it is on the whole a fair all round rate for the circle.

After making the above alterations, and deducting the percentages for non-realizations the half-net-asset rates and *jamnas* are as follows:—

1	2	3	4	5	6	7	8	9	10	11
Circle	Rate	Chahi	Khari	Abi	Dabri	Baram	Bur	Total cultivated	Present assessment	Increase per cent.
BANGAL	Rate	Rs. a. p.	Rs. a. p.	Rs. n. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	
	Area	5,000	10,673		754	46,911	4,147	67,207		
	Amount	Rs. 10,135	19,015			74,420	8,210	1,06,810	79,661	34
BHUDER	Rate	2 0 0		2 12 0	2 8 0	1 10 0	0 14 0	1 5 4		
	Area	4,897		62	913	10,592	22,400	38,824		
	Amount	Rs. 12,316		Rs. 226	Rs. 2,357	Rs. 17,212	Rs. 19,600	Rs. 51,713	44,420	16
DAHAR MITHA	Rate	Rs. a. p.			Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
	Area	4,491			4,364	12,531	4,113	25,499		
	Amount	Rs. 14,779			Rs. 12,618	Rs. 23,300	Rs. 4,242	Rs. 55,097	Rs. 47,276	17
DAHAR KHARI	Rate	Rs. a. p.		Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.	Rs. a. p.		
	Area	1,700		614	876	15,617	3,029	20,897		
	Amount	Rs. 1,403		Rs. 1,343	Rs. 2,024	Rs. 35,138	Rs. 3,031	Rs. 46,841	Rs. 37,411	35
CHIKNOT	Rate							Rs. n. p.		
	Area		52		361	152	10,182	338	11,033	
	Amount							Rs. 15,170	Rs. 14,151	7

\* Included in *baram*

The *abi* and *dabri* areas in all circles are not the areas in Statement II but the areas as finally fixed (*vide* paragraph 7), and the *baram* area has been modified accordingly.

It remains to compare the cash rent estimates with those based on kind rents and detailed in the preceding paragraph. In the Bangar and Bhuder Circles the half-net-assets by cash rents are lower than those based on kind rents, and in the Dahar Mitha Circle they probably would be lower if the produce estimate were reliable which, as I have already pointed out, I do not think it is. The reason seems to be that in these three circles the rent rate of one-half is too high, and the one-sixth-gross-produce estimate which in the two first named circles agrees very closely with the cash rent estimate is more reliable. In the Dahar Khari Circle the two-half net assets estimates agree almost exactly, and this is what we should expect as a *bata* rate of one-half is not too high for the fertile semi-dahar soil of this circle. In these four circles the cash rent estimate may, I think, be accepted with confidence as the true half-net-assets, as where the kind rent estimate differs from it, it is due to the causes which I have just enumerated.

In the Chiknot Circle we must, on the other hand, make kind rents our principal guide, and here again the one-sixth-gross-produce-estimate is much more reliable than the half-net-assets based on batai as a batai rate of one-half is obviously much too high for the extremely precarious soil of this circle. Though the cash rent estimates is little better than a guess, it may be noted that it agrees almost exactly with the one-sixth-gross-produce-estimate if we raise the latter by 6 per cent., which is the extent to which the produce of the selected years is below the average of the last 21 years (*vide* Statement X).

Expressed in round numbers the following sums are what I take to be the true half-net-assets in each circle:—

	Rs
Bangar ... ..	1,07,000
Bhuder . . . . .	52,000
Dabar Mitha ... ..	55,000
„    Kharī . . . . .	47,000
Chiknot ... ..	15,200

## PART II.—FISCAL AND MISCELLANEOUS.

## CHAPTER I.—FISCAL HISTORY.

36 Of the 244 villages of this tahsil 194 belonging to the parganas of Firozpur and Punahana were conferred in jagir by Lord Lake on Nawab Ahmad Bakhsh Khan, but were forfeited in 1835 owing to the instigation by his son, Shamas-ud-din Khan, of the murder of Mr Fraser at Delhi.

First Regular Settlement

The net average collections of the last 20 years of the jagirdar's management amounted to Rs 2,25,700 out of an average demand of Rs 2,45,700. The parganas were summarily settled between 1835 and 1837 by Mr C Gubbins for Rs 2,25,591, and in the following year the first Regular Settlement was concluded by that officer's brother, Mr M. Gubbins. Reductions on the Summary Settlement jama were allowed at once, while the enhancements took effect from the expiry of the terms fixed at the Summary Settlement. The assessments were as follows —

1	2
Jama of 1246 fash (first year of Revised Settlement)	Final jama attained in 1256 fash
Rs 2,22,213	Rs 2,33,264

In 1841 Mr Gubbins reported that his assessment was too severe, and in accordance with his representations it was reduced to Rs 1,84,908. Twelve villages were subsequently added to the tahsil from pargana Nuh and 12 from pargana Hathin. Their assessment, Rs. 18,176, raised the total assessment of the tahsil as then constituted to Rs 2,03,084.

The first Regular Settlement worked well, and in 1875 Mr Channing wrote, "although the settlement presses rather heavily on individual villages, and although, as I hope to show, in one circle, Chak Mandikbera, some reduction of assessment is in justice required, yet the present assessment has on the whole worked well. Transfers by sale have been very few, mortgages are not, except in a few instances, oppressive, and the revenue has been regularly and easily collected."

37. The Second Regular Settlement was begun in 1872. Mr Channing joined as Assistant Settlement Officer in 1873 and remained in charge of the settlement operations until the end of 1877, by which time all the actual assessment work was completed. Mr. Channing found that population had increased 52 per cent, cultivation 34 per cent, and that there had been a considerable rise of prices. On the other hand well irrigation and natural flooding had both decreased.

The instructions on which the assessment was to be based are contained in Section 121 of the Final Settlement Report. The demand was not to exceed the estimated value of half the net produce ordinarily receivable by the landlord either in money or kind. These instructions introduced a new and reduced standard, hitherto the Government share of the net assets had in theory amounted to two-thirds though in practice the pitch of the summary and first regular assessments was determined by the average collections of the jagirdar. In any case it was probably above the half-net-assets.

The processes by which Mr Channing's rates were framed are detailed by him in Section 141 of the Settlement Report. He was unable to derive any substantial assistance from cash rents, as the villages in which cash rents existed were extremely few, and his assessment was based almost entirely on his estimate of the produce, one sixth of which he took as his standard.

The estimates of yields were **367** have stated in paragraph 29, rather high, and as the barani yields were applied to the whole cultivated area, the value of the produce was probably somewhat over estimated. The total value of the gross produce of the tahsil as then constituted was Rs 15,16,164 and the proposed assessment Rs 2,40,739, or 95 per cent of the one-sixth gross produce.

As in Palwal Mr. Wood thought that the proposed rates were too lenient, but they were eventually passed without alteration. Mr. Channing however found himself unable to assess fully up to his rates, and the jama as finally announced was Rs 10,000 less than the jama proposed.

The following table shows the results of the re-assessment in each of Mr. Channing's circles (excluding the fifteen villages transferred from Nuh at the end of the settlement) —

1	2	3	4	5	6	7
	Punahana	Bhuder	Landoha	Mandikhera	Chiknot	Total Tahsil.
	Rs	Rs	Rs	Rs		Rs
Value of one sixth gross produce	89,533	53,692	50,420	27,217	31,832	2,52,694
Existing Jama	56,120	44,439	47,852	31,500	23,006	2,02,917
Jama proposed	78,582	50,573	53,651	26,935	30,998	2,40,739
Jama sanctioned	76,123	48,990	51,526	27,884	25,958	2,30,481
Increase per cent	+36	+10	+8	-11	+13	+12

The assessment of the 15 villages transferred from Nuh at the end of settlement amounted to Rs 8,030, thus bringing the total assessment of the tahsil up to Rs 2,38,511.

The general aspects of the breakdown which followed the famine of 1878 have been discussed in the Assessment Reports of Rewari and Palwal, and need not be referred to here. Owing to the character of the Meo the breakdown was worse in the Mewat than in other parts of the district. The assessment of Tahsil Ferozpur is examined circle by circle in paragraph 61 (Section 6—11) of Mr. Wilson's Revision Report, and the following temporary and permanent reductions were granted —

1	2	3	4	5	6
	Bangar	Bhuder	Dahar 1tha	Dahar Khari	Chiknot
Permanent ..	4%	8%	7%	3%	5%
Temporary	10%	9%	6%	2%	8%

The percentages of temporary reductions shown here are less than those given by Mr. Wilson in Appendix VI of the Revision Report. Mr. Wilson's figures include reductions due on land in the possession of mortgagees, to whom as a matter of fact no reduction was allowed. This explains the small percentage of temporary reductions in the Dahar Khari Circle, which in 1883-84 was almost as heavily involved in mortgage as it is now.

The total permanent reduction for the whole tahsil amounted to Rs 12,940, or  $5\frac{1}{2}$  per cent of the jama, and temporary reductions amounting to Rs 18,079 were granted for seven years on the understanding that at the end of that period the Deputy Commissioner should decide how much of the original assessments should be re-imposed. Between 1883-84 and 1889-90 the seasons were generally favourable and the condition of the tahsil greatly improved. At the end of the seven years Rs 2,653 of the amount for which temporary reductions were granted were remitted permanently and Rs 15,426 re-imposed. The total amount therefore by which Mr. Channing's assessment was finally reduced was  $6\frac{1}{2}$  per cent.

The following statement shows the fixed jama of the tahsil at the various periods alluded to and in 1905-06 —

1	2	3	4
Period	Jama.	Incidence on cultivation.	REMARKS
Summary Settlement ... ..	Rs 2,25,591	Rs a. p .	194 villages only
1st Regular Settlement . . . . .	2,03,174	1 11 5	229 do
2nd ditto ditto . . . . .	2,38,511	1 7 2	244 do
1883-84 . . . . .	2,00,717	1 5 2	
1889-90 . . . . .	2,22,970	1 6 8	
1905-06 . . . . .	2,22,919	1 5 10	

Details of the fluctuating assessment imposed on cultivation in the Kotla Basin will be found in Statement XVI.

35. The revised assessment worked well and the demand was paid with ease between 1890 and 1895, when the Working of the expiring Settlement since 1889 long series of bad seasons began, which continued up to 1905-06. 1895-96 and 1898-99 were poor years, while 1899-1900 was a famine year.

A recovery was made in 1900-01, but another series of poor rains was followed by a serious failure of the kharif and rabi harvests of 1905-06 in the Dahar and Chiknot Circles. In the Bangar and Bhuder Circles the harvests of that year were nearly average. These two circles have suffered very much less from the recent bad seasons than the Dahar Circles. In both the kharif is the chief harvest and in the Bangar Circle the canal and in the Bhuder Circle the lightness of the soil have enabled a large area to mature in spite of the scantiness of the rainfall. The Dahar and Chiknot Circles on the other hand—especially Chiknot—have suffered severely from the bad seasons, and in the fodder famine which lasted from August 1905 to April 1906 it is estimated that 75 per cent of the cattle of the tahsil perished. Owing to the scarcity of grazing the Mewat always suffers more severely in a fodder famine than the rest of the district.

The kharif harvest of 1906 was good, and the rabi harvest of 1907 exceptionally good, and these two harvests have much improved the condition of the tahsil, but a succession of good or average seasons is still required to restore the villages to their condition in 1895.

The following statement shows the suspensions, remissions and collections of revenue during the last 21 years in percentages on the average khalsa demand.—



The remissions in 1901-02 were on account of the Coronation, and in 1905-06 were of sums outstanding for more than three years. The amount under suspension at the end of Rabi 1907 was as follows —

1	2	3	4	5	6	7
	Bangar	Bhnder.	Dahar Mitha	Dahar Khari.	Ohiknot	Total
	Rs	Rs	Rs	Rs	Rs	Rs.
1 On account of previous years	2,570	5,866	9,309	2,143	2,631	22,519
2 On account of 1905-06	44,278	23,238	21,698	16,881	12,125	1,18,220
3 Total ...	46,848	29,104	31,007	19,024	14,756	1,40,739
4 Proposed for recovery with rabi instalment of 1907	10,346	7,002	8,222	5,832	2,075	33,477
5 Proposed for remission (Rabi 1907)	845	5,304	6,974	109		13,232
6 Total proposed recoveries and remissions.	11,191	12,306	15,196	5,941	2,075	46,709
7 Balance outstanding	35,637	16,798	15,811	13,083	12,681	94,030

All unrecovered balances existing when the new demand is announced should be remitted

## CHAPTER II.—MISCELLANEOUS

39. The total population at the last census was 1,32,287 Separate figures for the children of each tahsil are not available, but adopting the average of the whole district the population may be classified as follows —

1	2	3	4
Detail	Males	Females	Children under ten (excluding infants)
Urban ...	8,312	7,632	3,816
Rural ... ..	42,158	38,160	19,080
Total ..	50,470	45,792	22,896

Infants have been estimated to number 10 per cent of the total population. The simple diet of the zamindars of this district is described in the corresponding chapter of the Rewari report I do not think that over a series of years there would be any difference between the diet scale of this and the Rewari and Palwal Tahsils

The Mec is not nearly such a hard worker and probably eats less food, but, as cattle are so scarce, milk probably forms a smaller item in his diet, and he has to consume more grain food.

I therefore adopt the same diet scale as in Rewari and reproduce it for reference below —

1	2	3	4	5	6	7
	MALES		FEMALES		CHILDREN	
	Chataks per diem	Maunds per annum	Chataks per diem	Maunds per annum	Chataks per diem	Maunds per annum
Urban ...	10	5 $\frac{1}{2}$	8	4 $\frac{1}{2}$	6	3 $\frac{1}{2}$
Rural ... ..	12	7	9	5	6	3 $\frac{1}{2}$

The total annual consumption is therefore 6,48,180 maunds.

The yield of food grains is given in the detailed produce estimates, and the tabul totals in maunds, after making the fodder allowances detailed in paragraph 31, are as follows :—

Jowar	...	65,284	Chaula	..	1,580
Bajra	..	1,79,255	Wheat	...	42,484
Maize	...	2,520	Barley	...	1,67,450
Mung	..	6,729	Gojra	...	17,197
Mash	..	1,195	Gram	...	1,31,298
Moth	..	3,826	Gochni	..	46,304

I have estimated the yield of the fluctuating cropping at the dahri yields of the circle

I show below in the case of each crop the amount of seed sown per acre, the percentage of the sown area which fails and the resulting deduction to be made on account of seed. In estimating the percentage of kharaba the proportion of irrigation must be kept in mind. The total amount of seed sown is obtained by increasing the total matured area under each crop (Statements VIII and IX) by the percentage in column 3 and multiplying the result by column 2.

For conversion into flour the following deductions should be made :—

Jowar	..	} 1½ per cent	Wheat	..	} five per cent
Bajra	..		Pulses	..	
Maize	..		Mixtures	..	
Barley	..	..	..	10 per cent	

The total amount of converted food grains is therefore as follows :—

1	2	3	4	5	6
Crop	Seed sown per acre in sers	Percentage of failed to sown area.	Total amount of seed sown in maunds	Net produce in maunds	Net produce in maunds after conversion into flour
Jowar	8	25	3,394	61,890	61,116
Bajra	3	25	4,007	1,75,248	1,73,057
Maize	8	20	95	2,425	2,395
Mung	3	25	284	6,415	6,123
Mash	3	25	51	1,144	1,087
Moth	5	25	207	3,619	3,438
Chaula	2	25	63	1,512	1,437
Wheat	50	20	7,800	34,684	32,950
Barley	50	20	25,084	1,42,366	1,28,129
Gojra	50	20	3,025	14,172	13,463
Gram	25	24	14,549	1,16,749	1,10,912
Gochni	40	22	7,348	38,956	37,008
Total			65,912	5,99,210	5,71,115

There appears therefore to be a deficiency of food grains amounting to about three-quarters of a lakh of converted maunds, but the total includes 83,421 maunds of wheat, gojra and gochni which are more valuable than bajra and barley, the staple food grains, and the exchange of the former grains for the latter would represent an addition of about 20,000 maunds to the total. Further the produce in Statement XIII is 3 per cent below the average of the last 21 years, and as I pointed out in paragraph 34 the produce of the Dahar Mitha Circle is unduly low. In this circle the Government share is probably about Rs. 5,000 less than it ought to be, which equals roughly a gross deficit of Rs. 30,000, which sum may be taken to represent about 20,000 maunds of barley and bajra flour. On the above facts we are justified in adding about 60,000 converted maunds to our total of Rs. 5,71,115. This leaves a small deficit, but we have still to take account of the fact that owing to the bad seasons not only is the produce 3 per cent below average for the whole tabul, but in the Dahar Khari and Chiknot Circles it is much more and the character of the seasons has entirely altered the character of the cropping. In normal years the area under wheat, gojra and gochni in these circles would be much larger.

I think it may be assumed that over a series of years the food grains are a little more than sufficient to feed the people, though in view of the severe pressure of population on the soil in parts of the tahsil I do not think we can expect to find much excess of production over consumption.

After deducting one-half of the gross value of the sugarcane and sarson and one-tenth of the gross value of the cotton, the value of the non-food and miscellaneous crops (including those in the fluctuating area) is about Rs 3,10,000 to which must be added something on account of excess production of food grains. As the present khalsa demand with cesses and canal dues amounts to Rs 2,88,987, this estimate leaves very little margin for clothing and the other necessaries of life, and cannot be accepted as correct. I have already pointed out the very serious decrease of the area under cotton in recent years due to the scantiness and lateness of the rains, and a considerable addition must be made to the estimate on this account. Possibly also the fodder deductions are excessive and the net produce of food grains is too small. However, I think the above facts illustrate clearly the extreme poverty of the tahsil, and explain why the people are unable to tide over even one bad year. In a good year the value of the produce is very much greater than my estimate, and the people of the tahsil, over-populated as it is, are able to feed themselves, pay their revenue and live comfortably, but in a bad year the value of the produce is insufficient for these purposes, and in such years it is fatal to attempt to collect from the Meo the revenue which the thrifty Ahir or Jat would be able to pay out of the surplus of good years. My figures if correct seem to indicate the necessity for a substantial reduction of assessment, but in the Mewat a large reduction would be useless, and what is indicated is exceptionally careful revenue management, revenue being liberally suspended in bad years and collected again in good years.

---

1	2	3	4	5	6	7
	Bangar	Bhuder	Dahar Mitha	Dahar Khari	Chiknot	Total
Percentage of failed to matured crops— Irrigated	3	8	11	13	41	6
Unirrigated	24	31	36	34	37	30
Percentage of area cultivated by owners	65	54	52	55	61	59
„ of tenants-at-will paying cash rents (not being at revenue rates)	13	19	31	21	6	18
Increase per cent of prices						39
Half-net assets of last settlement (one sixth gross produce for 229 villages)	Rs 89,533	Rs 53,892	Rs 50,420	Rs 59,049		Rs 2,52,694
Half-net-assets of present settlement (244 villages) by kind rents	1,11,586	55,650	53,579	46,775	16,188	2,83,778
Half-net-assets by cash rents	1,06,810	51,713	55,097	46,841	15,170	2,75,631
Value of one-sixth gross produce of pre sent settlement.	1,06,852	51,120	47,604	41,635	14,394	2,61,605
Present fixed assessment	79,661	44,420	47,276	37,411	14,151	2,22,919

As already stated in paragraph 7 the apparent increase in wells in use, laos and irrigation must be taken for what it is worth. There probably has been an increase to make up for the serious decrease of flooding.

In giving the value of the one-sixth gross produce as estimated by Mr. Channing I have grouped the Mandikhera and Chiknot Circles together, as, owing to the transfer of six villages from the present Chiknot Circle to Dahar Khari, the present and former circles do not correspond. The difference in the number of the villages affects the Bangar Circle only, as all except one of the 15 villages transferred to the tahsil are in that circle.

The bearing of the above statistics on the assessment will be discussed circle by circle.

41. Before detailing my assessment proposals for each circle I wish to make a few general remarks about the method to be adopted in assessing the

Method of assessing Meos  
proprietary body of this tahsil. Enough has been said to indicate the improvidence of the Meo and the severe pressure of population on the soil. The combination of these two factors renders the problem of assessment an extremely difficult one. The former makes a full assessment combined with a careful and elastic revenue management theoretically desirable, while the latter makes the adoption of this course very difficult. The problem is how to impose an assessment light enough to leave a fair margin for comfort and the necessities of life and at the same time not so light as to demoralize the people. In assessing the various circles I have tried to keep this principle in mind.

42. This circle contains 103 villages, and comprises the former Punabana Circle and 14 out of the 15 villages transferred from Nuh at the end of last settlement.

Bangar Circle

The striking feature of the statistics in the preceding paragraph is the area under canal irrigation which now protects 13 per cent of the cultivated area. In consequence this is the most secure circle of all, and we find that 102 per cent of the cultivated area produces matured crops, though some deduction must be made from this very high percentage on account of the underestimate of failed crops alluded to in paragraph 28. With regard to the large increase of wells and laos in use and of the area irrigated from wells I must refer to the remarks in paragraph 8.

There has, however, been a large increase in the total number of masonry wells and a corresponding increase of irrigation may be presumed. Ploughs and bullocks have increased slightly and population largely. The area sold is very small, and the area mortgaged is not large for Meos. The settlement jama, though a large increase, amounted to a lower percentage of the half-net-assets in this circle than in any other, and with the reduction given at the revision may be said to have been very light. Prices have risen largely and the opening of the Agra-Delhi-Chord Railway, which passes within a few miles of this circle, has very much improved communications. The above facts all indicate a considerable increase of assessment. On the other hand the owners have always been lightly assessed, and are in consequence somewhat demoralized, and their cultivation compares very unfavourably with that of their more heavily assessed fellow tribesmen in the other circles. Any increase of assessment which is taken must be a moderate one, and must be justified by an increase of resources. This practically confines the increase to the nahri villages, as most of the barani villages, though lightly assessed, are not in a position to pay much more than they are paying at present.

I compare below Messrs. Channing's and Wilson's rates and jamas with the rates and jamas based on kind and cash rents:—

1	2	3	4	5	6	7	8	9
	Chahi.	Nahri.	Dabri	Chaknot and Narmot	Magda	Bhur	Total cultiva- tion	Jama
	Rs a p	Rs a p	Rs. a p	Rs. a p	Rs a. p	Rs a p	Rs a p.	Rs
Mr Channing ..	2 8 0	..	2 2 0	1 4 0	1 1 0	0 14 0	1 3 10	₹3,971
„ Wilson .	1 11 0	..	1 8 0	1 4 0	1 0 0	0 8 0	1 3 1	₹0,658
Kind rents ..							1 10 7	1,11,586
Cash rents .	1 12 6	1 12 6	..	1 9 6	1 9 6	0 12 6	1 9 5	1,06,810

Mr Channing's rates are for the 59 Punahana villages only, as his rates in the villages transferred from Nuh were various. Mr. Wilson left Mr. Channing's loan rates untouched and obtained his reduction by reducing the rates on chahi, dabri and bhur, all of which soils were considerably overassessed.

The present assessment is Rs. 79,661 and the increases given by the kind and cash rent jamas, respectively, are 40 and 34 per cent.

The first point for decision is the method of assessing canal lands as to which I would refer to paragraph 41 of the Palwal Assessment Report. The reasons for a fixed assessment of canal lands are if anything stronger in this tahsil than in Palwal. There are not likely to be any material reductions of the existing supply, and, even if reductions are made, the difference between the value of barani and nahri land after allowing for canal dues is so small that a reduction of the water supply would not make the proposed assessment press heavily on the villages affected. It is true, as I stated in paragraph 8, that small extensions of irrigation are to be undertaken in the near future, but these can if necessary be provided for by rules similar to those proposed for the Palwal Tahsil, though, as the net profits of canal irrigated land are not much larger than those of barani, the interests of Government would not suffer much if these profits remained unfixed during the currency of the new settlement. The area irrigated by "lift" is very small, and for the same reasons as in Palwal (*vide* paragraph 41 of the Palwal Assessment Report) I do not propose to make any difference between the rates on "flow" and "lift". In paragraph 3 of this report I described the Lohing Valley Canal and the Shakrawa and Shahchoka Bands. The statement at the end of that paragraph shows that up to 1896-97 there was a good deal of flooding and a fairly large income from abiana, but that since that year not a single acre has been irrigated. I have given reasons for holding that there is not likely to be any overflow from the Nuh Tahsil in the future, and it is therefore useless to classify any part of the area formerly irrigated as abi; but, as it is impossible to foretell what the result of a return to normal seasons will be, a fluctuating rate per matured pakka bigha should be maintained and added in addition to the barani rate whenever there is any flooding in this area.

The fixed rates which I propose **375**

1	2	3	4	5	6	7
Sol	Rate	Area in acres	Demand	Total	Incidence	REMARKS
	Rs a p		Rs	Rs	Rs a p	
Chahi	1 0 0	5,609	5,609			Nahri includes chahi-nahri, and the superior barani class includes the area classed in Statement II as abri The dabri area is that given in paragraph 7
Nahri	1 9 0	10,875	16,650			
Dabri	1 0 0	754	1,178			
Chikni	1 4 0	47,941	57,127			
Nahri						
Magda	0 10 0	4,147	2,792	5,767	1 4 8	
Bhur						

This is an increase of 9 per cent on the present assessment and amounts to 81 per cent of the half net-assets (which may be taken to be Rs 1,07,060), and to between  $\frac{1}{4}$ th and  $\frac{1}{3}$ th of the gross produce. This is a light assessment, but it is not too light for the Meos of this circle. My assessments of finished villages yield an increase of 8 per cent which is nearly the same as that proposed for the circle.

The chahi, nahri and dabri rates may seem low, but the chahi is extremely inferior, while nearly all the extra profits due to canal irrigation are absorbed by the canal dues. The dabri is flooded from a hill stream and is precarious and inferior.

The loam is a good strong soil, but is very dry and requires much more rain than it generally receives. The low rate which I have imposed on it is justified by the large percentage of the sown area which fails.

The bhur is also inferior.

My barani rate is the same as Mr Wilson's and the proportions of the various rates are exactly those of the normal cash rents except in the case of dabri of which there are no cash rents, and of chahi and nahri, where I have raised them slightly to allow for the greater security of the cropping. Paragraph 26 shows that the chahi and nahri rent rates were considerably reduced at attestation, and I am not sure that this was not a mistake.

The present fluctuating rate on abri flooded from the Lohinga Canal is Rs 1 per matured pukka bigha. This rate is in my opinion too high and I propose the same rate as I shall propose in the other circles of this tahsil—10 annas per matured bigha, or Re 1 per acre. I do not think the difference between abri and barani cropping can be assessed higher than this. In this circle there is no difference between abri and dabri, and as the abstract statement in paragraph 34 shows the difference between the value of the dabri and barani cropping is exactly Re 1 per acre.

43 This circle contains the same 53 villages as at last settlement. The apparent increase of irrigation is probably

Exceeds Circle

real as the total number of wells has increased very largely, and the wells of this circle have always been in fairly regular use. Further some increase of resources is only what we should expect from the general prosperity indicated by the considerable increase of ploughs and bullocks, and the comparatively small percentage of the cultivated area under mortgage. The soil is very light, and the produce is not valuable, but as Statement X shows it is wonderfully secure, and the circle as a whole has suffered very little during the past ten years of drought. On the other hand, though population has increased by only 9 per cent, the net area per owner free for profit is only 6 acres, which is very little for such light soil, and the present jam is a full one, though it stands after reduction as it was before last settlement. The enhancement taken by Mr Channing was hardly justified and the assessment broke down terribly in the famine which followed the imposition of the new demand. The circle is now in a prosperous condition because, owing to the regular use of the wells and the lightness of the soil, it has not suffered like the rest of the tahsil during the recent bad years, but I do not think there are any grounds for an increase of assessment.

I compare below Mr. Channing's and Mr. Wilson's rates with the half-net-assets rates based on kind and cash rents:—

1	2	3	4	5	6	7	8	9
	Chahi	Abi	Dabri	Chiknot and Narmot	Magda	Bhur.	Total cultivation.	Jama
	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	
Mr. Channing	3 0 0		2 4 0	1 8 0	1 2 0	0 14 0	1 4 4	49,401
Mr. Wilson	2 12 0		2 4 0	1 10 0	1 4 0	0 11 0	1 2 7	45,172
Kind rents							1 7 0	55,650
Cash	2 9 0	2 12 0	2 8 0	1 10 0	1 10 0	0 14 0	1 5 4	51,713

Mr Wilson's reduction was obtained by largely reducing the bhur rate, which was much too high, as the small decrease in the chahi rate was counterbalanced by a slight increase in the rates on narmot and magda. But even Mr. Wilson's assessment was a little high, as existing cash rents show, and Mr. Maconochie in fixing the assessment for the remaining term of settlement was unable to take Mr. Wilson's permanent jama, and it was reduced to Rs. 44,420 at which it now stands.

The rates which I propose are—

1	2	3	4	5	6	7
Soil.	Rate	Area in acres	Demand	Total.	Incidence	REMARKS
	Rs a p		Rs	Rs	Rs a p	
Chahi	2 4 0	4,807	10,816			
Abi	2 2 0	82	174			
Dabri	2 2 0	943	2,004			
Chiknot	1 7 0	10,592	15,226			
Narmot						
Magda						
Bhur	0 11 6	22,400	16,100	44,320	1 2 4	

This practically maintains the present assessment, but it amounts to 85 per cent of the half-net-assets which may be taken to be Rs 52,000 and to almost exactly one-seventh of the gross produce. It agrees with the result of my village inspections, the total of the tentative assessments of finished villages corresponding with the total of the existing jamas. The percentage of the half-net-assets which it is proposed to take is fairly large for Meos, but it is justified by the security of the cropping, and the comparative prosperity of the circle.

*Chahi*—The chahi rate is the average rate for the three kinds of chahi. The rate for kachcha wells will be much lower, but this decrease is counterbalanced by a correspondingly large increase in the rate on the valuable dhenkhi chahi.

My proposed rate is 8 annas less than Mr. Wilson's, but as the half-net-assets rate is only Rs. 2-9-0 Mr. Wilson's rate seems to have been too high. An effective comparison between the former and present chahi rates in this circle is possible, because the chahi areas of last settlement and now correspond almost exactly as regards the proportion of chahi soil actually irrigated. Statement III shows that taking the area irrigated as 1 the chahi soil of last settlement is equal to 1.8 and of the present settlement is equal to 1.7. As my rate amounts to 88 per cent of the half-net-assets rate (Rs. 2-9-0) I do not think it can be said to be too low.

The decrease in the chahi rate explains why, although there has been an increase of irrigation amounting to 400 or 600 acres according as we accept the figures of Statement II or Statement III (I prefer the former in this circle, as the average irrigation of the last eight years is owing to the large number of bad rains probably above average), yet no corresponding increase of assessment is possible.

*Abi*—The small *abi* area in this circle is all irrigated from the Kotla Bund. The area finally classified as *abi* is, as in the case of *dabri*, the area which I consider will be flooded in seasons of normal rainfall. As explained in my No 609, dated 27th May 1907, to the address of the Settlement Commissioner, it is desirable to get rid as far as possible of the system of *abiana*, and I propose that this *abi* should pay a fixed rate like *dabri*. In years of exceptionally good rainfall a larger area than that now classified as *abi* may possibly be flooded from the Bund. This is of course a common feature of all flooded land. A great deal of land which is not classed as *dabri* is occasionally flooded, but, as the flooding is precarious and uncertain, the land is classed as *barami*. In my opinion it would be simplest and best to forego the extra assessment on land which is outside the area now classed as *abi* in the event of its being irrigated by floodwater from the bund, but, if it is considered necessary to assess it, then a fluctuating rate of annas 10 per matured *pakka bigha*—Re. 1 per acre may be imposed, subject to conditions which will be discussed later. The old rate is a little low, but the new rate (*vide* paragraph 3) is much too high for the inferior irrigation of this bund. As I pointed out in paragraph 3 the water is mixed with sand, and the people attach very little value to the irrigation.

In this circle the *abi* area is in two villages only —

	Acres.
Fakharpur Khori . . . . .	18
Karheri . . . . .	69
Total . . . . .	82

The *abi* in Fakharpur Khori is deep sand in the bed of the Balauj stream, and no higher fixed or fluctuating assessment can possibly be imposed in this village. The *abi* in Karheri is of a much better quality, and can pay the fixed rate proposed by me and also the fluctuating rate on land flooded but not classed as *abi*, if Government decide to impose the additional fluctuating rate.

The Ghata Shamsabad and Rawa Bunds are, as shown in paragraph 3, supposed to pay *abiana* at the rates shown in the statement in that paragraph. As the former has been breached for years, and as there has up to the present time never been any irrigation from either bund, I do not understand how any rates can have been fixed for future irrigation from them, and in any case I certainly cannot express any opinion on the suitability of the rates now proposed. This cannot be done until the quality of the land after it has silted up sufficiently for irrigation purposes becomes known, and until it is seen what crops can be grown from the irrigation.

*Dabri*.—The *dabri* is fairly certain of regular flooding in seasons of good rainfall, but is inferior to the *dabri* of the Dabar Mitha Circle because very little of it is flooded by the Landoha. Half the area is flooded by the Tirbeni and half by drainage water from the hills.

*Barami*—The loam and the *bhur* both vary very much in quality as the villages of which the circle is composed adjoin the other four circles, and their lands resemble the lands of the various circles which they adjoin, but they are on the whole superior to the corresponding soils of the Bangar Circles, and the higher rates are justified. The proportions of the rates proposed correspond fairly closely with the proportions of normal cash rent rates, but I have taken a slightly lower *bhur* rate to allow for some of the inferior land not being regularly cultivated, and I have lowered the *abi* rate to allow for the fact that the *abi* in Fakharpur Khori cannot pay anything higher than the *bhur* rate of the circle.

Dabar Mitha Circle

44. This circle contains the same 31 villages as the former Landoha Circle

There has been an apparently large increase of irrigation, but the increase is mostly on *kachcha* wells and *chenkis* and is presumably due to the recent dry seasons and the cessation of flooding. The increase in the total number of *pakka* wells is small. The flooded area has decreased very largely. As already explained,

there was no flooding between 1898 and 1904, and the area classed as dahri is that which was flooded in both the years 1904 and 1906. This area amounts to 4,364 acres, and is little more than half the area recorded as dahri at settlement. For reasons already explained it is impossible to say whether the present estimate of the flooded area is a fair one. Possibly no area at all ought to be recorded as flooded, while on the other hand the succession of bad seasons may have led to its being under-estimated. In the circumstances, however, the present area must be accepted for assessment purposes. The large decrease is only what might be expected. Since the first regular settlement there has been a continual decrease of the area flooded by the Landoha, and this fact was noted and explained by Mr. Channing (*vide* paragraph 23 of his Assessment Report). Since last settlement cultivation in Alwar has probably increased still further, and in any case the alterations made to the Atria Bund are quite sufficient to explain the further large decrease of flooding.

Such dahri as there is is of excellent quality, as it is nearly all from the Landoha. In addition to the large decrease of flooding, which is somewhat compensated for by the increase of irrigation, which varies inversely with the amount of flooding, ploughs and bullocks have decreased, and the area under mortgage is very large.

Although these signs of deterioration are probably due to the disastrous series of bad rains since 1896, still the present assessment is rather high in view of the decrease of flooding, and some reduction is indicated.

I compare below Mr Channing's and Mr Wilson's rates with the half-net-assets rates based on kind and cash rents —

1	2		3		4		5		6		7		8
	Chahi		Dahri		Chiknot and Narmot		Magda		Bhur.		Total cultivation		Jama
	Rs	a p	Rs	a p	Rs	a p	Rs	a p	Rs	a p	Rs	a p	Rs
Mr. Channing ..	3	8 0	2	8 0	1	12 0	1	6 0	1	2 0	2	0 0	51,586
" Wilson	3	0 0	2	4 0	1	10 0	1	6 0	0	14 0	1	13 5	47,694
Kind rents											2	1 7	53,579
Cash "	3	4 6	2	15 0	1	13 9	1	13 9	1	0 6	2	2 7	55,097

Mr Channing decidedly over-assessed this circle as is indicated by the fact that his jama was 2 per cent in excess of the value of his one-sixth gross produce. The chahi and bhur rates were especially high, and Mr Wilson substantially reduced the rates on these soils besides giving a small reduction on dahri and narmot. The chahi rate remained high, but presumably was framed to allow for the possible expansion of irrigation in dry years. The jama fixed by Mr. Maconochie in 1889-90 was Rs. 47,276 which is exactly the present jama. Owing to the precariousness of the dahri it is extremely difficult to assess this circle, but the rates which I propose are—

1	2		3	4	5	6	7
Soil	Rate		Area in acres	Demand	Total	Incidence	REMARKS
	Rs	a p		Rs	Rs	Rs a p	
Chahi	2	12 0	4,491	12,350			
Dahri	2	4 0	4,364	9,819			
Chiknot Narmot	1	9 0	12,531	19,580			
Magda Bhur	0	14 0	4,113	3,599	45,348	1 12 5	

This is a reduction of a little over 4 per cent and amounts to about 82½ per cent of the net assets (which may be taken to be Rs. 55,000), and to nearly one-sixth of the gross produce, but as I pointed out in paragraph 34 the estimate of the gross produce seems unduly low, and I do not think the proposed assessment can amount to as much as one-seventh of the gross produce.

I have inspected all the villages in this small circle except three, and my tentative village assessments yield a decrease of 4 per cent which agrees with the assessment now proposed for the circle

The proposed decrease is not large in view of the decrease of flooding but, as already pointed out, in this circle this can be and has been somewhat compensated for by an increase of irrigation

*Chahi* — The chahi rate is lower than at last settlement, but Mr Channing's rate seems much too high for Meo cultivation, and is not justified by the normal cash rent rate of this settlement. The proposed rate is only four annas lower than Mr. Wilson's rate, and this is accounted for by the fact that the present area contains a much larger proportion of kaohcha chahi

*Dahri* — The dahri rate is by no means high for the good dahri of this circle, which could pay a higher rate if flooding were certain, but it has been kept low to allow for the effect of the Atria Bund

*Barrni* — The low lying loam and clay in the centre of the valley are of excellent quality, and can easily pay Re 1-12-0 per acre, but the circle average is reduced by the inferior, high lying loam alluded to in paragraph 26, which cannot pay a higher rate than the loam of the Bangar Circle which it resembles

*Bhur*. — The bhur is a good, moist, fertile soil, much superior to the bhur of the Bangar and Bhuder Circles. Except of dahri the proportions of the proposed rates agree with the proportions of normal cash rent rates, and except in the case of chahi my rates are almost exactly the same as Mr Wilson's.

45. This circle contains the 28 villages of the Mandikhera Circle and 6 villages of the former Chiknot Circle

Dahar Khari Circle

There has been an enormous decrease of flooding due to causes detailed in paragraphs 2 and 6, but the number of pakka wells has nearly doubled, and, though the irrigated area in Statement III is not much larger than the area irrigated at last settlement, Statement II shows that a large expansion is possible. Moreover from its situation in the centre of the valley the soil even when not flooded is kept moist by percolation and is almost equal to dahri. Still ploughs, bullocks and population have decreased and more than half the cultivated area is under mortgage with the result that the net area free for profit per owner is less than 4 acres. In this circle the mortgage and deterioration are due not so much to any decrease of resources or to over-assessment as to the severe pressure of population on the soil, and the position does not seem to be much worse than in 1883-84 when Mr Wilson revised the assessment. Of course the circle is suffering from the effects of the past ten years of drought, but it has suffered less than the Chiknot and Dahar Mitha Circles.

The circle cannot be said to be over-assessed, and it is useless to try and remedy the evil of over-population by any large reduction of assessment.

I compare below Mr Channing's and Mr Wilson's rates with the half-net-assets rates based on kind and cash rents. The former are for the 28 Mandikhera villages only, and, if they do not bring out the jama in column 9, it is because the rates in the six Chiknot villages do not agree with the Mandikhera rates. The jama is that of the circle as now constituted —

1	2			3			4			5			6			7			8			9
	Chahi			Abi.			Dahri			Chiknot Narmot			Magda			Bhur			Total cultivation			
	Rs	a	p	Rs	a	p	Rs	a	p	Rs	a	p	Rs	a	p	Rs	a	p	Rs	a	p	
Mr. Channing	3	8	0				2	0	0	1	12	0	1	6	0	1	2	0	1	13	4	38,420
„ Wilson	3	0	0				2	4	0	1	13	0	1	7	0	1	1	0	1	12	7	37,397
Kind rents							2	4	0	1	13	0	1	7	0	1	1	0	1	12	7	37,397
Cash	2	8	0	2	3	0	2	5	0	2	4	0	2	4	0	1	15	0	2	3	10	46,841

Mr Channing's assessment was a reduction of 7 per cent, which as pointed out by Mr Wilson in Section 61 (8) of the Revision Report was hardly required. Consequently a very small further reduction was granted at the revision by Mr Wilson, who lowered the rates on chahi and bhur but raised them on the other soils. Mr Macnochie assessed at Rs. 37,411, which is the present jama.

The rates which I propose are **380**

1	2	3	4	5	6	7
Soil.	Rate	Area in acres	Demand	Total.	Incidence	REMARKS.
	Rs a p		Rs	Rs	Rs a p	
Chahi ...	2 0 0	1,762	3,524			
Abi	1 14 0	614	1,151			
Dabri	2 0 0	875	1,750			
Chiknot, Narmot, Magda	1 12 0	15,617	27,330			
Bhur	1 1 0	2,029	2,156	35,911	1 11 6	

This is a reduction of almost exactly 4 per cent., and amounts to only 77 per cent. of the half-net-assets, which I take to be Rs. 47,000, but it is almost exactly equal to one-seventh of the gross produce, and in view of the severe pressure of the population on the soil and the serious amount of mortgage is a sufficiently high assessment.

*Chahi* — My proposed rate is very much lower than either Mr. Channing's or Mr Wilson's rate, but in this circle the area recorded as chahi at this settlement is very large as compared with the area of average irrigation. The proportion which the chahi soil of last settlement bears to irrigation is 17, while that of the present settlement is represented by 25. Cash rents show that the people consider chahi very little more valuable than good barani, and as I pointed out in paragraph 26 the small difference in the rent of the two soils is due to the high rents taken on dhenkhis and wells growing garden crops

*Abi* — Irrigation is all from the Kotla Bund and the same remarks apply with regard to the method of assessment as in the Bhuder Circle. The area to which I wish to apply the fixed rate proposed above is as follows. —

Villages	Acres
Nagina	451
Rajaka	42
Bhadas	121
Total	614

The rate ought to be the same as in the Bhuder Circle, and in Rajaka and Bhadas will be the same, but I have had to reduce the circle rate because out of the 451 acres irrigated in Nagina 256 acres (*vide* paragraph 3) have been seriously damaged by sand deposits, and it will not be possible to take a much higher rate on this land than the bhur rate of the circle. Any orders passed as to the imposition of a fluctuating rate outside the fixed area will apply to this circle also.

*Dabri* — From its situation in the northern half of the valley this circle is now almost beyond the reach of the Landoha, and the dabri lands which depend on the Landoha (about one-fourth of the whole) will be flooded only in exceptional years. The rest of the dabri is flooded by hill streams, and is not very good of its kind. A lower rate than in the Dahar Mitha Circle is therefore justified both by actual conditions and by cash rents which are very little higher on dabri than on good barani

*Barani* — My rate on this soil is almost exactly the same as the average of Mr Wilson's narmot and magda rates. It is a very high rate but is suitable to the fertile, semi-dahai loam and clay of this circle, which in the hands of Ahirs or Jats would pay an even higher rate.

*Bhur* — My rate is the same as Mr Wilson's. It is a very high rate for bhur, but is much below the rate indicated by cash rents which in this circle almost take the form of an all-round rate. The proportions of my proposed rates excepting on bhur are very nearly those of the normal cash rent rates.

46 This circle consists of 17 out of the 23 villages of Mr. Channing's Chiknot Circle, and one village (Jalalpur-Nuh) transferred from the Nuh Tahsil at

Chiknot Circle

the end of last settlement. The circle is very badly off and has deteriorated seriously since last settlement. The decrease of cultivation is not serious, as it is all in the area under fluctuating assessment, but bullocks, ploughs and population have decreased very largely, the net area free for profit per owner is, considering the almost total absence of irrigation, excessively small, and nearly half the cultivated area is under mortgage. This deterioration is due partly to over assessment, partly to the unsuitability of a fixed assessment to the conditions of the circle, but chiefly of course to the disastrous effect of the last ten years of drought. In paragraph 4 I described the character of the soil and irrigation, and I referred to Statement X as evidence of the vicissitudes through which this circle has passed during the cycle of bad seasons. Owing to the saltiness of the subsoil water there is very little irrigation, and the hard, black clay soil, which is capable of producing excellent crops of jowar and wheat in good years, yields little or nothing when the rainfall is scanty. The average percentage of matured to cultivated area is only 73, and in the last two quinquennial periods the percentage fell to 63 and 52. It is obvious that a fluctuating assessment is what the conditions of this circle require, but I found on enquiry that the people are very much opposed to the system, and, though this is not a sufficient reason for rejecting it, yet it must be admitted that a fluctuating assessment is if possible to be avoided in Meo villages.

In the Kotla basin cultivation has fallen off for no other reason than that the fluctuating assessment imposed at last settlement has removed from the lazy Meo the incentive to cultivate a proper area. It is to be feared that, if the system is extended to the whole of the circle, cultivation will fall off seriously and the people will be no better off than before, as the area under cultivation will fall below what is necessary for their support. In short, a fluctuating assessment will remove a fiscal difficulty, but will not make the circle any more prosperous than it is at present, and will aggravate the characteristic vices of the Meo—laziness and improvidence. For these reasons I do not think a fluctuating assessment suitable, and recommend a light fixed assessment, which, if combined with very careful and judicious revenue management, will, I think, succeed. It may be noted that the villages in the Kotla basin now under fluctuating assessment are no better off than those under fixed assessment. The following villages have their lands wholly or partly in the Kotla basin and are wholly or partially under fluctuating assessment —

Multhan Jalalpur-Nuh, Firozpur-Nuh.

affected by drought than by excess of flooding, as, unless thoroughly moistened by flooding, the hard soil overgrown with rank grass cannot be cultivated. I therefore propose the continuance of the present system of fluctuating assessment, which is popular, and which, though it does not stimulate cultivation, is suitable to the peculiar circumstances of the small area within which it is at present imposed.

I proceed to compare Messrs Channing's and Wilson's rates with the half-net-assets rates based on kind and cash rents

The same remarks as to the rates and jamas apply as in the Dahar Khari Circle :—

1	2	3	4	5	6	7	8	9
	Chahi.	Abi	Dahri.	Chiknot Narmot	Magda	Bhur	Total cultivation	Jama
	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs. a p	Rs a p	Rs
Mr Channing ...	2 12 0		2 0 0	1 6 0	1 2 0	0 14 0	1 6 0	15,604
„ Wilson ...	1 12 0		1 10 0	1 6 0	1 0 0	0 8 0	1 4 8	14,652
Kind rents ...	.	...	.	.	.	.	1 7 5	16,188
Cash „ .	.	..	.	.	..	.	1 6 0	15,170

Mr. Channing's assessment was an increase of 15 per cent, and taken as a whole was not considered too high by Mr. Wilson (*vide* Section 61 (9) of the Revision Report). The chahi, dahri and bhur rates were however obviously too high, and the permanent reduction given was obtained by largely reducing these rates. The important rate however, that on chiknot-narmot, was left unaltered. Mr. Maconochie assessed at Rs. 14,151, which is the present fixed assessment.

The above assessments may not have been too high at the time they were imposed, but I think the present jama is decidedly too high for the present conditions. It is improbable that the Landoha floods will ever reach this part of the valley in future, and the whole tract is suffering severely from a lack of moisture. The fixed rates which I propose are :—

1	2	3	4	5	6	7
Soil	Rate.	Area in acres	Demand.	Total	Incidence	REMARKS
	Rs. a p	Rs	Rs	Rs	Rs a p	
Chahi .. ..	1 8 0	52	78			
Abi .. ..	1 12 0	361	631			
Dahri .. ..	1 8 0	152	228			
Baram .. ..	1 2 0	10,132	11,398			
Bhur ...	0 8 0	336	168	12,503	1 2 1	

This is a reduction of 12 per cent and amounts to 82 per cent. of the half-net-assets, which may be taken to be Rs. 15,200, and to almost exactly one-seventh of the gross-produce estimate as it stands, though as the estimate is about 6 per cent below normal, the share taken is really less than one-seventh. At the time of my inspection the number of finished villages was less in this circle than in any other, but, as far as they go, my village assessments yield a decrease of 12 per cent., and so agree exactly with the assessment proposed for the circle.

Chahi and dahri — My proposed rates are nearly the same as in the Bangar Circle, the chahi and dahri of the two circles being very similar. The dahri is

in only two villages and is flooded by drainage water from the hills Both chahi and dabri are very inferior

*Abi*—The *abi* is all irrigated from the Kotla Bund and the area on which I propose a fixed assessment of Re. 1-12-0 is distributed as follows—

	Acres
Mandho	8
Hasanpur-Nuh	28
Saltaupur	161
Umra	169
Total	366

The *abi* of this circle is farthest away from the source of the streams which feed the Kotla Bund, and I have therefore pitched the rate a little lower than in the Bhuder and Dahar Khar Circles to allow for the greater uncertainty of irrigation, but the water when it does come is more beneficial than in any other circle, as the land lies beyond the reach of sand deposits and the soil, owing to its great strength, produces, when flooded, more valuable crops than the sandier *abi* of the other circles.

I mentioned in my description of the Kotla Bund in paragraph 3 that a sluice has been built at Hasanpur-Nuh to let excess water on to the lands inside the bund which are suffering from lack of moisture, and that in connection with this scheme a small bund has been built at Man No water has passed inside the bund since 1896-97, and it seems unlikely that enough water will ever again come down the bund to permit of the sluice being utilized, but, if it does, the fluctuating rate of 10 annas per pakka bigha proposed in paragraph 43 should be imposed Orders passed as to the imposition of this fluctuating rate on land on the up stream side of the bund, which not being classed as *abi* is flooded by water from the bund, will apply to this circle also

*Bairani*—The pitch of the assessment is determined by the rate on this soil, as the area under the other soils is insignificant My rate is much lower than the rates imposed by Messrs Channing and Wilson, but I think it is quite high enough for the extremely precarious cultivation of this circle, which ought, if circumstances had permitted, to have been put under a fluctuating assessment If a fixed assessment is to be successful, it must be a light one.

*Bhu*—The area of this soil is very small My rate agrees with the rate imposed by Mr Wilson

*Fluctuating area.*—As at the time of my inspections, measurements were not complete in any of the villages under fluctuating assessment, I have not inspected them for assessment, but subject to further enquiry the existing rate and rules appear suitable, and I provisionally recommend that their continuance be sanctioned I shall have inspected the villages probably before this report reaches the Settlement Commissioner and certainly before he has disposed of it, and, if any further report appears necessary, I will submit it separately If no such report is received, the above proposals may be taken to be final There can I think be no question of a return to the rate on cultivation proposed by Mr Maconochie and sanctioned by Government The proposal was in my opinion an unfortunate one, and should not have been sanctioned A rate of Rs 2 per matured acre is the highest rate that can fairly be imposed, and is only fair when worked with rule (1) of Mr Wilson's rules

47 The total fixed assessment of the tahsil which I have proposed amounts to Rs 2,24,849 against the present assessment of Rs 2,22,919, or an

increase of a little less than 1 per cent It was remarked in paragraph 13 of the forecast report that "the thrifless Meos of Ferozpur and Nuh have not much improved their resources," and this is certainly true Were it not for the increase of resources in the Bangar Circle due to the introduction of canal

irrigation, the decrease would, owing to the decrease of natural flooding, have been still larger. As it is, it is not possible to do much more than maintain the present assessment by redistributing it over the various circles. As less abiana will be levied in future, it may be said that there has been no increase at all. I append for purposes of comparison the rates in tahsil Ramgarh of the Alwar State, and tahsils Pahari and Kama of the Bhartpur State. The rates of tahsil Ramgarh should be compared with those of the Dahar Mitha Circle which it adjoins, those of tahsil Kama with the Bangar Circle, and of tahsil Pahari with the Bhuder and Bangar Circles. The State share of the net assets in both Alwar and Bhartpur is two-thirds and the rates are stated in the assessment reports in terms of the local bigha which in Alwar is the pakka bigha (five-eighths of an acre), while in Bhartpur it is two-fifths of an acre. To reduce the rates of these States therefore to our standard and measurement it is necessary to increase the Alwar rates by one-fifth and the Bhartpur rates by seven-eighths.

The resulting rates are as follows :—

1	2	3	4	5	6	7	8	9
Circle	Chahi	Abi	Dahri	Oluknot	Narmot	Magda	Bhur	Total cultivation
	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p
Ramgarh (Alwar)	4 0 10	...	3 3 7	2 6 5	1 15 2	1 5 7	{ 1 0 10 0 9 7 }	2 7 7
Bhartpur.	Kama ..	3 8 3	2 5 8	.	1 12 0		1 2 9	2 1 9
	Pahari	3 11 1	2 9 6	..	1 14 0		0 15 0	2 4 10

The rates in Alwar and Bhartpur are very much higher than those in this tahsil, and represent an altogether different standard of assessment

Before ending this paragraph it may be useful to show the result of my fixed abi assessments as compared with the fluctuating system hitherto in vogue. The Kotla Bund is the only bund on which there is any land classed as abi, and these remarks apply to this bund only. The statement in paragraph 3 shows that the average realisations from abiana during the last 16 years amount to Rs. 1,328. This is much more than what I calculate to be the difference between the abi and barani rates of the present abi area, which amounts to Rs 472 only; but the former total is swelled by the receipts of the years before 1896, that is, before the recent series of dry years set in and before the alterations to the Atria Bund. I have already stated that in my opinion owing to these alterations the Landoha floods are never likely to reach the Kotla Bund in future, and it would be fairer therefore to adopt for comparison the years after 1896. Since 1896-97 realisations from abiana only average Rs 223, which is much less than my assessment of the advantage due to the bund. Although the years since 1896 are much below average, still I do not think that realisations from abiana are likely to average more than Rs 472, and Government is not therefore losing anything by the fixed assessment, while the gain to the people and to the subordinate officials which will result from the abandonment of the vexatious and difficult system of abiana is very great. I would therefore repeat what I urged in paragraph 43, that it is unnecessary to impose a fluctuating rate on land not classed as abi which happens to be flooded in exceptionally good years

## CHAPTER II.—MISCELLANEOUS.

48 In tracts where wells are protective it is almost impossible that the existing rules for protective leases should conform with the principle that the period of protection should be such as to ensure the well-owner a return of his capital with interest at a fair rate. This is clearly brought out by the following statement, which shows for pakka wells the number of years during which

protective leases

the wet assessment on chahi land in each circle must be remitted to allow of the recovery of the capital alone without allowing anything for interest —

1	2	3	4	5	6	7	8
Circle	Net-assets chahi soil rate per acre	Net-assets all round barani rate per acre	Net profits per acre due to irrigation.	Area in acres irrigated by a 2 lao pakka well	Annual net pro fit on pakka well	Cost of pakka well	Number of years required for recovery of capital only
	Rs a p	Rs a p	Rs a, p		Rs a p	Rs	
Bangar	3 9 0	3 0 0	1 5 0	6	7 14 0	750	95
Bhuder	5 2 0	2 4 0	5 2 0	6	30 12 0	600	19½
Dabar Mitha	6 9 0	3 0 0	6 9 0	8	52 8 0	500	10
" Khari	5 0 0	4 6 0	1 10 0	4	6 8 0	300	46
Chiknot*						450	

Note — The sum in column 4 is arrived at by multiplying the difference between the sums in columns 2 and 3 by the area in column 5 of Statement III and dividing the result by the area in column 8.

\* No data available

The above statement shows that in only two circles would the existing period of 20 years suffice for the recovery of the capital cost, and that in one circle only would it suffice for the recovery of the capital with a fair rate of interest. The two circles in question are of course the Bhuder and Dabar Mitha, where the wells are profitable and are regularly used. In the other three circles wells are purely protective and a very long period is required for recovery of the capital alone. In the Chiknot Circle the period would not be less than in the Bangar Circle.

I shall defer making any proposals until orders are passed on the proposals in paragraph 49 of the Rewari Report.

49 The rules in Financial Commissioner's Circular Letter No 5890, dated 30th September 1904, as amended by Financial Commissioner's Circular

Wells falling out of use

Memo. No 1, dated 10th April 1907, are suitable and should be extended to this tahsil. In the Dabar Mitha and Bhuder Circles, where chahi is much more valuable than barani a good many villages at last settlement distributed their assessment by soil rates, and probably many more will do so when the new assessments are imposed. In the other three circles the chahi is little, if at all, more valuable than good barani, and the assessments will probably be distributed at an all-round rate as before.

50. In paragraph 42 I pointed out that reductions of canal irrigation in villages at present commanded though possible in a few cases are improbable,

Rules to meet charges of canal irrigation.

but that small extensions of irrigation will almost certainly be made in the near future. In Palwal where the difference between the value of nahri and barani after allowing for canal dues is considerable, I proposed certain rules to meet increases and reductions of irrigation (*vide* Palwal Assessment Report, paragraph 47). In this tahsil where the difference between the value of nahri and barani is much less, I do not think the same necessity for such rules exists, but if rules of the nature proposed are sanctioned for Palwal, it would perhaps be advisable for the sake of uniformity to extend them to all canal-irrigated parts of the district. In that case for the eight annas specified in my proposed rule 1 it would be necessary to substitute some such words as "by the difference between the settlement nahri and loan rate," and the same rules would then be applicable to all the three tahsils in which there is canal irrigation.

51. Reh is serious in one or two villages in the canal-irrigated tract, and although it is hoped that the new drain will improve their condition, any rules

Deterioration due to reh

sanctioned for the Palwal Tahsil (*vide* Assessment Report, paragraph 45) should be made applicable to this tahsil also

52 If my proposal to levy fixed abii assessment is sanctioned, then no rules will be required for the working of the assessment of lands already classed

Abi.

as abi, but as I have proposed a fluctuating rate on irrigation, if any, from the Shakhrawa, Shahchoka and Mau Bunds and on irrigation by means of the Hasanpur sluice, and as Government may wish to impose a fluctuating rate on the other lands not classed as abi, but irrigated from the Kotla Bund, rules for the working of the fluctuating assessment are necessary. A single set of rules for the whole district will probably have to be sanctioned finally, but at present I am only in a position to propose rules for this tahsil. The following appear suitable :—

(1) No abiana shall be levied on any of the following classes of land :—

(a) Land classed as abi

(b) Land classed as chahi or dahri even if flooded by water from a bund, unless such land is flooded at the express request of the owner or cultivator

(c) Land flooded owing to the breaking of a bund

(d) Land seriously injured by sand deposits. Objections to the levy of abiana on such land may be submitted to the Tahsildar within ten days of the date on which notice of the intention to levy abiana was given, and will be decided by that official after inspection of the spot by himself or by the Naib Tahsildar. Abiana should ordinarily be remitted when the land though flooded has become incapable of producing crops of a better class or yield than unflooded land. The objector may appeal to the Collector or such officer not lower in rank than an Assistant Collector of the 1st grade as the Collector may authorise against the decision of the Tahsildar within 15 days of the date on which he was made acquainted with it.

(2) Abiana shall be levied on the matured area only

(3) Abiana shall be levied on the same land only once in the year. The crops of each harvest shall be measured up separately and assessed to abiana, but land which has paid for a matured kharif crop shall not be charged again for a rabi crop if grown.

Rule (1) (b) is necessary owing to the uncertainty which has existed in the past. Lands classed as dahri were regularly assessed to abiana until a few years ago, when the point was raised on appeal and decided against the District Board. Mr. Halifax and other authorities on the Gurgaon Bunds are of opinion that dahri land advantaged by bund water should pay abiana at half rates and in paragraph 5 of No 58 dated Lahore 19th March 1906 from the Chief Secretary to Government Punjab to the Senior Secretary to the Financial Commissioner, Punjab this view finds support, but it is in my opinion quite untenable. Land classed as dahri is assessed at a rate which assumes that it will be flooded in years of normal rainfall, and it is unlikely to be flooded by bund water in any year in which it would not be flooded by drainage water in the ordinary way. Not only is it unfair as a detail of assessment to levy abiana on dahri land, but as a detail of management it is very difficult to work fairly. Where abi and dahri lands adjoin it is often quite impossible to decide with any certainty whether the water which advantages the dahri is from natural flooding or from the bund. If left to the patwari he invariably assigns it to the bund. On both the above grounds therefore I am of opinion that except in certain specified cases no abiana ought to be levied on dahri land unless it is flooded at the direct request of the owner or cultivator. In this tahsil there is no controlled irrigation by cuts, and so this contingency can never arise, but as cases will arise in other tahsils I have left the rule in the form which will be suitable for the whole district. Similarly the only occasion when chahi should pay abiana is when the chahi lands are flooded by request. This contingency is not likely to arise in this tahsil, but it has arisen and will arise in other tahsils, and the general rule is therefore proper. Whenever chahi and dahri lands are extremely inferior and would really be advantaged by bund water, they will of course be excepted from the operation of this rule. For instance in this tahsil I should have excepted the chahi and dahri lands of the Chiknot Circle and proposed to assess them at half abiana rates, if there had been any chahi or dahri within the range of flooding, but there is not.

Rule (1) (d). I think this provision is necessary, because it is very unfair that land which has so deteriorated that it cannot fairly pay even the barani rate imposed at settlement should have to pay abiana in addition. I have roughly indicated the procedure which seems to be necessary for carrying out the rule, but in the other tahsils there will be other reasons justifying remissions of abiana, and a procedure suitable for objections of all kinds will have to be prescribed, and the procedure now proposed need not be considered final.

Rule (2) is the existing rule and should be continued.

Rule (3) is one of the rules at present in force in the area under fluctuating assessment. In my opinion it is equally necessary in the case of crops grown on land flooded from a bund. The possibility of its adoption was suggested in paragraph 5 of the letter quoted above. The existing rule by which abiana has hitherto been levied both on kharif and rabi crops matured on the same land in the same year is manifestly unfair. The only case in which two crops are matured in the same year in flooded abj land is, when a kharif cereal is followed by gochni, bejhar or gram. The kharif cereal could not possibly be benefited by the flooding and would generally be damaged, and the yield would almost certainly be less than in barani land. The imposition therefore of abiana on the kharif crop in addition to the fixed barani assessment is unfair. The real advantage from the flooding is derived from the valuable rabi crop (generally gochni), which can be sown if there has been good flooding, and this is the only crop which ought to be taken into account for the purposes of abiana. If cotton matures at the kharif, no rabi crop is possible. A matured cotton crop is extremely rare in flooded land and in any case the position remains unaltered, as the net value of cotton and gochni is very nearly the same. The various forms therefore which a year's matured cropping in flooded abj land may take are as follows —

<i>Kharif</i>	<i>Rabi</i>
1. Cotton	Bejhar or gram
2. Jowar or bajra	Wheat, gochni
3	

In the first two cases, which are unusual, the flooding must of necessity have been very light, or for cotton abnormally heavy, while in the third case which is the prevailing form it will have been average. In all three cases the value of the cropping is about the same, and the case for imposing abiana only once in the year is therefore established. Differential crop rates are of course theoretically desirable but their introduction would involve an amount of trouble which would be out of all proportion to the advantages gained. One rate for all crops, levied only once a year on the same land, gives a result which is sufficiently fair. The proposed rule may not have been quite clearly worded, and I wish to point out that it is not my intention to propose that a whole field, any part of which has borne a matured kharif crop, shall be exempt from payment of abiana at the rabi. The prohibition only extends to that part of the field which has borne a matured kharif crop. Thus in a field of one bigha, if three biswas yield a matured kharif crop and are assessed to abiana, the remaining 17 biswas may be separately assessed to abiana at the rabi, if they yield a matured rabi crop.

In the Government letter already alluded to it was suggested that the assessment should be made only once a year i.e., in the rabi, but I think there are objections to this proposal. The cultivator who grows only a kharif crop might find it inconvenient to pay the assessment on it at the rabi, and any objections to the assessment of a kharif crop would have to be dealt with by the Collector or Assistant Collector long after the crop had been harvested, and it would be very difficult to come to a proper decision. On the whole I think it would be better to retain the rule in the form proposed.

The existing rules as to the inspection and assessment of lands liable to pay abiana are a set drawn up by Mr Hamilton in 1901. The rules have worked extremely well hitherto, and I do not anticipate that many modifications will be necessary, but it will be necessary to amplify them in certain points, e.g., by making provision for objections &c. My proposals will be submitted later when I am in a position to submit rules applicable to the whole district. If it is decided to introduce the new proposals for assessing abj and

levying abiana piecemeal by tahsil 388. My proposed rules for this tahsil should be provisionally sanctioned, and the system of fluctuating assessment should continue to be worked according to the rules laid down by Mr Hamilton in so far as they are not cancelled by my proposed rules, and as soon as possible I will submit for sanction a final set of rules for the whole district

53. The term of settlement which is suitable is 30 years. If a shorter term is finally sanctioned for the canal villages in Palwal, it will probably be advisable to fix the same term for canal villages in this tahsil also, but no orders on this point are required at present. The present settlement expired with the rabi instalment of 1907. As pointed out in my No. 905 dated 6th August 1907 to the address of the Settlement Commissioner the present assessment was by an oversight sanctioned up to Rabi 1908, (*vide* orders of Punjab Government and of the Government of India in the printed Settlement Report) but as the engagements taken from the owners under Act XXXIII of 1871 were for a period of 30 years ending (approximately) with Rabi 1907, the mistake does not effect the date from which the new demand can be imposed. The question has been settled as regards the Rewari Tahsil, and in this tahsil no importance attaches to it, as there appears to be no possibility of orders on this report being received in time to permit of the demand being imposed before Kharif 1908. The new demand should be imposed from that date, provided that orders are received in time.

Cesses

			54. The sanctioned cesses are—		
				Rs	a p
Local rate	.	...	.	8	5 4
Lambardari	...		.	5	0 0
				<hr/>	<hr/>
			Total	13	5 4
				<hr/>	<hr/>

These should be continued. I have submitted separately proposals for the abolition of the office of chief headman, which were called for in Settlement Commissioner's endorsement No. 879 of the 9th March 1907

Points on which orders are required

55. Orders are required on the following points —

(1) The proposed rates and assessments including the method of assessing (a) nahri (b) abi (c) land not classed as abi, but which may possibly be flooded by water from the Kotla Bund (d) land which may be flooded from the Shakhrawa, Shahchoka and Mau Bunds (e) land in the Kotla basin under fluctuating assessment (paragraphs 42—46).

(2) Adoption of the rules for the remission of the wet assessment when a well falls out of use (paragraph 49).

(3) Question of adopting the rules proposed in paragraph 47 of the Palwal Assessment Report, if they or similar rules have been sanctioned (paragraph 50).

(4) Adoption of the rules proposed in paragraph 48 of the Palwal Assessment Report, if they or similar rules have been sanctioned (paragraph 51)

(5) Adoption of rules for regulating the assessment of abiana on lands not classed as abi, but irrigated by water from District Board Bunds (paragraph 52).

(6) Date of imposition of the new demand (paragraph 53).

(7) Cesses (paragraph 59).

B. T. GIBSON,

Dated 26th September 1907.

Settlement Officer.

*Extract from a letter No 579, dated 2nd May 1902, from the Deputy Commissioner, Gurgaon District, to the Political Agent, Alwar State*

7 The third point is the most important of all. It appears that the Alwar Darbar have erected a huge masonry wall 3½ miles in length, running almost parallel to the hills right up to Atria temple, traversing in its course the old earthen embankment, shown as "Landoha Bunds" on the map referred to in paragraph 4. The zamindars of Firozpur complain most bitterly of this action of the Darbar and aver that the wall in question has entirely intercepted their supply of water. I do not know the full particulars of this work, and before I express my opinion on it I shall be glad to know when it was built and with what object. But I cannot refrain from remarking that a work of such magnitude should not have been allowed to be constructed without the concurrence of the Punjab Government, considering that its effects are far reaching and are not unlikely to upset all the arrangements hitherto made between the officers of that Government and the Raja of Alwar, for controlling the waters of the Landoha stream.

*Extract from a letter No 337, dated the 22nd July 1902, from the State Engineer, Alwar, to the Political Agent Alwar*

9 With regard to the Atria Bund nothing has been done to which the Punjab Government can raise objection.

10 The bund was constructed in old days and had been working, (whether effectively or not is beside the point) for years before the Punjab Province came into existence.

11 As first made, like the majority of village-made earthen bunds, or dhols, it was irregular in form and weak in structure.

It burst frequently, when the flood causing the breach ran directly down the old channel of the river to Gurgaon and this may have given rise to a wrong impression of the amount of water which the dividing arrangement at Karaoh should give to Gurgaon.

12 To remedy this state of affairs, and secure to the Alwar State their proper share at my suggestion the earth bank of the Atria Bund was faced with masonry, and this is the masonry now complained of.

The masonry has merely been given to prevent the bund breaching and the Alwar State is perfectly within its right to repair or strengthen any bund in its territory in the way most to its advantage, and no one outside the State has any right to make objection.

13 The result of the masonry face wall has been that the bund has not breached in late years and it is hoped will never breach again.

This and the many successive dry seasons has caused Gurgaon to receive less water than previously had been their good fortune, mainly through the misfortune to the Alwar State by the breaching of their old established bund.

*Extract from a letter No 3074, dated 24th July 1902, from the Political Agent, Alwar State, to the Deputy Commissioner, Gurgaon District*

As regards the construction of the Atria embankment I would invite your attention to page 200 of the Gurgaon Settlement Report where you will find that the Atria Bund was constructed by the Jats over 100 years ago.

The Alwar Darbar is perfectly within its rights in strengthening or repairing this old bund in any way it considers proper and any action it may have taken in this direction is not therefore open to discussion.

## GLOSSARY OF VERNACULAR TERMS USED IN THE REPORT.

Vernacular.	English.
Abiana ..	An assessment levied in addition to the assessment at unirrigated rates on account of the advantage derived from irrigation
Ahur ..	A Hindu caste
Anna ...	One-sixteenth part of a rupee.
Arhar .	A pea ( <i>Cajanus indicus</i> ).
Badni ..	A gambling transaction
Bajra .	Spiked millet ( <i>Pennisetia spicata</i> ).
Bangar .	Uplands
Bania ..	A Hindu caste.
Barani .	Dependent on rain
Batai ...	Rent taken by division of crop
Bejhar .	A mixed crop of barley and gram
Bhaiachara ...	A form of tenure where possession is the measure of right.
Bhuder .	Sandy.
Bigha ...	A measure of area · 1 pakka bigha = $\frac{1}{8}$ of an acre.
Band ...	Protective embankment.
Chamar .	A kamin (Q. V.)
Charsa ...	Leathern well bucket.
Chari ...	Jowar grown thick for fodder.
Chhalak ...	One-sixteenth of a ser (Q. V)
Chaula or lobia ..	An autumn pulse ( <i>Vigna catianga</i> ).
Dahar .	Flooded land.
Dhenkh ..	A hand-lever well
Dhol ...	A low earthen wall.
Dhaniya ..	Coriander seed
Dofash .	Yielding two crops in each agricultural year.
Fash .	Agricultural year
Ghi ...	Clarified butter
Gochni ...	A mixed crop of wheat and gram.
Gojra ...	A mixed crop of wheat and barley.
Guar ..	An autumn pulse ( <i>Cyamopsis psoraloides</i> ).
Gur .	Unrefined sugar.
Jagir .	An assignment of land revenue.
Jagirdar ..	Holder of an assignment of land revenue.
Jama .	Land revenue demand.
Jat ...	A Hindu caste.
Jhoka ..	A man who tends the fire on which the juice of the sugarcane is boiled
Jinswar .	Harvest crop statement.
Jowar ..	Great millet ( <i>Sorghum vulgare</i> ).
Kachcha .	(Of a well) not lined with masonry
Kamin ...	A village servant
Khalsa ..	Revenue credited to Government as contrasted with jagir (Q. V.)
Khanzada .	A Muhammadan caste
Kharaba ...	Portion of a crop which has failed to come to maturity
Kharch .	Cess reahed by landlord in addition to rent.
Kharif ...	Autumn harvest
Khasra girdawari ..	Harvest inspection register
Lakh ...	One hundred thousands (100,000).
Lambardar ..	Village headman
Lao ...	Laterally well rope. Well area worked by two (generally) yoke of bullocks
Mali ...	A Hindu caste
Malikana .	Fee paid in recognition of proprietary title
Mash .	An autumn pulse ( <i>Phaseolus radiatus</i> ).
Maund .	Eighty lbs
Meo ...	A Muhammadan caste
Mewat ...	Tract where Meos live
Moth ..	An autumn pulse ( <i>Phaseolus acontifolius</i> )
Mung .	An autumn pulse ( <i>Phaseolus mungo</i> ).
Nala .	A stream
Pakka ...	(Of a well) lined with masonry.

Vernacular	English.
Pala	The dwarf bor (plum)
Parzana	A group of estates forming a sub division of a district or tahsil
Pattidari	Held on ancestral or customary shares (a form of village tenure)
Pattari	A village accountant
Pala	Mung grass
Rabi	Spring harvest
Rajhala	A distributary of a canal
Reh	A saline efflorescence in the soil
Sarson	Rape seed
Ser	A measure of weight=one-fortieth of a maund (Q V)
Ser	A cess of one ser per maund of the produce taken by landlords
Shial	A Muhammadan caste
Tahsil	Sub-division of a district in charge of a Tahsildar
Taramra	Rape seed
Tara	A man who makes gur (Q V)
Til	Sesame
Urd	The same as mash (Q V)
Z-bi	Cash rents levied on account of crops of which the produce is not divided
Zamindar	Landowner
Zamindari	A form of tenure where the village is owned by a single proprietor or set of joint proprietors

villages. I reduced the existing assessment of each village where necessary, on considerations affecting the village itself, and, having totalled for the circle the reduced assessments, suggested those rates as shewing how the total reduced assessment of the circle might be considered to fall on the areas of the different soils as recorded at Settlement. I thought that in some respects the areas so recorded had been exaggerated, and in such cases reduced not the area but the rate; so that my rates do not represent what I then thought were fair rates for the soils if not exaggerated as to area, but in some cases, especially the *chahi* and the *bhur*, were below such fair rates. In both these circles however I showed that my reduced assessments might be held to fall at Re. 1-4 on *narmot* and Re. 1-0 on *magda*. In view of the evidence afforded by the cash rents and the smallness of the general enhancement, I would make the revenue-rate on *barani* soils (except *bhur*) Re. 1-6 in Firozpur and Re. 1-4 in Nuh.

19. For the reasons given in my Gohana and Palwal Reviews, even in distributing a fixed dry assessment over villages, it is not fair to assess villages which have no canal irrigation at the same rate as villages which can irrigate when they wish to, and, as in those tahsils, I propose that the difference between such villages should be marked by applying, as the dry rate, a revenue rate higher than the *barani* rate to the area actually irrigated from the canal on an average of years in each village. I make the difference less in Firozpur than in Nuh, because much of the irrigation in Firozpur is from the tails of distributaries. It will be observed that these *nahri* dry rates will not exceed the half net asset rates on land actually unirrigated. The rate on *bhur*, which is so apt to be left uncultivated in bad years, should be kept low, and I would accept the rate of 10 annas proposed for both circles by the Settlement Commissioner. Mr Diack accepts the rates for *chahi* proposed by the Settlement Officers namely Re. 1-9 in Firozpur and Re. 1-8 in Nuh, but they intended to apply those rates to the whole area recorded as *chahi*, while I propose, for the reasons above given, that the *chahi* rate should be applied only to the average area actually irrigated, which is in each case only about half the recorded area. It will be safe therefore to adopt in each circle a *chahi* rate four annas below the half net asset rate worked out above. The rates which I propose for a fixed assessment on the land in its unirrigated aspect are as follows:—

Soil	FIROZPUR BANGAR			NUH BANGAR.		
	Area	Revenue rate	Result	Area	Revenue rate	Result
	Acres	Rs a p	Rs	Acres	Rs. a p	Rs
Chahi (actually irrigated)	2,632	2 0 0	5,264	2,208	1 12 0	3,864
Nahri (actually irrigated)	8,690	1 8 0	13,035	17,452	1 8 0	26,178
Barani ... ..	51,219	1 6 0	70,426	60,614	1 4 0	75,768
Bhur ... ..	3,928	0 10 0	2,455	6,324	0 10 0	3,952
Total ...	66,469		91,180	86,598		1,09,762

The Settlement Officer should therefore aim at a fixed dry assessment of Rs. 91,000 in Firozpur and Rs 1,10,000 in Nuh. These assessments will give increases over the present assessment of 14 per cent. in Firozpur and 10 per cent. in Nuh.

20. The rates I have proposed for the fixed assessment on *nahri* lands leave a margin of 12 annas in both tahsils on the half net assets rate on *nahri* land. The Settlement Commissioner, following Mr. Dome, proposes that this margin of profit should be assessed by having, in addition to the fixed assessment, a fluctuating canal advantage land revenue rate, differentiated from village to village, and averaging 8 annas per acre in Firozpur and 11 annas in Nuh (as against 12 annas in Palwal). The Settlement Officer says that, notwithstanding the cash <sup>195</sup> canal irrigation is not so good in

## TABLE OF CONTENTS.

Para.	Subject	Page.
<b>PART I.—PRELIMINARY.</b>		
<b>CHAPTER I—PHYSICAL DESCRIPTION</b>		
1	Area and boundaries	1
2	Physical features	1b
3	Streams	1b
4	Drainage facilities	2
5	Antiquities and relics	4
6	Climate	5
7	Vegetation	6
8	Soil	1b
<b>CHAPTER II—GENERAL STATISTICS</b>		
9	Area	7
10	Climate	8
11	Irrigation	9
	{(a) Wells	11
	{(b) Canal Irrigation	13
12	Cultivation	1b
13	Population	14
14	Temples and idols	15
15	Trade fairs	16
16	Manufacture	17
17	Estimated average income	17
<b>CHAPTER III—CROP STATISTICS</b>		
18	Principal crops	18
19	Minor crops	1b
20	Percentage of principal crops grown	20
21	The system of cultivation	1b
22	Classification of crops	1b
<b>CHAPTER IV—RENTS AND TENANCIES</b>		
23	Cultivating occupancy	24
24	Kind rents	1b
25	Cash rents	25
<b>CHAPTER V—HALF-NET-ASSETS BASED ON BATAI</b>		
26	Character of the selected harvests	28
27	Crop entries	29
28	Yields	30
29	Priests	32
30	Price	33
31	Todder crops	1b
32	Menials' dues and hired labour	1b
33	Repairs to wells	1b
34	Failed area allowances	1b
35	Landlord's share of the produce	1b
<b>CHAPTER VI—HALF-NET-ASSETS BASED ON CASH RENTS</b>		
36	Deductions and half net-assets rates	25
<b>PART II.—FISCAL AND MISCELLANEOUS.</b>		
<b>CHAPTER I—FISCAL HISTORY.</b>		
37	First Regular Settlement	37
38	Second Regular Settlement	1b
<b>CHAPTER II—MISCELLANEOUS</b>		
39	Consumption of food	40

## PART III.

## CHAPTER I.—THE ASSESSMENT.

39	Summary of statistics	...	..	...	..	..	42
40	The Taoru circle	..	...	...	.	..	ib
41	The Dabar circle	...	...	.	...	.	44
42	The Bangar circle	..	..	..	.	..	47
43	Total proposed assessment	.	.	..	.	..	49
44	Comparison between the old and new methods of assessing abi land					...	ib.

## CHAPTER II — MISCELLANEOUS

45	Protective leases	.	...	...	.	...	57
46	Rules for wells falling out of use	...	..	...	...	...	ib
47	Rules for canal villages	...	..	...	.	...	ib
48	Rules for abi land	..	...	..	...	...	ib.
49	Term of settlement and date of imposition of new demand				...	..	52
50	Cesses	...	..		...	..	ib
51	Points on which orders are required			..	...	..	ib
	Glossary of vernacular terms	...	..	..	..	..	53
	Map	.	...	.	.	.	End of Report.

FROM

B. T. GIBSON, Esquire, B.A., I.C.S.,

*Settlement Officer, Gurgaon District,*

To

MAJOR F. POPIHAM YOUNG C.I.E.,

*Settlement Commissioner, Punjab, Lahore**Dated GURGAON, 8th October 1907*

SIR,

I have the honour to forward the Assessment Report of the Nuh Tahsil written by M. Boughhey Assistant Settlement Officer

2 There is a close resemblance between the Nuh and Ferozpur Tahsils, and the Ferozpur Assessment Report, which has already gone to the Press, should be read with this. In both the proprietary body consists almost exclusively of Meos who are pressing heavily on the soil and are extremely poor. There is nothing in the Nuh Tahsil, which corresponds to the fertile valley of the Landoh, but on the other hand the population is correspondingly less dense, and the percentage of mortgages is not so large. The Bangars of the two tahsils are almost identical, the only difference being that the nahri of the Nuh Bangar is markedly superior to that of Ferozpur. The Dahar Circle of Nuh resembles but is superior to the Chiknot Circle of Ferozpur, while the Taora and Bhuder Circles correspond remarkably closely in the lightness of their barani soil, the regularity with which the wells are used, and in the consequent security of the cropping and prosperity of the proprietary body. I compare below for facility of reference the proposed rates in the circles above mentioned —

1	2	3	4	5	6	7	8
Circle	Pakka Chahi	Nahri	Abi	Dahri	Barani	Bhur	Total cultivation
	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p
Taora	2 1 0		1 4 0	1 4 0	0 15 0	0 8 6	1 0 5
Bhuder	2 4 0		2 2 0	2 2 0	1 7 0	0 11 6	1 2 4
Dahar	1 7 0		1 7 0	1 7 0	1 3 6	0 10 0	1 3 9
Chiknot	1 8 0		1 12 0	1 8 0	1 2 0	0 8 0	1 2 1
Bangar	1 8 0	1 11 0	1 3 6	1 3 6	1 3 6	0 10 0	1 5 0
Do	1 9 0	1 9 0		1 9 0	1 4 0	0 10 0	1 4 8

In the two last pairs of circles the rates correspond very closely. In the first pair the chain rate is the same but the barani of the Taora Circle lacks the fertility of the corresponding Bhuder soil.

3 In view of the orders recently passed on the subject of Assessment Reports written by Assistant Settlement Officers, it is perhaps unnecessary for me to add that I am in entire agreement with Mr Boughhey's proposals, which appear to me moderate and at the same time suitable and fair both to Government and the people.

I have the honour to be,

Sir,

Your most obedient servant,

B. T. GIBSON,  
*Settlement Officer.*

ASSESSMENT REPORT  
OF THE  
NUH TAHSIL  
OF THE  
GURGAON DISTRICT

PART I.—PRELIMINARY.

CHAPTER I.—PHYSICAL DESCRIPTION.

1. The Nuh Tahsil is an irregularly shaped tract divided into two separate

*Areas and boundaries.*

portions by a chain of hills running roughly North-West and South-East To the east of the hills is a parallelogram bounded on its remaining sides by three tahsils of the Gurgaon District, Firozpur on the south, Palwal on the east, and Gurgaon on the north. On the west of the hills is a projection extending from the north half way down the total length of the tahsil, and bounded on the north and north-west by the Gurgaon and Rewari Tahsils, and after that by the Alwar State. Thus the hills separate the Gurgaon District from Alwar State from the south as far as the point where the projecting table land of Taoru begins, nowhere else does the tahsil adjoin outside territory.

2. The physical characteristics of the tract may all be traced to the above-

*Physical features*

mentioned line of hills, that form part of the great Aravalli range, and extend a long way beyond the limits of this tahsil both north and south. As Mr. Channing points out there are traces of another similar line slightly more to the east, which, though only visible at one or two places within the tahsil, is nevertheless important because it appears just north of the Nuh Tahsil, and forms the eastern side of the Bundsi valley, which is the source of a great deal of the drainage of the tahsil. The hills themselves are about 250 or 350 feet high, and are absolutely devoid of vegetation. As a grazing ground for goats and cattle they help to supply a much felt want, but their utility in this respect is more than counterbalanced by their forming a haunt for herds of chunkara and wild pig which do immense damage to the neighbouring crops. Their effect on soils and drainage will be dealt with under those heads, and I shall only here notice that they have a distinct climatic influence. The villages at their feet suffer severely from heat especially those on the eastern side, while during the rains the tract is devastated by fever.

3. The only streams which have any effect on the tahsil now are the

*Streams*

Mandwara and the Birond. These are the two channels by which flood water enters the tahsil. They are merely torrents which flow after heavy rain, and carry off the drainage of the hills. Both have their rise in the Bundsi valley, and entering the tahsil from the north unite near the village of Kalhaka in front of the Khalpur Bund. The rest of the flooding is due to insignificant torrents to which no name has been given. The Indori Nadi passes through the Taoru Circle on its way to join the Sahibi in the Rewari Tahsil. It has no importance as an irrigation stream, though a certain amount of precarious cultivation is done in the dry bed of the stream. Formerly there was some dahri land in one or two villages in the Taoru Circle, but a bund constructed in Alwar, where the Indori rises, has put a stop to this. A similar complaint is made—I do not know with what truth—as regards the Landoha. This stream reaches the Nuh Tahsil after passing through Firozpur, and its only effect here is in connection with the

Kotila Bund, which used to hold up a ~~great~~ deal of water, but of late years has ceased to give any flooding at all.

4. The drainage of the táhsil is its most striking feature. A short account was given by Mr. Channing in Section 5 of the Settlement Report, and

Drainage and bunds

there is a description of the various drainage works in Section 32 of the Nuh Report. The Dahar Circle forms the natural receptacle of all the neighbouring drainage. The slope of the ground from north, south, and east is all towards the lowlying land at the foot of the hills, and the drainage from these hills for a very considerable distance used to converge into the three depressions known as the Khalilpur, Chandeni, and Kotila Jhils; the latter being actually the lowest point in the whole district. From the Bundsi valley a vast amount of water used to flow down in the Mandwara and Birond streams. These fell into the Khalilpur Jhil, flooding a great deal of country on the way. The Chandeni Jhil, which lies quite close to the hills, was fed from several sources. In the first place the torrents from the adjacent hills naturally flowed almost directly into the jhil. Then floods from the hills above Sohna, after passing through the sandy villages that lie to the east of the main road between Nuh and Sohna, crossed the road near Kanwarsika and Rawasan, and joined the jhil flooding the lands of Kherh-Kankar on the way. Finally the drainage from the Delhi side of the Bundsi valley hills, which entered the táhsil more to the east than the Mandwara and the Birond, and thus escaped the Khalilpur Jhil, came down the slope from the east towards the hills. The Kotila Jhil was fed principally from the south by the waters of the Landoha and other streams, which, after passing through the Firozpur Táhsil, entered the Nuh Táhsil close to the jhil. As in the case of the Chandeni Jhil the surrounding hills helped to swell the waters of the Kotila Jhil, while occasionally an overflow from the Chandeni Jhil would escape along the lowlying land near the hills. The result of all this flooding was that practically the whole of the Dahar Circle was under water in the rainy season, and extensive remissions for submersion were regularly granted. The idea of controlling the drainage by artificial works was early put into practice. A large bund, known as the Kotila Bund, was built south of the Kotila Jhil to divert water from it. Originally it was intended by Sir Henry (then Lieutenant) Durand to be more a canal than a bund, but long before last settlement the necessity of giving adequate protection to the jhil had been noticed, and though a channel was maintained on the outside of the bund in order to flood the lands near Sangel and Ujna, the main object was to protect the jhil from submersion. Apart from this the only drainage work existing at last settlement was the Chandeni Cut, the object of which was to carry off the surplus waters of that jhil to Ujna. Mr. Channing notes that it was hardly large enough, and undoubtedly it was not able to drain the jhil properly, but its chief use was that it joined the Kotila Bund, and prevented the water previously diverted there from flowing round the end of the bund into the Kotila Jhil. Both these works were in the hands of the Canal Department, and, though classed as dahri, the lands irrigated from them were assessed at barani rates, the canal authorities levying an owners' and occupiers' rate amounting to Re 0-9-6 per acre. Shortly after last settlement these works were handed over to the district authorities, and the question of the drainage of the whole district was undertaken on somewhat different lines. The object of the Canal Department had been to get rid of superfluous water along channels, and if necessary pass it on to other districts, irrespective of the question whether it was wanted there or not. Mr. Maconachie in his printed report on the Gurgaon Bunds urges that this is a very wasteful practice, his theory being that every Deputy Commissioner ought to utilise all the water he possibly can, and only pass on such of the drainage as cannot be converted to irrigation within the limits of his own district. With this idea he initiated a scheme of bunds on a large scale, and naturally the drainage of the Nuh Táhsil forms a great part of their objective. The end in view was not to interfere with the useful flooding, but to drain the three jhils, and save the villages that were liable to submersion. Great stress was laid on the importance of controlling the water supply close to the source as this admits of a larger area being irrigated, besides raising the water level of the surrounding country. The consequence is that the Nuh Táhsil, which for the most part lies at a distance from the source of the streams, is affected by irrigation works situated outside

the tahsil itself, the object of which is to hold up the waters and prevent them—wholly or in part—from entering the tahsil as they used to do. With these I am not concerned in this report, and I therefore proceed to discuss the means taken to deal with the diminished water supply that is now permitted to enter the tahsil. The Khalipur Jhil was protected by a single bund bearing that name. This extends in a curve along the west side of the old jhil and diverts all the water that used to flow into the jhil, until it is absolutely held up by the Qutabgarh Bund. A sluice permits of water being let into the basin if required, and this is perhaps capable of some development. No real flooding is done on the inside of the bund, as the waters are merely guided past the dangerous part, and allowed to continue their course round the end of the bund. The map of the bunds will serve to illustrate the position. This is sufficient for the Khalipur Jhil, but the floods thus diverted would if left to themselves go to swell the Chanderni Jhil. To prevent this a bund was built at Qutabgarh, which directly faces the course of the floods. Water is only let through in sufficient quantities for actual irrigation in the villages of Qutabgarh and Maulawas. A sluice was made higher up with the object of letting water into Ghasera, the lands of which have been almost entirely deprived of flood water by these means, but there is hardly ever enough water to reach as far along the bund as this. Between the Khalipur and Qutabgarh Bunds the floods irrigate a large area of country. At the village of Chappera, which under the new system was liable to get too much water, a cut takes off, which passes by Aldonki and leads to the small Dorainchi Bund. In order to still further protect Chappera a mud rampart has been erected round the abadi. As a matter of fact these subsidiary works are rarely required. Only once since the construction of the bunds has Chappera been in danger of flooding, and even then the amount of water that was carried down to the Dorainchi Bund was apparently very small.

Turning to the Chanderni Jhil the most important works affecting this part of the drainage are situated outside the tahsil. The Sohna Bund holds up all the water that used to come down from there, though a large sluice is occasionally opened, which admits of a certain amount of flooding. This, however, is usually done in the interests of the Sohna people and more often than not damages the crops of the Nuh villages. The water may reach as far as Kherli Kankar, but never beyond that point, so it can hardly be said to affect the Chanderni Jhil now. The latter besides being protected from the Sohna floods is saved by the Qutabgarh Bund from any danger of overflow from the east. The only waters that enter it now come from the hills in the immediate vicinity. In the middle of the old jhil is a bund running east and west. This saves the Chanderni lands from excess flooding, as otherwise the surplus water from the northern half of the old jhil would flow down into the southern half. As it is, a small portion is liable to submersion though not to any serious extent. All this area has benefited most enormously by the drainage system. The land is the best in the tahsil, and the crops of wheat and gochni grown there in a fair year are wonderful. The present water supply is amply sufficient, and almost all danger of submersion has been avoided.

The last of the three jhils was the largest and most important of all. As previously pointed out the Kotla Bund has for a very long time cut off the floods from the Ferozpur Tahsil, and after the Chanderni Cut was extended so as to form an embankment that joined the Kotla Bund, the only way for those floods to enter the jhil was by passing over the bund. This used to occur fairly frequently, and Mr. Channing in his report noted the fact and proposed that the Canal Department should charge abiana whenever it occurred. However for the last ten years no water has been carried along the Kotla Bund channel, and for very much longer than that no floods have passed over the bund. Besides this dam there is no other drainage work of any importance that was built with the avowed object of draining this jhil, but there can be no doubt that the draining of the other two jhils has had the result of diminishing the water supply of the Kotla Jhil also. Surplus water from the Chanderni Jhil used to pass on towards Kotla, but a good deal was utilised on the way, and the small irrigation cuts made for this purpose can still be seen between Nuh and the Chak Jhil lands. Apart from this, however, the area enclosed by the Kotla Bund and Chanderni Cut is very large, and as the slope is all towards the jhil a good deal of water used to accumulate there in the days when the Dajpur Circle was almost entirely inundated.

But, as in the case of the Chandeni 399 the only water supply now for the jhil is from the hills in the immediate neighbourhood, and indeed these two jhils are now very similarly situated. The only difference is that the soil of the Kotla Jhil is harder and more black, while the slope from the hills is more pronounced, so that the floods enter the jhil area with more violence than is the case in Chandeni. Finally the Chandeni floods are spread over a larger area, the various channels by which the water comes down from the hills being somewhat further apart. Thus in every way the Chak Jhil tract is the more insecure: owing to the hardness of its soil it requires more flooding, and yet its standing crops are more liable to be damaged when there is a late fall of rain.

Three small bunds have been built within the Chak Jhil area, of which only the Akhara Bund is of any importance. The detailed statement attached to paragraph 44 shows that on the whole it has been fairly profitable. It holds up a little water which flows down the slope from east to west. All the irrigation is on the upper or eastern side, and no sluice was considered necessary. The Palla and Palri Bunds serve no useful purpose and might be handed over to the zamindars to keep up if they wish.

This completes the account of the drainage of the Dahar Circle. In Taoru several dams have been built, but the problem was very different. The circle is almost surrounded by hills, but the level being very much higher than that of the Dahar Circle the volume of water to be dealt with was much less, and there was no drainage question, the object being to utilise the water of the various torrents, which owing to the sandy character of the tract ate into the ground and did great damage by carving out deep nullahs. Eventually the floods spread over a certain amount of country, but being uncontrolled did more harm than good. The first two bunds I will describe are known as the Taoru-Bahora road and Taoru Bunds respectively. Their object was to hold up the floods which previously spoilt some very good land north of Taoru. The Taoru-Bahora road runs north and south, while the Taoru Bund takes off from it at a point about half mile north of Taoru and runs in a westerly direction. By these means the floods from the east and south have been held up and two blocks of land have been most successfully irrigated. The land to the east of the Taoru-Bahora Bund usually grows a good flooded crop. The old channel bed has silted up and is now almost level with the surrounding fields to a distance of about 300 yards from the road. At a point about  $1\frac{1}{2}$  miles north of Taoru a sluice has been built to let off the surplus water which thus passes under the road and floods land on the west. At present this sluice is very badly placed and the only result of its use is to spoil some good well land. The district authorities have been addressed on this point, and I believe the question of altering its position is under consideration. The Taoru Bund has no sluice, but all the irrigation to the south is good and the abri land is most valuable. The Dhulawat Bund holds up water from the hills close to the village from which it takes its name. More water is held up than is required and the people are very anxious to have a sluice built in order to allow surplus water to be let off. This would not give any further irrigation as the land on the far side of the bund is unculturable, but the water could be let off into the old nullah bed and might be utilised lower down. At present the land under the bund is very liable to submersion and many good crops have been spoilt in this way. The Raheri bund irrigates about 50 acres, though in a good year over 100 acres have paid abiana. Here again there is no sluice, all the water being required for flooding inside the bund, and as a rule the results are most successful. These two bunds are situated close together east of Taoru, but the Raheri Bund gets much less water and there is no danger of submersion. Further north lies the Sabras Bund. This again deals with local drainage from the neighbouring hills, but it is not quite so successful as the others, as a good deal of damage is done. The people are anxious to have a few alterations made and I think the district authorities would be wise to get an expert to listen to what they have to say, and decide whether the proposed alterations are likely to make a real improvement.

5. Mr. Channing divided the tahsil into three assessment circles, which have been retained unaltered. To the

west lies the Taoru Circle, a high table land almost surrounded by hills and completely cut off from the rest of the tahsil, which it does not resemble 42 any way. The soil is sandy, and the

chief crop is the kharif when almost the whole circle is sown with the autumn cereals and pulses, and a little inferior cotton. In the spring they have to rely upon irrigation, and water being plentiful and sweet there is a regular system of well cultivation. On the east of the hills is the lowlying Dahar Circle, which receives the drainage of all the neighbourhood. Its chief characteristic is the flooding from which it derives its name. The soil just under the hills is light, but for the most part it is very heavy clay, which contains a lot of kallar and consequently requires a thorough soaking with rain water before it can produce anything. The wells being salt are merely used as a protection against total loss from drought, as the action of the water is most injurious to the soil. Further east lies the Bangar upland forming part of the large loam plain extending from the Ballabgarh Tahsil of the Delhi District to the Kosi Tahsil of the Muttra District, and including the Palwal Tahsil, to which it bears a strong resemblance. The eastern portion is irrigated by the Agra Canal, but the remainder is very badly off for irrigation. The soil is rather hot and dry hardly varying at all throughout the circle. Here too the wells being salt are little used, the great crop being unirrigated barley and gram in the spring harvest. When there is a good monsoon followed by winter rains at fairly frequent intervals a wonderful harvest of wheat, barley and gram is obtained.

Soils

6 The classes of soil recorded at last settlement were—

*Chahi* —Land irrigated from wells*Dahri* —Land which received the drainage from hills or higher lying land.*Chiknot* —Hard clay soil.*Narmot*. —Hard loam soil.*Magda* —Light loam soil.*Bhur* —Sandy soil.

Within the classes of *chahi* and *dahri* there was a further classification by soils, so that we have *chiknot dahri*, *narmot chahi*, etc. There was also a class *labil abpashi*, in which was put land which was within the area served by a well, but was not irrigated in the year of measurement, and also land irrigable by wells not in use in the year of measurement.

The classification of soils now adopted is the same as the above, except that in irrigated lands no soil distinctions have been retained, while the definition of *chahi* has been altered. Two additional classes have been introduced, viz, *nahri* for canal irrigated lands, and *abi* for land irrigated from artificial embankments.

The following definitions appear in Mr. Hamilton's Preliminary Report on Soils, Assessment Circles, and Prices, and have been sanctioned for the present settlement :—

*Chahi* —All land regularly irrigated from a well whether the well is constructed of masonry or not, and whether it is worked by bullocks or by lift (*dhenkh*). Land will be regarded as regularly irrigated if it has received water in two different years in the period 1898-99 to 1902-03, provided the means of irrigation are still in existence.

*Nahri* —All land regularly irrigated from the Agra Canal. Land will be regarded as regularly irrigated if it has received canal water in any two years from 1898-99 to 1902-03, or is irrigated at the time of measurement.

*Chahi-nahri* —All land which is regularly irrigated both from the canal and from a well, whether the canal and well are used in the same harvest or not. All land which has been irrigated from the canal in two years out of the five years 1898-99 to 1902-03 and has also been irrigated from a well in the same five years will be regarded as *chahi-nahri*.

*Abi*.—All land which is irrigated from tanks, *jhils*, springs, or from river branches, or by District Board bunds. Both the land flooded by water held up within the bund, and also the lands irrigated by cuts from the bund will be included.

The definitions of the unirrigated soils have not been changed. The definition of *chahi* has been altered, and this accounts to some extent for the difference in the area recorded now. The *nahri* classification is quite new, but neither this nor the *chahi-nahri* definition require comment.

7. The question of flooded lands forms one of the chief problems of the Nuh Tahsil. Mr. Channing experienced

flooded lands.

a similar difficulty, and he notes that he

made a point of looking into this question himself in every village. In spite of this Mr. Wilson three years later was of opinion that the flooded area had been over-estimated, and there seems no doubt that this was true. Mr. Channing, from the statistics which he accepted, had an erroneous idea of the rainfall of the tract, and appears to have based his estimate of the floods on the results of exceptionally good years. But in any case the flooded area would now be much smaller than it was then. In the paragraph on drainage I have shown that since last settlement a great deal of the water supply has been cut off outside the tahsil. On the other hand the protection of the three swamps where water used to collect has placed a larger supply at our disposal for irrigation purposes. There is practically no difference between the figures for dahri at last settlement and those for dahri and abi now in the Dehar Circle, but these figures are not final, and it is probable that the difference will be greater when all the estates have been inspected. My own experience has been that the flooded area has again been often over-estimated. In places there was a tendency to accept all the settlement entries as correct, land which was shown as dahri in our papers was retained as flooded land in spite of altered conditions. For instance, both the Kotla Bund channel and the Chandani Cut used to convey water over a large portion of the Ujina flats. Owing to the various bunds this has been entirely altered, the Chandani Cut has not carried water for many years and the same is true of the Kotla Bund channel. Moreover, as I have elsewhere stated, it is likely that this area was liberally estimated on purpose because the land paid a barani assessment and water rates. In spite of this the settlement entries had been accepted as they stood, and there is reason to suppose that the same kind of thing will be found elsewhere. However the entries are being constantly re-checked in the light of recent experience and by the time that all estates have been inspected, the question will have been gone into most thoroughly. The difficulties have of course been greatly increased by the abnormally dry seasons which have been experienced of late years, as until 1906 there had been no opportunity of testing the correctness of the entries. Fortunately the monsoon in that year was average, and the patwaris were ordered to mark on their maps the area affected by flooding at the time when such flooding occurred. In order to further test the accuracy of these maps I had a rough crop register prepared for the Dahar Circle showing the crops grown on land alleged to have been benefited by flooding. The result shows that 71 per cent of the area was under wheat or gochni, 14 per cent under bejhar, the rest being miscellaneous crops. Bejhar is practically never grown on land that has received a real soaking, and it may safely be assumed that none of the 14 per cent under bejhar received any advantage from flooding. Of the miscellaneous crops not more than 8 per cent are flooded crops, the remainder being sarson and tara which are not grown on any but barani lands. This shows that about 80 per cent of the land said to have been flooded in 1906 was really advantaged. As it is proposed to put a fixed assessment on abi and dahri lands it is essential only to include in the definition such lands as possess a real advantage. I doubt if this has been done at present, and in dealing with the assessment of the Dahar Circle I shall again refer to this important question.

The classification of unirrigated soils made at last settlement has been very little altered, except where the disturbing elements noted above have come into play. In the Taoru Circle most of the soil has been recorded as magda and only the very sandy blocks are entered as bhur, but the difference is not great. The generally uniform character of the soil in the various circles has simplified this part of the work, and very few alterations have been found necessary.

8. Statement I gives details of the rainfall for 20 years from 1885-86 to 1905-06. There are three rain-gauges

Rainfall.

in the tahsil, and the average of all

three has been taken. The year is divided into two periods, *viz.*, the four months of monsoon rain and the rest of the year. The previous figures are compared with those now obtained in the following statement:—

(The figures of the adjoining tahsil of Alwar State are added for reference)

Average rainfall as given in Section 7, Gurgaon Settlement Report	82.0
Average rainfall as given in Section 7, Nuh Report	28.2
Average rainfall of 18 years in the Revision Report, Section 2	24.0
Average rainfall Thara Tahsil Alwar (1876—1898) ..	22.07
Statement I { Rain Registers	23.03
{ Gazette Average	23.33

In Section 2 of the Revision Report Mr. Wilson points out that the figures given by Mr Channing do not represent a true average being the result of a few exceptionally wet years. In a district where the variations are so great any attempt to deduce an average from a few years is extremely dangerous. The present statement shows a maximum of 43.06 inches in 1885-86 and a minimum of 11.88 inches in 1905-06. It will be noticed that the present average is slightly below Mr Wilson's, but the gazette returns on which he based his calculations were admittedly in excess of a true average. The difference is in any case slight, and seems to dispose of the theory prevalent among the people that the rainfall has been diminishing. But there can be no doubt that in the Dahar Circle 23 inches of rain do not mean so much as they did before the floods were held up or diverted by bunds. When Mr. Channing wrote his report a normal monsoon rainfall meant that a very large area was thoroughly soaked, and even allowing for loss by submersion the harvests were generally good. The result of interfering with these natural floods as far as this circle is concerned has been to make the distribution of rainfall far more important than it was before. Most of the soil is heavy (some of it being extremely stiff clay), and as it does not get soaked to the same extent now, frequent rain is absolutely necessary.

The area under crops is larger in the autumn than in the spring harvest but the latter entirely consists of valuable crops capable of yielding a high outturn. For the former about 17 inches of rain are required during the four months, less than 14 inches may be said to result in total failure, while the average rainfall of 23 inches should be sufficient to ensure a fairly good crop. The statement shows how abnormal the last few years have been. In the 20 years there have been 9 falls of less than 17 inches, 5 of which have occurred in the last eight years. For the spring crop no similar estimate of the amount of rainfall required can be made, as proper distribution means much more than actual amount. Rain is required at least every 6 weeks and a very heavy fall late in the season is certain to damage the gram and submerge a large area of lowlying crops.

The sandy circle of Taoru can do with considerably less rain than is required in the rest of the tahsil. Its principal harvest is the kharif, and as the monsoon rarely fails altogether there is usually some sort of a crop. Moreover the circle is particularly hardy and the variation in rainfall has a very much slighter effect.

## CHAPTER II.—GENERAL STATISTICS

9. The following table compares the areas of the past and present Settlements. Before Mr Channing's Settlement the villages now included in the

Area. Nuh Tahsil were distributed over various parganas which were merged into the tahsils of Gurgaon, Palwal, and Nuh, making any comparison of area impossible —

1	2	3			4		5
		PERCENTAGE ON TOTAL AREA OF					
		Total area in acres.	Unculturable.	Uncultivated	Cultivated		
Last Settlement	257,680	18	6	81			
	257,406	12	6	82			
Now							

403

Cultivation had practically reached its limit at last settlement, and there is very little difference between the two sets of figures. No further extension is possible without encroaching on the grazing area, which is already too small. Fortunately a good deal of the unculturable area consists of hills where some grazing is obtained, but the remainder is salt land which hardly produces anything beyond a few karil bushes. The present area is distributed by circles as follows :—

1	2	3	4	5
Heading.	Taoru.	Dahar.	Bangar.	Total.
Unculturable .. ...	22	14	5	12
Culturable .. ..	3	7	6	6
Cultivated ... ..	75	79	89	82

The above figures do not require much explanation. The large unculturable area in the Taoru Circle is all hill land, and this explains why the culturable area is so small, there being less necessity to set aside land for grazing. Similarly the difference between the Dahar and Bangar Circles is almost entirely due to the hill area possessed by the former, though possibly there is also slightly more salt land. The culturable area in each circle is terribly small.

10. The areas of each class on soil at last settlement and now are compared in the following statement :—

1	2	3	4	5	6	7	8	9
Soil.	TAORU		DAHAR		BANGAR.		TOTAL TAHSIL.	
	Settle-ment	Now.	Settle-ment	Now	Settle-ment	Now.	Settle-ment	Now.
Chahi ... ..	9 34	13 08	3 38	3 63	5 04	5 61	5 23	6 30
Nahri ... ..	...	..	..	..	...	26 71	...	11 06
Abi ... ..	...	2 65	...	8 08	...	1 10	...	4 13
Dabri ... ..	2 18	1 45	37 68	29 23	07	08	15 17	11 71
Chiknot ... ..	...	..	1 43	2 23	2 54	1 50	1 61	1 49
Narmot ... ..	1 99	1 89	36 62	36 06	72 39	46 68	44 71	33 76
Magda ... ..	64 91	61 63	10 05	10 41	11 36	10 37	21 28	20 43
Bhur ... ..	21 58	19 30	10 84	10 36	8 60	7 91	12 60	11 10

The large increase in the chahi area is due in great measure to the different classification now adopted.

The new nahri classification needs no comment but it explains the alteration in the narmot area in the Bangar Circle. The classification of land as abi is also new. Taken in conjunction with the dabri the figures are very interesting. In the Taoru Circle where the bunds have been most useful the total flooded area shows a decided advance on the settlement figures. In the Dahar Circle the total is exactly the same, but this result has largely been obtained by blindly following the settlement classification in spite of altered conditions, and I have elsewhere stated my reasons for thinking that the total flooded area now is smaller than it used to be. The unrigged soils were most carefully classified at last settlement, and practically no alterations have been made. As the final attestation of many villages remains to be done the above distribution is liable to alterations.

The increase of cultivation by circles is as follows :—

Taoru	..	..	..	..	..	..	..	1 4
Dahar	...	...	...	...	...	...	...	6
Bangar	...	...	...	...	...	...	...	6
Total Tahsil	...	...	...	...	...	...	...	75

11. In this tahsil well irrigation is for the most part protective only. The chief crops are the valuable spring crops grown on unirrigated land and the wells are used as little as possible. There are several reasons for this. First and foremost is the saltiness of the water. Even if there is rain at sowing time the heavy clay and loam soils are injuriously affected by the use of salt water. There is moreover a great tendency to saltiness in the soil, and this is intensified by irrigation with salt or brackish water. As this will be dealt with more fully in the chapter on the system of cultivation, it is sufficient here to note that though the wells are practically not used at all in the autumn, and as little as possible in the spring, the protection afforded by them is most valuable, as in dry years the unirrigated crop is a total failure. The above remarks do not apply to the Taoru Circle where the wells are in regular use for the same reasons as in the Rewari Tahsil.

The data relating to the wells of each circle are given in Statement III. Kachcha wells are only popular in the Taoru Circle, and it is curious to notice that this popularity is of very recent growth. The reason appears to be that there are now enough masonry wells to ensure a fair amount of stable irrigation, and it has been found profitable to dig rough kachcha wells, which here cost only about Rs 10, and often not as much as that, and last from 2 to 10 years. In the other circles the saltiness of the water and the system of irrigation referred to above, render kachcha wells useless. The cost of a masonry well varies with the size and length of the cylinder. The result of my inquiries has been to show that an average well costs Rs 20 per hath (i.e.  $1\frac{1}{2}$  feet) to construct. This assumes that the work is done by the zamindar himself with the help of a mason and not given out on contract. In the latter case the cost is much more. On the above assumption the cost works out as follows —

	Rs
Taoru	750
Bangar	450
Dahar	

A good masonry well lasts for 200 or 300 years, but there is a tendency to leave repairs rather too long, and I should put the life of a well at not more than 150 or 200 years.

Another class of well is found sometimes in the Dahar and Bangar Circles known locally as Kuriand. These are roughly made with stones put together without the help of mortar above the water level. They are not very successful as they cost about half as much as a proper masonry well and do not last nearly so long. Lastly there is the dhenkli, consisting of a shallow hole in the ground from which water is lifted by a wooden lever. A few are in regular use by mahis for growing vegetables and other valuable garden produce, but as a rule they are used in dry years only. Water must be very close to the surface to make the dhenkli profitable, and the three places where they are to be seen working in great numbers in a dry year are the Kotila and Chandeni Jhils, and the lowlying flats near Ujina. The dhenkli is always dug by the user himself, and the only cost is about Re 1 or Rs 2 for the wood lever, which will last for a fairly long time.

The average area irrigable per lao in each circle is shown in columns 36 and 37 of Statement III. It is largest in the Taoru Circle where irrigation is regular, though 4 acres is a very low average. The reason, I think, is that near the hills the wells are deep and hard to work, and consequently irrigation is small. In the fertile villages in the middle of the circle the irrigation is distinctly higher, and I was not prepared for such a low figure. In the Dahar and Bangar Circles the small average irrigation is due to the peculiar circumstances which have been already noticed. The figures are however somewhat misleading, as there are many two lao wells on which both laos are never worked together, because the result would be to work down to the salt source and ruin the well. Such wells have to be shown as two lao wells but naturally the irrigation, which would be small for a single lao, is ridiculously

inadequate for two. Moreover even when this is not the case it is very common to find that a well is not being used to the full capacity of the working laos because it is not spring-fed, and if overworked is liable to run dry. This to a certain extent vitiates the resulting averages, but on the other hand it shows how limited the action of the wells necessarily is in those circles. As regards the character of the water it may be said that generally water in the Taoru Circle is sweet, and in the other circles either salt or brackish. This is true of Taoru almost without exception as the statement shows. In the other two circles the proportion of salt and brackish wells would be very much higher, but for the fact that there are a number of wells the surface water of which is sweet but the source being salt, the character of the water changes after it has been worked for a short time. Most of these wells have been recorded as sweet. As a matter of fact, except just under the hills, I do not think any sweet wells exist in the Dahar Circle, and I doubt if there are any in the Bangar Circle either. For the cost of wood-work and the method of working the wells I would refer to paragraph 8 of the Rewari Report. The various prices given to me in answer to my inquiries were somewhat higher than those detailed for Rewari, but the recent famine has had a very serious effect on the Nuh Tahsil, and prices are admittedly inflated.

The increase or decrease per cent of wells capable of use, laos and irrigation in each circle is as follows:--

1 CIRCLE	2		3		4		5		6		7		8	
	WELLS IN USE				LAOS				IRRIGATION					
	Pakka.		Kachcha		Pakka		Kachcha		Pakka.		Kachcha		Total	
Taoru	+33		+242		+25		+160		+10		+75		+19	
Dahar	+164		+500		+26				+99		+71		+97	
Bangar	+102		+500		+30		-70		+56		+583		+58	
Total Tahsil	+78		+252		+27		+96		+38		+87		+42	

This shows a most satisfactory development in irrigation throughout the tahsil. The largest increase in masonry wells has been in the Bangar Circle. Considering that this circle alone has benefited by canal irrigation the development appears abnormal, but the area that is not served by the canal is very badly off. There is no flooding as in the Dahar Circle, and in a dry year there would be total failure except for the wells, moreover, as previously stated, the wells when sunk cannot be fully used. It is instructive to compare the protective power exercised by a well in the various circles. In the Dahar Circle it is terribly small. The chahi area per well is only 5 acres and the irrigation 2 acres. This includes a certain number of wells under the hills, where the water is good and the soil light, and where consequently irrigation is properly kept up. In the Bangar Circle a well protects between 9 and 10 acres and irrigates 4, while in the Taoru Circle between 8 and 9 acres are protected and over 5 acres irrigated. The figures in columns 3 and 18 show that the proportion of single laos wells is greatest in Taoru, so this difference is not due to any superiority in the size of the Taoru wells, but is a real illustration of the comparative effectiveness of irrigation in the various circles. The extraordinary figures for non-masonry wells in the Dahar and Bangar Circles may be neglected, the total number being 12 in each circle as against 2 at last settlement. The present irrigated area is the average of the 8 years from 1898-99 to 1905-06 and may be taken as accurately representing the average in the various circles. The settlement figures only give the area irrigated in the year of measurement. In a tahsil where the well irrigation varies so enormously with the rainfall the results of a single year are most unlikely to prove of any value, and this is shown by, comparing the result of

adding the two years of revision, and getting an average for three years as follows —

1	2	3
Circle	Settlement	Average of 3 years
Taora	2,480	2,717
Dahar	577	896
Bangar	1,406	1,542

This shows that the increase in irrigation is not so large as the figures seem to indicate, in fact as there happened to be really good rain in the year of measurement the figures are useless (as regards the Dahar and Bangar Circles) except to show how little the wells are required in a good year. The information required by Settlement Commissioner's Circular No 21 is given in the following statement —

1	2	3	4
Assessment circle	Number of masonry wells in use in the beginning of the expiring settlement which have fallen out of use during its term	Number of new masonry wells sunk during the term of the expiring settlement and still in use	Number of masonry wells which were not in use at the beginning of the expiring settlement but were repaired during its term and are still in use
Taora	10	74	33
Dahar	55	110	55
Bangar	24	107	61
Total Tahsil	89	291	149

The system of irrigation in vogue on the Agra Canal has been described in the Palwal Report (b) Canal irrigation. There are no important differences in the Nuh Tahsil. The cultivators are mostly Jats, the proportion of Meos being too small to affect the main results. The average area irrigated yearly for the selected years is 17,452 acres, or 75 per cent of the nabri area, which corresponds almost exactly with the Palwal figures. At last settlement irrigation from the Agra Canal was only just beginning, and Mr Channing did not levy any nabri assessment, nor did he give details by tahsils of the area irrigated. He notes however that in the year of measurement 23 Nuh villages took canal water in the autumn and 22 in the spring, the irrigation for the whole district being 41,275 acres in that year. Mr Wilson in his Revision Report gives more detailed figures, the entries for the Nuh Tahsil being as follows —

1	2	3
Number of villages in which irrigation takes place.	AREA IRRIGATED IN ACRES	
	1881-82	1882-83
25	9,974	12,145

The actual increase in irrigation is shown in the following table of the areas irrigated in each harvest since the introduction of irrigation in 1875:—

1						2	3	4
Year.						Kharif	Rabi	Total
1883-84	...	...	...	..	...	5,641	12,398	18,039
1884-85	...	...	...	..	...	7,181	5,896	13,077
1885-86	...	...	...	..	...	6,108	10,910	17,018
1886-87	...	...	...	..	...	2,192	7,354	9,546
1887-88	..	...	...	...	...	5,827	7,754	13,581
1888-89	..	...	...	...	...	4,717	9,728	14,445
1889-90	...	...	...	...	...	7,049	11,564	18,613
1890-91	...	...	...	.	.	4,735	10,468	15,203
1891-92	...	.	...	.	...	7,004	12,031	19,035
1892-93	...	.	.	...	..	4,934	5,705	10,639
1893-94	...	...	...	...	..	4,772	6,883	14,355
1894-95	.	.	.	...	...	7,778	4,955	12,733
1895-96	...	.	.	..	...	6,360	9,289	15,649
Average of 10 years						5,807	8,573	14,380
1896-97	..	...	...	..	...	9,141	15,259	24,400
1897-98	..	..	...	.	...	8,809	8,757	17,566
1898-99	...	.	...	..	...	7,242	10,320	17,562
1899-1900	...	..	...	...	...	8,780	11,214	19,994
1900-01	...	...	..	...	...	10,541	4,337	14,878
1901-02	...	...	.	.	...	7,739	11,511	19,250
1902-03	...	...	...	..	...	8,150	9,789	17,939
1903-04	...	...	..	.	...	8,333	9,327	17,660
1904-05	...	...	..	...	...	9,177	630	9,807
1905-06	...	..	..	...	...	6,003	11,695	17,698
Average of 10 years						8,391	9,284	17,675

The great variation in the figures is due to the fact that the amount of canal water taken varies with the rainfall, in a good year very little water is wanted, whereas in a dry season the cultivators will take all that they can get. Unfortunately this tahsil lies at the extreme edge of the area served by the canal and there is usually not enough water for their needs in a dry season. The ten years' averages indicate a steady increase in the irrigated area, and though to a certain extent the recent dry years are responsible for this, yet new distributaries have been opened, and the canal is generally popular.

The following statement has been made up from figures supplied by the Canal Department. It shows the area irrigated with the amount collected during the five years selected for the Produce Estimate

1	2	3	4	5	6
Year	AVERAGE AREA IRRIGATED IN ACRES			Occupier's rates	Owner's rates
	Flow	Left	Total		
1898-99	15,327	2,069	17,396	51,304	14,477
1900-01	12,089	2,366	14,455	41,445	13,842
1901-02	16,116	3,253	19,369	58,639	18,865
1902-03	14,359	2,800	17,159	50,991	16,351
1903-04	14,819	3,254	18,073	53,655	17,182
Total of the 5 years	72,710	13,742	86,452	2,56,034	80,217
Average of the 5 years	14,542	2,748	17,290	51,207	16,043

For purposes of reference I also append the table of the rates of canal dues now in force on the Agra Canal. The old and new rates are compared in

para. 8 (b) of the Palwal Report, where the whole question has been fully discussed.

1 Crops	2 Original	3 Revised	4		5	
			PROPOSED BY PUNJAB GOVERNMENT			
			Per acre		Per bigha	
	Rs a p	Rs a p	Rs a p		Rs a p	
Cauo	8 14 3	8 14 3	8 12 10		5 8 0	
Wheat, barley, and mixtures	4 0 0	5 5 4	5 3 3		3 4 0	
Gram and peas	4 0 0	2 10 8	2 12 10		1 12 0	
Cotton	4 0 0	2 10 8	2 12 10		1 12 0	

12 The main road from Gurgaon to Firozpur passes through this tahsil. From Gurgaon to Nuh it is already metalled, and the conversion of the remaining portion is now being undertaken as well as of the road from Nuh to Palwal. The latter is the more important of the two as far as this tahsil alone is concerned, as it links it up with the Agra-Delhi-Chord Railway, besides facilitating communication with the important market town of Palwal, which already receives most of the surplus cotton of the tahsil. The eastern portion of the tahsil has fairly easy communication with the town of Hodal, in the Palwal Tahsil, which is also on the Agra-Delhi-Chord Railway, and besides being a market town itself, lies close to the town of Kosi in the Muttra District. Thus the canal area is fairly accessible, and as the available surplus is largest there this is satisfactory. The Grand Trunk Road passes quite close to the eastern boundary of the tahsil, and is of great assistance in conveying produce to Hodal. Both Palwa land Hodal contain ginning mills, and there is consequently a ready demand of cotton. Within the tahsil itself the only market towns are Nuh, Hathin and Taoru. The latter is connected by a poor sandy road with the town of Rewari, but I cannot find that there is any trade along it, as the people seem to deal entirely with their local bannias, and the latter find a ready market for their stock within the tahsil itself.

13. The figures for live-stock are given in Statement IV. Comparing columns 2 and 6 there has been a decrease in every circle, and a deduction must be made from the present figures on account of bulls. The position is worst in the Dahar Circle, while in the Bangar Circle the numbers have remained almost stationary, and there has actually been a slight increase in the number of ploughs. But the introduction of canal irrigation has had a great effect upon the prosperity of the people, and the position is not as good as might have been expected. The present condition of the tahsil is undoubtedly bad, but I doubt whether it is comparatively so bad as the figures indicate. The Taoru settlement figures for instance seem to be obviously too high. Even with their present numbers the people have more than is actually necessary for cultivation and can afford to sell at neighbouring fairs. But more extraordinary still is the decrease of ploughs in Taoru. This would seem to indicate an amount of distress which is very far from being the case, and I can find no satisfactory explanation of it. I therefore prefer to take the present figures by themselves without paying much regard to any increase or decrease they may indicate, as I do not think that much reliance can be placed upon this. In the Taoru Circle then we have an average of slightly under 16 acres of cultivation to a pair of bullocks, after making allowance for bulls. On this light soil this is a very small duty per plough, and as might be expected, the people not only can afford to sell at neighbouring fairs but also lend to their poorer relatives in the Dahar Circle. In the latter place the shortage of plough cattle is terrible. Making allowance for bulls the average works out to 23½ acres to a pair of bullocks. On that heavy clay soil 12 acres would be by no means a low average, and the present figures are practically

twice as much. Moreover, the position now is if anything worse, as numbers of cattle died in 1905-06. The results are everywhere apparent. Land does not get nearly as much ploughing as it requires with the result that outturns suffer. Again, if a tendency to saltiness appears, a little care and frequent ploughing may do wonders, but nowadays such land is often given the same scanty attention with the result that one or two dry seasons are sufficient to cause very serious injury. The average for the Bangar Circle is the same as that for Taoru, 16 acres. This is about right for the class of soil, though in the canal tract a pair of bullocks probably do not work quite so much, as the land is very carefully prepared and the people can afford to keep as many as they require. The plough averages do not show any very great difference, 17, 24 and 16 acres being the averages for the three circles.

Turning to other animals, the number of cows is in all circles almost the same as that of bullocks. The proportion is lowest in the Bangar Circle where, however, many more cow-buffaloes are kept. The numbers of young stock are fair, though, as I remarked before, the present totals would probably be considerably lower. Taking the figures as they stand we may say that the numbers are quite sufficient having regard to the smallness of the grazing area. Sheep and goats are not usually kept by agricultural tribes. A certain amount of transport work is done by donkeys, but bullock-carts are generally used for this purpose, the number of camels being small.

14. The following table shows the totals of the general population at different periods:—

Population.						different periods:—	
1						2	3
Year.						Population.	Incidence per square mile.
1848	...	...	...	...	...	95,999	.
1868	.	...	...	..	...	1,41,407	.
1881	...	...	...	...	...	1,20,324	299
1883	...	..	...	.	..	1,15,870	288
1891	.	.	..	.	.	1,31,593	327
1901	...	...	...	...	...	1,45,931	362

Details by circles of the last three enumerations are given in Statement IV. The causes of the decrease in population between 1868 and 1883 are dealt with by Mr. Wilson in section 6 of his Revision Report. In the next 8 years an increase of 13 per cent is recorded, and the last census showed a further increase of 10 per cent. The present total is very little in excess of that recorded in 1868, but to appreciate the position correctly the details by circles must be examined. From them we see that the population in the Dahar Circle is still less than it was in 1881. This is the more astonishing as the drainage of the flooded lands has undoubtedly done much to improve the healthiness of the tract. Neither the soil nor the people appear able to make any headway against adverse conditions, and one or two bad years have an effect which only wears off very slowly. Most of the increase in population is in the Bangar Circle, though the Taoru figures are satisfactory.

The following places have been classed as towns:—

Taoru.	Ujna.
Nuh	Ghasera.
Malab	Hathn.

Excluding their population and cultivated areas the incidence of the rural population per square mile of cultivation is—

Taoru	...	...	...	...	...	...	...	465	
Dahar	...	...	...	...	...	...	...	309	
Bangar	...	...	...	...	...	...	...	417	
152									
Total								...	421

15. The usual form of tenure is imperfect *bhaiachara*, as the following statement shows :—

1				2	3	4	5	6
Circle.				ZAMINDARI		Pattidars.	Bhays, chora	Total.
				Landlords.	Communal.			
Taoru	...	...	..	..	1	28	55	84
Dahar	...	...	...	1	4	29	72	106
Bangar	...	...	...	..	8	24	72	99
Total Tahsil				...	1	6	199	289

Statement XI shows that 58 per cent of the cultivated area is in the hands of the owners, and the average area per owner and the size of proprietary and *khudkash* holdings is given below—

1				2	3	4	
Circle.				Average of proprietary holdings	Average area per owner	Average area of <i>khudkash</i> holdings	
							Taoru
Dahar	...	...	...	54	7	22	
Bangar	...	...	...	80	7	30	
Total Tahsil				...	70	8	27

There are very few large owners. One or two villages were auctioned for failure to pay land revenue, and elsewhere large properties have come into the hands of mortgagees, but as a rule the land is owned by small peasant farmers. Their position is infinitely worse now than it was at last settlement. Then cultivation had recently increased and there was very little debt. The figures in the above table are for all cultivation, but if we exclude the area in the hands of mortgagees and of tenants who cultivate at revenue rates we find that the average area free for profit per owner is as follows :—

Taoru	..	..	...	...	...	...	5.5
Dahar	...	...	...	...	...	...	4.3
Bangar	..	...	...	..	..	...	4.7
Total Tahsil							4.7

Thus in spite of the fact that population has not greatly increased, and in the Dahar Circle indeed has remained almost stationary, the farmer is distinctly worse off for land than he was then. Omitting the canal tract I have no hesitation in saying that there is a general poverty throughout the tahsil, and with such a small unencumbered area I see no prospect of amelioration unless a series of exceptionally good years should come. The area under cash rents may seem to show that at present the scarcity of land is not severely felt, but a great deal of the cash rent is on mortgaged land while the few large owners all take cash rents as a matter of course. But besides this there are two reasons which make the small owner ready to let out part of his holding. Except in the Taoru Circle land requires a great deal of ploughing and there are very few cattle with which to do it. To some extent, the farmer is often forced to let out his land, though as a rule he is not by any means unwilling to give up one or two fields. If the season is good he gets a fair rent, and in the Dahar and Bangar Circles the out-turns will rule high and profits on the remaining portion will be large. On the other hand if the season is bad, he will not get any rent, but he will be no worse

off then if he had retained it, and if the succeeding harvest be good, he may recover some arrears of rent as well, this he regards as clear gain. In spite therefore of a fairly large cash rented area I think there is throughout the tahsil a most serious scarcity of land with its inevitable result of poverty and inability to stand out against the failure of even a single harvest.

Statement V shows the distribution of ownership according to the main agricultural tribes. There is a large predominance of Meos, who taken as a whole are only fair cultivators. In some parts they are distinctly good, but they need to see quick and certain results of their work or else they get disheartened and lazy. In a village where Meos are found side by side with Ahirs or Jats the difference is surprising, though they never learn to adopt the thriftiness of those tribes. Next in importance as regards numbers are the Jats, who are mostly found in the canal tract. These and the few Ahirs are by far the best cultivators in the tahsil. All the available irrigation is carefully developed in their villages, and unremitting toil and care are bestowed to get the best value out of the land. The remaining tribes are all inferior Rajputs, whether Hindu or Mussalman, are very indifferent. Owing to the strictness of their marriage rules they are rapidly decreasing in numbers, and as a rule in their villages holdings are large. Both Brahmans and Khanzadas are equally bad, but the Gujars are better. There are a few Mahajans and Kayisths, who are owners by purchase, and do not as a rule do any cultivating themselves. Occupancy tenants are generally Meos or Jats with a fair sprinkling of privileged Brahmans or Faqirs. Apart from these there is no proper tenant class, the tenants-at-will being generally owners cultivating either in some other village or under purchasers and mortgagees.

16. Statements VI and VII contain detailed statistics of transfers, while in the following table the present state of transfers is compared with that in existence at the time of settlement. The top figure is the percentage of the area transferred, and below is the price in even rupees :—

1	2	3	4	5	6	7
Circle.	SALES			MORTGAGES		
	Before 1857 to settle- ment	Since settlement		At settle- ment	Now.	
	Total area.	Total area	Cultivated area	Total area	Total area.	Cultivated area.
Taora . . . . .	4 Rs 15	33 37	40 41	3 25 15	17 7 40	23 6 40
Dahar . . . . .	1 8 Rs 10	7 5 19	6 2 29	12 9 21	30 8 40	37 9 41
Bangar . . . . .	1 Rs 10	1 6 50	1 6 57	3 2 20	21 0 58	23 7 58
Total . . . . .	..	4 3 26	3 9 36	. ..	24 3 46	29 2 46

Of the sales 38 per cent and of the mortgages 63 per cent are to zamindars. The quinquennial statement shows that the worst period was from 1895-96 to 1899-1900. Except that there has been a slight falling off in the last periods (due in great measure to the Land Alienation Act, and also to some extent to the fact that there is very little land left to mortgage) the area sold and mortgaged has steadily increased. Not much reliance can be placed on the sale figures. Some of them are fictitious transactions, but the majority, I think, are small sales with a view to reducing mortgaged property.

The high proportion of sales in the Dahar Circle is a bad sign, as not only

has been reduced to a dangerously small figure. Mortgages are most serious. The figures plainly show the poverty that is prevalent throughout the tahsil. The whole tahsil appears to have suffered a blow from the famine of 1878 and subsequent years from which it has never recovered. The very small area of land sold and mortgaged before last settlement seems to show that the people were generally prosperous but now the proportion of transfers is everywhere high, and curiously enough there is not much difference in the various circles in the rate of increase. The actual percentage is highest in the Dahar Circle but so it was at settlement. On the other hand the Bangar Circle, with all its advantages, has a very large mortgaged area. The Meo of course has no idea of thrift, and a series of bad years will always affect him. Mr Channing was fully aware of this, and laid great stress on the necessity of a most liberal revenue policy. The wisdom of this is undoubted, as however light an assessment may be imposed, the result will be the same. I should say that the above figures show that in bad times the people cannot afford to pay anything, and that the bad effects of over collection during such times are practically ineradicable. In a Meo community there will always be a certain amount of mortgage, but on the other hand no theories of extravagance will account for such a tremendous increase in the mortgaged area throughout the tahsil

In the following table the figures relating to the unsecured debt are given by circles, showing the amount due to each class of creditor.

1				2	3	4	5
Circle				Due to co-owners	Due to other owners	Due to money lenders	Total
Taoru	...	..	..	15,306	20,611	2,34,808	2,70,925
Dahar	...	.	...	51,569	81,687	2,54,813	3,88,069
Bangar	..	..	...	41,265	26,915	1,81,833	2,50,018
Total				1,08,140	1,29,413	6,71,454	9,09,007

The position in Taoru is most extraordinary, as credit has been given to the extent of 8 times the land revenue. The bannias themselves say that the Taoru people are always looked upon as certain to pay, and so credit was given to almost any extent. Besides this a most curious result of the Land Alienation Act was given to me. Just at present there are a good many transactions which took place about the time of the passing of the Act, and which, if disputed in Court, might easily be set aside. The bannia therefore at present is going on the principle of giving ready credit and wiping off these doubtful items by degrees. The explanation is not satisfactory as regards the exceptional position of the Taoru Circle, but it is sufficiently interesting to record for what it is worth. As might be expected the amount due to money-lenders is considerable. There are not many zamindars in this tahsil who can afford to lend money.

17. There is now no miscellaneous income of sufficient importance to require consideration from the point of view of assessment. In former times

Miscellaneous income  
there was a flourishing salt industry round about Nuh, and one class of salt took its name from the village of Salumba. It has now fallen into disuse, and though the people themselves have a grievance against Government, and say that they were prevented from making salt, it is clear that, as Mr. Channing foresaw, the decline is entirely due to competition. In 1848, when Nuh salt was very popular, the manufacture of elementary earth salt in the North-West Provinces was finally prohibited, except in the Nuh Mahal and the villages in the vicinity of Farrukhnagar (which at that time was independent territory). In 1849, with the annexation of the Panjab, the salt range mines came into British possession, and after the mutiny of 1857 the lands of Jhajjar and Farrukhnagar were forfeited and another source for the supply of salt came into our hands. At last settlement the Nuh industry was still keeping alive, but Mr Channing prophesied that the new Rajputana-Malwa Railway, which served the Farrukhnagar mines and the

great Sambhar Salt Lake would finally extinguish it. This has actually occurred, but so far from having a grievance against Government it would appear that the industry was for a long time bolstered up by Acts which conferred a monopoly upon it.

As in other tahsils, both pala and pula are found; but not in sufficiently large quantities to affect the tahsil as a whole. Allowance has been made for them in the village assessments in the few cases where the crop has been large enough to justify an enhanced assessment, but this has not often been the case, as it is generally used by the zamindar himself for fodder, and the surplus available for sale is small. No outside professions are taken up, the people as a whole being dependent on the land. Some Rajputs go out as soldiers, but the Meo is not popular as a recruit, nor does his inclination lie that way. He prefers not to leave his land unless forced to do so by poverty or some equally cogent reason; and then he does not as a rule return to his village at all.

### CHAPTER III.—CROP STATISTICS.

18. Detailed crop returns by soils for the years selected for the produce estimate are given in Statements VIII and IX. They only show the cropping on the settlement areas as modified by the patwans at crop inspections. This is important in the dahri and abi classification, where I suspect that the areas have been over-estimated. The entries of nahri may be regarded as fairly correct, and in other respects there has been very little change.

19. Statement X shows the area matured at each harvest in the various circles during the 21 years 1885-86 to 1905-06, with quinquennial averages. In the Taoru Circle the average is wonderfully high. This is due to the character of the soil, which is light and hardy. Not only is less rain required, but it is capable of withstanding drought for a longer period than the heavy soils. Moreover, most of the land is used for autumn crops, and as, even in a dry year, it is unusual for the monsoon to be a total failure there is always hope of obtaining at least a moderate harvest: in the *rabi* except well-irrigated crops very little is attempted, and as the water is sweet the results are fairly good. In the Dahar Circle on the other hand the cultivation is extremely precarious. The soil is heavy, and requires a thorough soaking, though in many parts owing to the prevalence of kallar it is not good to have water standing for any length of time. The small matured percentage shows the difficulties with which the cultivators have to contend, as either excess or defect in the rainfall has a serious effect on the harvest. In the Bangar Circle the high matured percentage is due, not to the intrinsic character of the soil, but to the fact of canal irrigation, which protects a very large area. It will be shown elsewhere that this protection has probably been to some extent exaggerated, and that a larger failed area ought to have been allowed, but for the present it is sufficient to point to the irrigation as mainly responsible for the matured percentage.

Turning to the average for the five years selected for the Produce Estimate it will be seen that in Taoru it agrees almost exactly with the average of the 21 years. In the Dahar Circle it is 6 per cent below, and in the Bangar Circle  $4\frac{1}{2}$  per cent above the average. The explanation in each case is, I think, to be found in the dryness of the seasons.

Statement I shows that in 4 out of the 5 years the rainfall has been below the average. In the Dahar Circle this has had a very perceptible effect. The heavy land, which has been accustomed to get a thorough soaking has become hard and dry, and in many cases the resources of the cultivators have not been sufficient to enable them to plough such land with bullocks few in number and weakened by want of sufficient fodder. In the Bangar Circle, on the other hand, the effect has been to extend the demand for canal irrigation, and thus increase the protected area.

20. The following statement shows in percentages the average area of each important crop sown, matured, and failed on 100 acres of each class of land during the years selected for the Produce Estimate:—

1 Crops	2 TAORA		3 DAHAR		4 BANGAR		5 Total	6 TAHSIL
	Settle- ment	Now.	Settle- ment	Now	Settle- ment.	Now.	Settle- ment.	Now.
Jewar .. .	1	2	16	10	31	12	19	9
Bajra .. .	73	16	19	24	21	26	32	30
Mora .. .	..	5	..	2	..	2	..	2
Moth .. .	1	1	..	1	3	1	1	1
Til .. .	..	..	..	1	..	1	..	1
Chaula .. .	..	8	..	..	..	..	..	2
Cotton ...	3	3	14	10	11	13	10	10
Wheat .. .	2	1	26	4	..	4	11	4
Barley ...	2	9	7	9	6	13	7	11
Gram .. .	6	7	3	9	10	12	6	10
Mixedrae .. .	1	2	7	9	..	2	3	4
Saman .. .	..	1	..	4	..	2	..	2
Tara .. .	..	1	..	1	..	1	..	..
Gar .. .	..	10	1	7	1	7	1	5
Chan .. .	..	1	..	6	..	2	..	3
Oil-seeds .. .	..	3	..	3	..	1	..	2
Bajra .. .	..	..	5	..	14	..	8	..
Vegetables .. .	..	..	1	..	..	..	..	..
Rice .. .	..	..	1	..	..	1	..	..
Sugarcane .. .	..	..	..	..	..	..	..	..
Total	100	100	100	100	100	100	100	100

21. The characteristic agriculture of the tahsil is that practised on the flooded and unirrigated lands in the Dahar and Bangar Circles. In the Taora

Circle the soil is sandy and the cultivation resembles that adopted in Rewari.

Barley is the chief irrigated crop, the soil being too light for wheat as a rule; moreover wheat requires more water and care generally, and with the exception of the Ahirs the people are not sufficiently industrious to grow it. Gochni is grown on the best abli land, but the area is small. The only other irrigated crops are tobacco and zira, and the fodder crops kasm and carrots. The wells are not used for the autumn crops, except to grow a little charri. On the irrigated land the main crops are bajra mixed with pulses in the autumn and dofash gram (if conditions are favourable) in the spring. A little cotton and juar are also grown on flooded land. As regards the method of preparing the soil, the time of sowing, and the amount of seed sown there is nothing to alter in the description already given for Rewari. For the same reasons I do not propose to give a detailed account of the nahri cultivation. The Hathin Circle, where all the canal irrigation is found, adjoins the Palwal Tahsil, and naturally the two systems are the same.

On flooded lands the main crop is wheat. The best land is sown with wheat alone. Seed is liberally given, 30 sers being the usual though at the same time the minimum quantity. Provided that there is sufficient rain to bring down the floods the same land can be grown to a wheat crop year after year. Manure is given every third or fourth year, but the main essential is that the land should be properly ploughed. Not only is the soil a stiff clay, but frequent flooding adds to its original hardness, and the more it is broken up the better. This of course can only be done when it has been moistened by rain, and consequently the importance of the rainfall to this land cannot be over-estimated. It requires a good flooding during the monsoon, and yet the water must dry up sufficiently quickly to enable the land to be ploughed at the proper time. The same remarks apply to the cultivation of gochni on the less heavily flooded land. As to bajra, although the cropping returns show a

great deal of this crop on flooded land, <sup>41</sup><sub>5</sub> merely means that the field has not received sufficient flood water to make any appreciable difference, and is frequently a sign that the flooded area has been over-estimated. So far I have only dealt with the spring crop. As may be imagined the land that is regularly flooded during the monsoon is not of much use for growing an autumn crop, but jwar, bajra, cotton, and occasionally melons, are found. To some extent the remarks made above about over-estimating the area apply here also. Autumn crops are grown on land which, though classed as flooded, does not under normal circumstances get enough flooding to injure a standing crop. But this is not the only reason. It often happens that some of the flooded land has not been available for a wheat crop owing to excessive flooding or drought. Under these circumstances if the zamindar waits for a year to get a spring crop, he not only loses all the benefit of the flooding, but even then will get nothing off his land if the season is abnormally wet or dry. He therefore grows an autumn crop to be on the safe side. If the rains are light, he has utilised the winter flooding and got a crop off his land—possibly a very good cotton crop: if not, he only loses his seed, and can sow wheat.

The chief difference in the case of unirrigated land is that more rest is required, and even with favourable conditions a spring crop could not be grown regularly year after year on the same field. Cultivation is too dependent on the rainfall to admit of any definite system of rotation being employed, but bejhar and gochni, the two chief crops, are as a rule grown on land that has lain fallow for two harvests. The following is the rotation which the zamindars say is best, but actually it is very rarely found:—

*Autumn.*

Juar.  
Cotton.  
Bajra.  
Bajra.  
Fallow.

*Spring.*

Fallow.  
Fallow.  
Dofash gram.  
Fallow  
Bejhar.

If this system were adhered to there would be a much larger area under autumn than under spring crops, of course the preponderance is this way, but the proportion is not so great, the reason being that with an uncertain rainfall and insufficient cattle it is impossible to get the fields always under a crop; but if the conditions look likely to be good for a spring crop, every effort is made to use all the available fallow land. As regards the crops grown, bejhar is by far the most common spring crop. As a rule two parts of barley are sown to one of gram, the total amount being 25 or 30 sers. Gochni is only grown on the lowlying land that gets some additional moisture. Sarson is sown in the lines of these two crops. Gram is also a popular crop. If there are good September rains, it is sown as second crop after bajra; if the rains are light, it is put in fields that do not contain sufficient moisture to enable barley to be sown. The crop neither requires nor it is benefited by very much rain but on the contrary is liable to be damaged by late winter rain with thunderstorms. I have not given any details of the number of ploughings, as this depends chiefly on the cattle available. The land is so heavy that it cannot be ploughed too often, and the difficulty is to get the necessary bullocks, as the people are very badly off in this respect at present.

22. The appended statement shows the areas under all the most im-

*Changes of cropping.*

portant crops in the various circles at settlement and now. In Taoru the apparent difference in the bajra areas is accounted for by the fact that pulses were not separately recorded then but were shown as bajra. The present total of bajra and pulses is 70 per cent so there has been no real change. The remaining figures are all very similar. In the Dahar Circle the area under jowar has decreased, but the total of autumn cereals is considerably larger than before. This is probably due to the recent bad seasons, and to the fact that the flooded area is smaller than it used to be. Both these causes would tend to increase the area under autumn crops. Cotton requires good rain at sowing time, and as this is not always available the increase has appeared in the cereals and not in the more valuable crop. The settlement percentage of cotton looks as if it were an over-

estimate, but during village inspections I have frequently found that Mr. Channing has noted on the very fine crops of cotton grown in a village which now hardly ever produces any at all. The great decrease in the area under wheat is also attributable to the same cause. The wheat area fluctuates according to the seasons, and we may safely say that neither set of figures represents a true average, the settlement figures being too high, while the present area is undoubtedly too small. It should be noticed that the present figures for gram include bejhai, for which no separate column has been allotted in the records. In the Bangar Circle the introduction of canal irrigation has caused a very real change in the cropping, which is clearly brought out by the figures. The area under cotton is almost the same, although there has really been a great development since the advent of the canal. It must be remembered that the area was very much over-estimated at last settlement. On the other hand there has been a change in the jowar cropping which is rather hard to understand. To some extent the canal is responsible, as there is not such need for autumn fodder as there used to be, and jowar does not grow on canal land, it is however clear that the settlement entries include them, whereas they are not recorded at all. The byra percentages show that it is not a serious matter in the Bahar Circle, of jowar being given up for bajra. The percentage of bajra is small, but it is not grown on unirrigated land at all, and there is no flooding to speak of in this circle.

1	2	3	4	5	6	7	8	9	10	11	12	13	
Assessment Circle.	Harvest	Crops.	AREA IN PERCENTAGES.										
			Chahl.	Nahri	Abu	Dabri.	Abi and Dahri.	Chiknob and Narmot	Narmot.	Mogda	Bhur	Total.	
TAORU	Khary	Jowar	19				2 65		5 00	2 78	1 16	2 14	
		Bajra	04				37 68		48 14	55 71	49 14	46 27	
		Mung					2 55		7 06	5 75	5 71	4 69	
		Moth					1 07		3 46	1 48	1 99	1 40	
		Guar					4 387		13 74	11 90	11 91	10 09	
		Chaula					2 37		9 50	9 00	13 59	6 45	
		Cotton	70				1 60		5 14	3 49	97	2 59	
		Chara	17				95		4 36	1 21	49	98	
		Vegetables	31							04		07	
		Others	32				30		1 41	1 07	30	81	
			Total crops harvested	1 73				54 24		97 61	92 38	85 26	77 69
	Total area failed					12 11		12 64	6 61	10 54	6 65		
	Total area sown	1 73				66 35		10 65	98 99	95 80	84 54		
DANAR	Khary.	Wheat	7 04				6 53		1 41	24	39	1 43	
		Barley	42 16				8 13		6 42	3 67	1 75	8 69	
		Gram	26				7 24		13 66	10 08	3 02	7 39	
		Sarson	2 21				1 71		1 30	73	39	91	
		Tara	15				42		1 54	69	22	53	
		Others	8 45				15 61		11 81	1 03	1 52	2 90	
			Total crops harvested	60 26				39 64		36 84	16 64	7 19	21 84
			Total area failed	98				10 86		16 82	9 10	6 69	7 60
			Total area sown	61 24				50 50		53 66	25 74	13 88	29 64
			Total crops harvested	61 99				93 88		134 65	109 02	92 45	99 53
			Total area failed	93				22 97		29 66	15 71	17 23	14 65
	Total area sown	62 97				116 85		164 31	124 73	109 63	114 18		
DANAR	Khary.	Jowar	10		60	1 60		15 99		5 41	1 15	7 33	
		Bajra			39	1 14		25 84		33 00	39 12	17 75	
		Other cereals	02		02	09		50		26	12	26	
		Mung			02	06		1 99		2 01	1 60	1 17	
		Guar			11	31		7 16		11 69	12 93	5 38	
		Other pulses				08		1 15		2 36	2 97	1 02	
		Cotton	24		18	1 83		14 44		9 95	2 06	7 27	
		Chara	13		05	41		8 39		4 38	1 73	3 97	
		Others	84		07	08		2 13		1 10	29	1 02	
			Total area harvested	1 34		1 44	5 71		77 53		70 19	62 22	45 27
			Total area failed	03		2 28	3 42		19 17		16 31	16 30	12 21
	Total area sown	1 37		4 72	9 13		96 70		86 50	80 61	57 48		

1	2	3	4	5	6	7	8	9	10	11	12	13	
		AREA IN PERCENTAGES											
Assessment	Harvest	Crops											
			Chobi	Nahr	Abi	Dahr	Abi and Dahr	Olucknot and Narmot	Narmot	Magde	Bhar	Total	
DAHAR - conold	Habs	Wheat	7 16		3 63	4 04			2 75		2 38	2 01	3 42
		Barley	32 64		2 76	2 17			7 88		9 46	5 48	6 65
		Gram	13		2 81	1 90			14 30		5 81	1 65	7 04
		Other cereals and pulses	2 66		10 10	6 69			8 29		3 86	3 15	6 67
		Sarson	87		29	99			4 91		2 44	99	2 64
		Tora			03	34			85		1 17	58	62
		Others	5 18		26	95			05		02	01	51
		Total area harvested	48 64		20 60	17 08			38 16		25 14	12 87	27 55
		Total area failed	2 15		2 21	3 49			20 18		14 77	10 44	11 61
		Total area sown	51 09		22 81	21 16			58 29		39 91	23 31	39 16
List of both harvests	Total area harvest	40 98		22 04	23 88			116 69		95 38	75 09	72 82	
	Total area failed	2 48		5 40	6 90			39 20		31 08	28 83	28 82	
	Total area sown	52 46		27 53	30 29			155 99		126 41	103 92	101 64	
Kharif	Jowar		63	10				21 61		6 80	4 13	11 63	
	Bajra		03	21				85 59		40 58	35 28	24 16	
	Mung		01					2 78		2 69	1 98	1 78	
	Moth		26					1 27		2 69	4 07	1 28	
	Guar		23	21				9 93		7 62	7 88	6 27	
	Other cereals and pulses	06	55	10				1 02		48	42	73	
	Secumum		25					1 48		80	33	89	
	Sugarcane		4 96					02		01	-	1 34	
	Cotton	14	26 56					8 98		6 62	3 41	12 25	
	Fodder		60					3 80		1 43	53	1 84	
	Others	25	1 71					54		24	06	76	
	Total area harvested	45	35 78	62				86 4		69 14	57 07	63 02	
	Total area failed		28	1 25				8 61		7 14	9 57	5 74	
Total area sown	45	36 07	1 87				95 06		76 28	66 64	66 76		
HAMAR	Rabi	Wheat	8 49	11 87	3 02				65		08	04	4 01
		Barley	28 61	11 13	62				10 97		14 49	13 42	12 45
		Gram	29	7 75	32				15 36		11 77	5 29	11 14
		Other cereals and pulses	3 71	4 89	3 95				59		81	14	1 82
		Sarson	1 84	1 49	62				1 83		2 10	2 13	1 78
		Tara							1		24	16	11
		Others	1 97	92					02				37
		Total area harvested	48 91	38 05	8 53				29 57		29 00	21 88	31 69
		Total area failed	29	57	73				13 39		13 10	12 55	9 11
		Total area sown	44 83	36 92	9 26				42 96		42 10	33 73	40 80
Total of both crops	Total area harvested	44 36	73 64	9 15				116 04		98 14	78 23	94 71	
	Total area failed	92	1 15	1 93				22 00		20 24	22 12	14 65	
	Total area sown	45 28	74 99	11 12				138 04		118 38	100 37	109 56	

## CHAPTER IV.—RENTS AND TENANCIES.

23. The following statement shows the percentage on the total cultivation of land held by the owners themselves and by the various classes of tenants :—

1 Circle.	2	3	4	5	6	7	8	9	10	11
	CULTIVATED BY THE OWNERS OR HELD REST FREE.		HELD BY OCCUPANCY TENANTS PAYING				HELD BY TENANTS AT-WILL PAYING			
			Cash rent		Kind rent		Cash rent		Kind rent	
	Sottloment.	Now	Sottloment	Now.	Sottloment	Now	Sottloment	Now	Sottloment.	Now.
Taoru . . . . .	62.2	60.9	12.6	11.7	.	.	22.8	24.3	2.4	3.1
Dahar .. . . .	70.0	56.3	7.1	6.8	1.1	..	21.5	25.9	1.3	11.0
Bangar . . . . .	63.8	62.4	7.1	9.0	.	.	29.0	21.6	1	7.0
Total . . . . .	66.0	59.7	8.1	8.7	0.4	.	24.86	23.8		8.7

The above figures do not indicate any great changes in the proportion of land let out or in the character of the tenancies. The Dahar Circle is the only one where the owners' cultivation has been seriously curtailed. The increasing popularity of kind rents throughout the tahsil also deserves mention. Both features are the direct result of the bad seasons, though the latter is of quite recent growth, whereas the former can be traced back to the famine of 1878. Tenants are of the usual kinds. The form of partnership on well lands in vogue throughout the district is extremely common in this tahsil. If it becomes necessary to work the wells an owner is generally obliged to take in his tenants as partners, as otherwise he would not be able to afford the expense, nor probably has he sufficient bullocks. In such cases no difference is made in a cash rent, but the rate for kind rents is lowered to  $\frac{1}{3}$ rd. The form of partnership is the same as in Rewari.

24. Statement XI shows the rates at which kind rents are paid. The figures indicate an overwhelming preponderance of payments at  $\frac{1}{2}$  on both unirrigated and irrigated lands. In the case of well lands however the statistics are misleading. The explanation given above about partnerships shows how in the Dahar and Bangar Circles owing to the peculiar circumstances  $\frac{1}{2}$  may be agreed on but not paid if the well is used. In the Taoru Circle, where irrigation is regular, batar is most unusual on well lands that are being watered, but not nearly so rare in the case of well lands on which an unirrigated crop is to be grown. The difference is fairly represented by the areas in the two columns of  $\frac{2}{3}$  and  $\frac{1}{2}$ , and when actual instances were examined it was found that the irrigation rate was always  $\frac{1}{3}$  and not  $\frac{1}{2}$ . On canal land the rate is  $\frac{1}{2}$ , but it is usual to find that all expenses are shared in the same proportion. In the case of sugarcane cultivation this indicates a difference from the practice prevalent in the Palwal Tahsil, but it is merely a difference of detail. The landlord is made to share in other expenses which were not included when the rate was  $\frac{1}{3}$ , and the result is almost exactly the same. I have accordingly adopted the calculations given in the Palwal Report for this tahsil. The cost of cultivating an acre is Rs 22 and the canal dues as shown in paragraph 11 (b) amount to Rs. 8-13-0. On all unirrigated land  $\frac{1}{2}$  is regularly taken, and a share of the straw as well, the tenant being expected to pay the kamins. These conditions are extraordinarily severe. In the adjoining Tijara

Tahsil of Alwar the figures given in section 115 of Mr. O'Dwyer's Report show that rates of  $\frac{1}{3}$  and  $\frac{1}{2}$  were taken in almost equal proportions. This however was the only tahsil out of the five dealt with in that Report in which this state of things existed, and the rate adopted for the Produce Estimate was  $\frac{2}{3}$ . As might be expected under these circumstances the area under produce rents is not large. It has however increased since last settlement, when both Mr Channing and Mr Wilson found this class of rent almost unknown. The rate too has risen as the following table shows :—

	1	2	3	4	5
		Half	Two-fifth.	One-third	One-fourth
Settlement	...	177		823	
Now	..	913	15	68	4

With such a small area it seems reasonable to suppose that only the worst land was so rented, and consequently a low rent was taken. At the present time there is a decided leaning towards produce rents. The tenants clamour for them because they have not had a really good harvest for so long, and when this does come it is certain that the landlord will try to get back a portion at any rate of the arrears if the land is cash rented. Probably the total amount so collected does not exceed  $\frac{1}{2}$  the produce, but the cultivator likes to feel that if nothing matures he will not have arrears of rent to pay in addition to his other expenses. Where the character of the soil is so even a slight increase in the popularity of a rent is sufficient to bring the better soil under its influence, and this in itself would tend to raise the rate and so retain the popularity of cash rents. Lastly, there is the influence of competition. Though population has not increased to any great extent since last settlement yet the poverty of which this is one sign has led to a good deal of mortgage, and there is now a very real scarcity of unencumbered land. The original owner must cultivate to keep alive, and as a rule he stops on as a tenant paying a high rent.

The result of all these influences has been that the area under kind rents is almost all paying at the high rate. I have therefore accepted it for the produce estimate, but it does not mean that the resulting standard would be a fair one to levy from the owners and occupancy tenants, who together cultivate 68.6 per cent.

There are no zabti rents at all in this tahsil, but as there is a small area under crops, for which as a rule a cash value is taken, I have made assumptions for the purposes of the Produce Estimate. The area is not sufficiently large to affect the general result, and the assumed values may be taken as fairly representative.

25. The table in paragraph 23 shows the area cultivated by tenants-at-will paying cash rents. Sixty per cent of this is in the hands of tenants paying at other than revenue rates, and these form the basis of a cash rent estimate. Mr. Channing in his Nuh Report section 26 says: "Competition rents are very rare. Seventy per cent of the lands held on cash rents are at revenue rates only, so that I have not been able to give much weight to the prevailing rent rates in framing my assessments. I have however selected a few villages in each circle in which rents other than customary seemed to prevail, and analyzed their rates." It is difficult to see exactly what plan was adopted. The average rents given by Mr Channing seem to be far below his rates, but when dealing with the various circles he compares an assessment at his assumed rates with that given by half the cash rents in the selected villages and the difference though still considerable is not so great as the figures in section 26 lead one to expect, while in the Taoru Circle the two sets of figures are almost identical. However no use was made of them in assessing, and it is more important to

note that at revision 6 per cent. of the total cultivated area paid cash rents not directly dependent on the revenue rate at an average of Rs. 2 per acre. This proportion has risen to 9 per cent., but the 60 per cent., shown as cultivated by the owners includes a great deal of mortgaged land cultivated by the mortgagor at a high cash rent. The following statement shows the area paying a cash rent with the rate per acre at revision and yearly from 1891-92 to the present day:—

1 Year	2 Area in acres	3 Rent Rs	4 RATE ON		6 Total Rs a
			Irrigated Rs a	Unirri- gated. Rs a.	
1891-92	25,523	64,590			2 8
1892-93	26,940	69,553	...	...	2 9
1893-94	27,711	73,013	...	...	2 10
1894-95	28,301	76,380	4 0	2 8	2 11
1895-96	28,750	78,813	2 13	2 12	2 12
1896-97	28,817	80,372	3 10	2 10	2 13
1897-98	29,952	84,721	4 4	2 9	2 13
1898-99	29,979	89,192	4 11	2 11	3 0
1899-1900	30,112	88,654	4 9	2 10	2 15
1900-01	28,822	86,776	4 9	2 11	3 0
1901-02	29,077	92,415	5 8	2 11	3 3
1902-03	29,983	98,110	3 15	3 2	3 4
1903-04	29,980	96,673	3 15	3 2	3 4
1904-05	29,883	96,359	3 15	3 2	3 4
1905-06	30,316	98,985	3 12	3 3	3 4

The statement shows that a very extraordinary change has taken place during the past five years. Up to the year 1902-03 there was a marked difference between the irrigated and unirrigated rates, but since then there has been a close approximation between the two classes. In the Dahar Circle there is no difference now at all, and in the Bangar Circle the two rents are nearly the same. The regular well irrigation in the Taoru Circle has prevented it from being affected by this. The real fact appears to be that in the other two circles land is let out in May before it is known whether it will be irrigated or not, if it becomes necessary to work the wells, it means that the season is not good, and with the scarcity of bullocks and poverty prevalent throughout the circles the owner prefers to get what help he can from the tenant in working the well, and no extra rent is charged. Moreover, the owner knows that in a bad year the only chance of getting a crop at all is to irrigate the field, and unless this is done he will not be paid any rent whatever.

Turning to the method of analysing the existing rents I quote the following description from the Rewari Report. "The rents in sub-heads (d) and (g) of the Rent Statement are of course the only ones capable of affording data for a cash rent assessment. These were first divided into mixed rents and the

rents paid on single classes of land, and each of these divisions was then further sub-divided into—

- (a) Rents paid by mortgagors to mortgagees
- (b) Rents paid by tenants-at-will to mortgagees
- (c) Rents paid by tenants-at-will to owners.
- (d) Rents paid by sahys to owners "

The majority of rents belong to class (c), and it is there alone that the genuine competitive rents can be found in any quantity. Rents in class (a) were usually rack rents or else included a payment of interest on the loan, and so had to be rejected. Those in class (b) varied a good deal sometimes they were exorbitant but on the whole they did not differ very much from those taken by owners. Those in class (d) were as a rule too low. The usual kinds of abnormal rents were met with and rejected at village inspections. In the Taoru Circle cash rents are not common, and no customary rate for land was admitted. In the Dahar and Bangar Circles however it was usual to find a customary rate of Rs 2-8 or Rs. 3 per bigha on all soils except bhur, for which no such rate existed. Wherever kallar is found in a field to any extent it was invariably regarded as a good reason for taking a lower rent, and if the field was really bad a very considerable difference would be made. On the other hand with the exception of rack rents it was unusual to find the customary rate exceeded. The result is that the total rents work out somewhat lower than the customary rate though the latter is always used as a guide in determining the rent of average fields.

Statement XV shows the area under true cash rents after the elimination of abnormal rents. The tendency to be below the customary rate rather than above it is slightly more evident. This shows that the proportion of rack rents rejected was greater than that of small payments by privileged tenants, and this is undoubtedly the case throughout the tahsil. With the present poverty privileged tenancies are rare. Those who could have established occupancy rights, and the remainder have been forced to pay at the usual rate or else give up the land. I do not think there is any doubt that the rents represent the true letting value of land. In the Dahar and Bangar Circles the soil is most extraordinarily uniform in character, the only difference as a rule being one of saltiness. With such a large proportion of mortgagee's rents we may feel confident that good as well as bad land has been let out, and this in conjunction with the uniformity already noticed suffice to make the cash rents more representative of general conditions than the small proportion of land so rented might seem to warrant. By this I do not mean to say that the rents as they stand represent a fair letting value of land, and consequently a fair basis for assessment. On the contrary I think they are far too high, but there is no doubt that any one wishing to let out an average field can count on obtaining a tenant at these rates, and similarly there is no doubt that a man wishing to cultivate a normal field will, unless special reasons exist to the contrary, have to pay at a rate closely approximating to that shown in the statement. This state of affairs has been induced by the circumstances of the tahsil. The reasons which have led to the great increase in transfers have been already noted, but the effect of this upon rents cannot be too strongly emphasised. With only a small amount of land at their disposal, and practically no culturable waste to fall back on, the people have been obliged to sell and mortgage until each owner has a very small property left unencumbered. A keen competition has been set up, and the owners—following the lead of the mortgagees—exact high cash rents for their land. These rents obviously could not be paid in a bad year, and this was everywhere admitted by owners and tenants alike. There are very few large owners in the tahsil, and hardly any of these keep accounts, but when inspecting the village of Hiranbala the Kayasth owners showed me their books. According to the Government papers the rental is Rs 3,136, but the average collections for 16 years are only Rs 2,360, or 75 per cent. The property is well and carefully managed, and every effort is made both by the owners and their agent to keep up cultivation and get the maximum value out of it. As an additional incentive to this I may mention that in spite of bad harvests they have never been held to require any relief, and the full Government revenue has invariably been exacted. We may therefore feel sure that no undue leniency has been displayed by them to their tenants. 165

The following table compares the rates of cash rents paid on the various classes of soil before and after the elimination of abnormal rents in the villages that have been inspected —

1	2	3	4	5	6	7	8
Circles	Rents,	Chahi	Nahri	Abi.	Dahri.	Barani	Bhur
		Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p
Taoru	Total rents	5 6 11	...	3 5 4	3 4 0	2 6 11	1 8 8
	Corrected rents	5 2 0	...	3 1 0	3 2 0	2 5 8	1 6 0
Dahar	Total rents	4 1 7	.	3 14 1	4 0 1	4 4 6	2 9 7
	Corrected rents	3 14 0		3 13 0	3 15 0	4 1 0	2 10 0
Bangar	Total rents	4 7 7	3 4 11		2 4 0	3 8 7	1 12 10
	Corrected rents	4 6 0	2 12 0		3 0 0	3 4 4	1 11 0
Total Tahsil	Total rents	4 14 7	3 4 11	3 13 5	3 15 11	3 6 9	1 15 8
	Corrected rents	4 10 0	2 12 0	3 11 0	3 14 0	3 5 1	1 14 0

The general result of the analysis has been to slightly lower the rate on all soils. This is because owing to the scarcity of land there are very few tenants at privileged rates, while on the other hand the tendency towards charging excessively high rents is most pronounced. The nahri rents, as I have pointed out elsewhere, are quite unreliable. Practically all are paid in two large villages in which no change in the rate has been made in spite of the introduction of canal irrigation. To have eliminated these would have meant that only a few acres of nahri rents could have been shown, and in neither case could the results have been accepted as a fair test of the rent of this class of land. I therefore retained all these rents and only eliminated a few rents which were extraordinarily severe. There can be no doubt that the rents have been falsified in both these villages and it is unfortunate that there are not enough cash rents elsewhere in the tahsil to give an idea of what the proper rate should be. I have neglected the nahri rents altogether and am applying the chahi rate to the nahri area for the purposes of the cash rent estimate. Unfortunately well irrigation in this circle is inferior and the result is that the cash rent estimate is unduly low. Chiknot, narmot and magda have been classed together as barani as the differences between the various rates are so slight as to be negligible.

## CHAPTER V.—HALF-NET-ASSETS BASED ON BATAI.

26. The years selected for the produce estimate are the years 1898-99 to 1903-04 excluding the famine year

1899-1900. The spring harvests have been almost uniformly bad, but the matured percentage of the five years is 87, which is only slightly below that of the 21 years. The character of the harvests is given below:—

*Kharif* 1898.—The monsoon was delayed, but there were fair rains in July and August, which allowed sowings to be made. Unfortunately the September rains failed, and the harvest was not so good as at one time appeared likely.

*Rabi* 1899.—A fairly large area was sown but the winter rains failed, and the harvest was not good. A little rain in December and February saved the situation, and eventually the harvest was about average.

*Kharif* 1900.—There were abundant monsoon rains, very well distributed and the harvest was consequently above the average.

*Rabi* 1901.—The rains in September and October were favourable for sowings, and a large area was got ready. Conditions were good throughout, and a splendid crop was obtained.

*Kharif* 1901 — Good rain in June permitted extensive sowings to be undertaken, and with moderate conditions in July and August the prospects were good. The failure of the September rains however altered the position, and there was eventually an average harvest.

*Rabi* 1902 — Sowings were rather restricted, and as no rain fell between October and April the result was disastrous, the failed area being almost as large as that matured. The conditions were especially unfavourable for the Dahar Circle, but even the Bangar Circle with canal irrigation suffered heavily, while Taoru was only better because practically nothing but irrigation was attempted.

*Kharif* 1902.—A good harvest. In both the Taoru and Bangar Circles the amount of rain was sufficient, and though the Dahar Circle would have been better for a little more the actual area matured was large, and the percentage on sowings unusual for this tahsil.

*Rabi* 1903 — Sowings were not so large as might have been expected with good rain in September and October, but the crop as a whole did moderately, except in Taoru where the failure on unirrigated land was very heavy. The winter rains were below the average and the harvest may be characterised as rather poor.

*Kharif* 1903 — The rains came a little late, but were on the whole favourable for sowings, which were consequently above average. As in 1898 the September rains failed, and owing to the late sowings the damage was severe. In the end the harvest was rather below the average.

*Rabi* 1904 — Sowings were somewhat restricted, and as there were no winter rains the crop looked like being a total failure. A good fall of rain in March just prevented this, but the unirrigated harvest was very poor throughout the tahsil.

The harvests may be summarised as follows —

1		2	3
		Kharif	Rabi.
1898-99	..	Average	Average.
1900-01	..	Fair	Very good
1901-02	..	Average	Poor
1902-03	..	Good	Poor
1903-04	..	Below average	Bad

27. The failed area returns made by the patwaris seem fairly reliable, except in the case of the Bangar Circle where owing apparently to the way in which no kharaba has been granted on nahri lands, there has been a distinct tendency to under-estimate the amount of failure. The average kharaba for nahri lands for the years selected for the produce estimate is only 1.5 per cent, the figures being —

	Acres
Matured	17,185
Failed	267
Sown	17,452

The failed area percentages in the various circles are given in the table of leading statistics in Chapter I of Part III. The small unirrigated proportion in Taoru is due to the fact that the soil being light and hardy requires less rain. Moreover bajra is the principal crop and the failure is consequently less than in those parts where unirrigated rabi crops are attempted. I have therefore made no further deduction although 15 per cent is very small. In the Bangar Circle both the irrigated and unirrigated percentages are too small and I propose to increase them by 10 per cent. The percentages will then be—

Irrigated	..	11½		Unirrigated	..	28
-----------	----	-----	--	-------------	----	----

The difficulty of correctly estimating the proportion of jowar and chari has been noticed in the reports on other tahsils, and exists here also. At present jowar is regarded mainly as a fodder crop, and many fields are sown rather more closely than is advisable for a jowar crop with the result that the grain suffers, and the outturn is poor. It is hard to determine how far this is due to the drought, certainly there is now a tendency to regard a fodder famine as probable, and to take every precaution against it. Moreover the jowar crop has not done at all well of recent years, and it is not by any means popular as a grain crop even in the Dahar Circle.

28. Statement XII gives the data on which the assumed yields are based.

Yields, Paragraph 31 of the Rewari Report sets out the reasons why the crop experiments in this district have not been very reliable. In the Nuh Tahsil the evidence of crop experiments would never be satisfactory, as the harvests tend to be very much above or below the average, with the result that the selection of fields becomes extremely difficult. At last settlement a number of experiments were made without any reference to the character of the harvest under observation, the object being to get a large number of outturns recorded and strike the average. This is open to the same objection that the result is liable to be either above or below a true average. The people themselves give estimates which as a rule seemed to me fair, and I have generally accepted these yields as correct when the same estimate is given over a large area in different villages. A glance at the statement of matured areas will serve to illustrate my meaning. The average matured percentage for 21 years is 90.7, but during that time the number of years in which the matured percentage is either above 100 or below 80 is 14, while only once has a harvest approached within one point of the average. Unfortunately the situation of the Nuh Tahsil does not admit of much useful comparison with outside districts. The Tijara Tahsil of Alwar State adjoins the Taoru Circle and seems to correspond fairly with it, but the remaining tahsils of Alwar do not afford any help. The Dahar Circle is the one in which the variations of the seasons are most prominent, and for this no satisfactory comparison is possible.

I now proceed to discuss the various yields assumed for the produce estimate.

This is not an important crop except in the Dahar Circle, where the soil is suited to it, and the outturns on flooded land are sometimes very good. I have taken 280 sers on irrigated and flooded lands in the Dahar Circle, and 240 sers on these lands in the other two circles. The outturns for barani are 220, 200 and 140 sers in the Dahar, Bangar, and Taoru Circles respectively, and for bhur 160, 140, and 120 sers.

Bajra is the great autumn cereal, and is especially suited to the light lands of the Taoru Circle where practically nothing else is grown. Very little is irrigated, and I have assumed 280, 240 and 200 sers in the three circles, the barani outturns being 200, 180 and 140 sers. On bhur lands I have taken 180 sers in the Dahar Circle, 160 in Bangar and 140 in Taoru.

The yield of all the pulses is difficult to ascertain with any accuracy, as they are practically never grown alone. I have made no difference between the various soils or circles, the outturn of mung being 140, and of mash and moth 160 sers. For guar I have assumed a cash rate, while chaula has been put at 160 sers throughout the tahsil, and til at 120.

Cane is only grown on canal lands. It is not very popular, and on the whole the outturn does not seem to be good. 800 sers is as high as we can safely go though larger estimates are frequently given. A little barani cane has been put at 480 sers.

This is a most important crop the yield of which is very hard to fix for many reasons. In the first place it is almost impossible to tell what is going to be an average field. This has led to an exceedingly high estimate of the

outturn of cotton, as the experiments have been probably above the true average. The usual reply given by the zamindars is that the outturn is 200 sers on all except the worst lands including canal crops. This is not quite accurate. As far as I could judge canal fields are usually better than unirrigated, though of course the chief advantage of the canal cotton crop is that it enables the farmer to hedge against a total failure. The crop is sown earlier than the unirrigated, and is ready about September, consequently heavy late rain is not needed, whereas for the unirrigated crop it is essential. It is not possible to get a good canal crop and a good unirrigated crop in the same year, as one or the other is bound to suffer. The general assumption (borne out by the five years' average and the rainfall statement) is that dry years predominate and for this reason alone we might fairly put the nahri yield higher than the unirrigated. I propose to take 200 sers on chahi, nahri, and flooded lands in the Dahar and Bangar Circles, and 160 on the barani and bhur; the light Taoru lands are not so well suited to cotton cultivation, and I have assumed 160 sers on chahi and flooded lands, 120 on unirrigated, and 100 on bhur.

Wheat is not nearly so popular a crop as it was at last settlement. On well lands it is very little grown. I have assumed 520 sers in Taoru where it is carefully cultivated, the Ahirs being the only people who grow it to any extent; in the Dahar Circle I have taken 440 sers, and in the Bangar 400. The abhi and dahri wheat of the Dahar Circle I have put at 400 sers. It is only grown on the very best land, gochmi being the regular crop on the average land. In a good year the outturn is very much higher than this, but I do not think it would be safe to assume a higher average. On the barani lands I have taken 240 sers and on bhur 140. On canal lands the crop does well, but the outturn is never high. I take 360 sers on both nahri and abhi land in the Bangar Circle and on abhi in Taoru. On the Taoru dahri which is somewhat inferior I take 320 sers. The Bangar barani is superior to that of Taoru and I take 240 sers in the former against 160 in the latter, the bhur outturn being 140 in both.

Barley is the staple well crop in the Taoru Circle. In the other circles it is not grown to the same extent, owing to the peculiarities of well irrigation there. For Taoru I have taken a yield of 640 sers on chahi and 280 on abhi and dahri. The unirrigated crops are poor in this circle, and I only assume 180 sers on barani and 160 on bhur. In the Dahar circle my yields are 460 sers on chahi, 360 on flooded land, 320 on barani, and 220 on bhur, while in the Bangar Circle they are 500 sers on chahi, 440 on nahri, 300 on abhi and barani, and 200 on bhur. It will be seen that my yields for this crop differ considerably from those adopted by Mr Channing at last settlement not only in the various circles but also and more particularly in their relation to each other. I am convinced that it was wrong to suppose that the chahi outturns in the Dahar and Bangar Circles were higher than those in Taoru, where the well cultivation is much more careful. On the other hand there can be no doubt that the unirrigated crops are better in those circles than in the light Taoru land. I have given a lower outturn for barley than wheat on flooded lands because neither barley nor bajhar are grown on land that has received a proper flooding, and the sign that a field has benefited by the floods beyond the ordinary barani land is that it is possible to grow wheat on it instead of barley. The result is that flooded barley is little better than unirrigated while the wheat is very superior.

Gram is not an irrigated crop at all. It is sometimes mixed with wheat or barley on well lands, the original intention having been to grow the crop without irrigation, and water being only given as a last resort. On canal lands it is grown as a second crop after cotton and then a little water is often required, but the result is no better than on unirrigated lands. The difficulty in fixing a yield for gram is that no separate column has been given to bajhar in the registers, and consequently the area shown as being under gram includes that grown on fallow land and the dofashi gram sown after bajhar. However when dofashi gram is grown to any extent it means that the conditions have been favourable, and the outturn is generally good, so the difference is not so great as might have been expected. Mr Channing's rate of 400 sers per acre in the Dahar Circle

seems to me too high for an all round rate, though on the best lands more than this is frequently obtained. In the Taoru Circle I have taken 340 sers on chahi, 320 on flooded lands, 200 on barani and 160 on bhur. The unirrigated rates are if anything a little high, but gram is only grown in Taoru when conditions are particularly good and the results are better than might have been expected considering the light soils of the circle. In the Dahar Circle I have made no difference between the chahi and unirrigated outturns as gram is not an irrigated crop. On flooded land however it does well and I have assumed 360 sers there against 320 sers on chahi and unirrigated. Practically no gram is grown on bhur, and when it is it usually means that the field possesses some distinct superiority, and I have therefore taken 240 sers. In the Bangar Circle I have taken 400 sers on chahi and nahri, 280 on abri and unirrigated, and 220 on bhur.

Oil-seeds are very little grown in this tahsil. Sarson is grown in the lines of bajhar and gochni crops, and tara similarly in the lines of gram fields. I

(d) Oil-seeds 2 per cent.  
I have taken 160 sers on unirrigated land, 140 on chahi, nahri and flooded, and 120 on bhur throughout the tahsil except in the Taoru Circle where neither crop is much grown and 140 sers seems enough on unirrigated as well.

No zabti rents are found, but as there is a small area under crops for which a cash value is usually demanded I have assumed the same rates as are found in the rest of the district.

The invariable custom in this tahsil regarding straw is that the landlord takes the same share of the straw as he does of the produce. However with the scarcity of grazing prevalent throughout the tahsil it usually has to be consumed for fodder, and practically none can be sold. I have therefore included it in the gross produce estimate, but have omitted it from the net assets calculation.

The outturn of straw has been assumed to be three times that of the grain for jowar, twice for bajra, and one-and-a-quarter times for wheat; in all other cases it has been supposed to be equal to the grain. The value of the straw of rabi cereals and jowar has been fixed at three annas per maund, that of the other kharif crops and gram being put at two annas. The straw of oil-seeds is of no value, and has consequently been neglected.

29. The sanctioned prices of the present settlement are given below in annas per maund, and compared with those of last settlement:—

1	2	3	4	5	6	7	8	9	10	11	12	13
	Jowar.	Bajra.	Mung.	Moth.	Til.	Can.	Cotton.	Wheat.	Barley.	Gram.	Sarson.	Taramira.
Prices at last settlement ..	17	19	21	18	43	..	49	24	17	18	32	22
Sanctioned now ..	20	23	30	22	60	45	64	32	22	23	45	32
Rise per cent. .	18	21	43	42	40	..	31	33	29	28	41	45

Mr. Channing's prices were the average of the 20 years 1854—1873, while the present ones are based on the harvest prices of the last ten years extracted from bannias' books. The sanctioned prices are for the whole district. Mr. Hamilton in his Preliminary Report commented on the fact that there was no difference in the Nuh Tahsil in spite of its isolated position. The reason of this appears to be found in the practice amongst the Meos of borrowing money on a crop before it is grown; if it fails the borrower has to pay the full market value of the crop, though of course the money was lent at a very much lower rate. This has tended to inflate the harvest price of crops to the detriment of the farmer. The all round rise according to the method of calculation given in

paragraph 326 of the Settlement Manual is 24 per cent Bajra is the only crop which attains a high percentage, but the rabi crops wheat, barley and gram taken together are responsible for practically the whole of the spring demand, and cotton with bajra for the autumn. As has been pointed out in the other reports the effective rise in prices is not of much importance as the assessment is being based on cash rents

30. The area available for grazing is very small throughout the tahsil, and what there is produces such inferior grass as to be of very little assistance. Fodder crops are therefore almost entirely stall-fed, and large fodder deductions are necessary. Charri and gowar are fodder crops and as elsewhere will be entirely neglected.

Apart from these regular fodder crops it is difficult to determine what proportions of the various crops the tenant would be allowed to cut for fodder, as the area under kind rents is so small. Undoubtedly large deductions would have to be made, and I accordingly make the following assumptions. Irrigated jowar is regularly cut for fodder and may be entirely neglected, but the case of unirrigated jowar is more difficult. In Rewari 50 per cent of the jowar grown on magda and bhur was deducted, while in the Tijara Tahsil of Alwar Mr O'Dwyer only deducted 12 per cent. I propose to deduct 25 per cent on all soils in this tahsil, and 20 per cent of the pulses which though not grown for fodder are readily sacrificed to make room for a rabi crop. All sarson on irrigated land should be deducted, and 20 per cent of the remainder, as though a valuable crop it is exceedingly delicate, and is in consequence largely cut for fodder. Five per cent must also be allowed for the barley that has to be given up. These deductions are considerably more than those granted in Alwar, but with a salt soil and practically no grazing I do not think that they are excessive.

31. Menials' dues are invariably paid by the tenant and not from the common heap. There is therefore no deduction to be made on this account, but when assessing some account must be taken of the very large area cultivated by the owners themselves, as on all of this the expenses of menials' dues have to be met by the person who is responsible for the land revenue.

The only crops for which hired labour is invariably required are cotton and cane. Cotton pickers get 10 per cent, cash payments being practically unknown. For hoeing cane fields I propose to deduct Rs 3 per acre as in Palwal. In all other cases the Meo relies on the assistance of his own family and no hired labour is required.

32. In the Taoru Circle where wells are regularly worked the owner is responsible for keeping the well in good working order. In the other two circles it is usual for the landlord to take in his tenant as a partner if the well has to be worked, and in these cases the expenses are shared. But here too the majority of the wells are kept in the hands of the owners, and consequently all expenses have to be borne by them. In Taoru 5 per cent will be deducted, but in the other circles, as in the case of the menials' dues, no actual deduction will be made, but the fact must be borne in mind when assessing the tract.

33. The question of the true proportion of the failed to the matured area has already been discussed in paragraph 27. As proposed there 10 per cent will be deducted in the Bangar Circle.

34. The landlord's share of the produce on the various classes of soil was stated in paragraph 25, and the percentages in the following table —

Irrigated	{	Chahi	25
		Nahri	15
Unirrigated			10

As in the case of unirrigated crops, no further deduction has to be made, the Government share is half that of the landlord's. The same is true of chahi in all circles except Taoru, where the share is  $31\frac{2}{3}$  per cent, owing to the deduction referred to in paragraph 32. On nahri land the landlord pays half the cost of the seed and half the canal dues, and in the case of cotton he shares the cost of the picking, while in the case of cane there is the cost of cultivation to be taken into consideration. The details of this have been given in the Palwal Report. For purposes of reference I give them again here—

	Rs	a	p
Cost of seed ...	9	0	0
Share of cost of hoeing ...	3	0	0
Hire of the press .	5	0	0
* Pay and food of the jhoka and tarra .	7	12	0
Total	24	12	0

To avoid unduly complicating the produce estimate I have worked out separately the value per acre of each nahri crop, and to obtain the total value of the Government share it is only necessary to multiply the area by the value per acre. These rates per acre are obtained by working out the value of a matured acre of each crop (less fodder allowance, *vide* paragraph 30) at the yields assumed in paragraph 28, and the sanctioned prices given in paragraph 29. After deducting the value of the seed sown, the canal dues, and the expenditure mentioned in paragraph 31, the Government share is one-fourth of the remainder except in the case of cane when it is one-sixth.

The gross produce and half-net-asset estimates are worked out in detail in Statement XIII. Before abstracting the results here it is necessary to make the allowance in the Bangar Circle for the serious under-estimate of kharaba alluded to in paragraph 27. In the following table the extra deduction of 10 per cent. mentioned there has been made —

1	2	3	4	5	6	7	8	9	10
Circle	Detail	Chahi irrigation	Nahri irrigation	Flooded.	Baran	Total	Value of 1/4th gross produce	Present assessment	Increase of column 7 on column 9
TAORU	Matured area in acres	3,338		1,582	36,052	40,972			
	Value of gross produce	78,932		17,168	2,32,726	3,28,826			
	Half-net-assets	10,964		3,550	45,386	59,900	54,804	36,501	64
	Rate per acre	3-4-7		2-4-0	1-4-2	1-7-5			
DAHAR	Matured area in acres	1,464		6,615	50,563	58,642			
	Value of gross produce	27,863		1,11,907	5,14,086	6,53,856			
	Half-net-assets	3,939		24,029	98,125	1,26,093	1,03,968	1,01,251	25
	Rate per acre	2-11-1		3-10-1	1-15-1	2-2-5			
BANGAR	Matured area in acres	2,163	17,185	89	62,941	82,377			
	Value of gross produce	38,409	3,23,519	1,269	5,09,181	8,72,378			
	Half-net-assets	5,361	43,829	268	1,01,950	1,51,408	1,45,396	1,00,360	50
	Rate per acre	2-7-9	2-8-10	3-0-9	1-9-11	1-13-5			
TOTAL TABLE	Matured area in acres	6,965	17,185	8,285	1,49,556	1,81,991			
	Value of gross produce	1,45,204	3,23,519	1,30,344	12,55,943	18,55,010			
	Half net assets	20,264	43,829	27,847	2,45,461	3,37,401	3,09,168	2,38,112	42
	Rate per acre	2-14-7	2-8-10	3-5-9	1-10-3	1-13-8			

It will be seen that the half-net-assets in all circles is considerably higher than the value of  $\frac{1}{6}$  of the gross produce. This is due to the high rate of batai prevailing on unirrigated soils. In Alwar Mr O'Dwyer assumed a rate of  $\frac{2}{3}$ ths, and this would probably be a fair rate here also.

## CHAPTER VI — HALF-NET-ASSETS BASED ON CASH RENTS

35 The results of the examination of cash rents have been described in paragraph 25. It only remains to decide what share of the corrected rents may be taken as equivalent to half the net assets. In the Taoru Circle, which closely resembles the Rewari Tahsil, I propose to make the same deductions as those detailed in paragraph 37 of that report. In the Dahar Circle the case is quite different. The rent rates are high, and owing to the precariousness of the cultivation the proportion that is unrealisable over a series of years is extraordinarily large. I do not think that the position disclosed by the Hiranthala owners' account books is in any way abnormal, on the contrary everything goes to show that efforts have been made to keep collections up to the highest possible pitch, as there is no doubt that the owners have lost heavily owing to the way in which the full demand has invariably been taken from them. This indicates a loss of 25 per cent on the declared rental, and I propose to make this deduction. It is more difficult to decide what should be done in the Bangar Circle. Not only are there no accounts to help us, but the nahri rents are so obviously unreliable that the whole value of the rents is to a great extent discounted. Under these circumstances it seems best to treat the nahri rate as equivalent to the chahr rate for the purposes of the cash rent estimate. As to the amount of the deduction to be made, the circle seems to me to be about half way between the Dahar and Taoru Circles in the matter of collections, and I accordingly propose to deduct 15 per cent from the rental. The half-net-asset rates and jamas accordingly are as follows —

1	2	3	4	5	6	7	8	9	10
Circle	Detail	Chahr	Nahri	Flooded	Barani	Bihar	Total cultivated	Present assessment	Increase per cent
TAORU	Rate	Rs 2 5 0		1 7 0	1 2 0	0 10 6	1 3 3		
	Area	Acres 5,385		1,685	26,149	7,946	41,165		
	Amount	Rs 12,462		2,422	29,418	5,215	49,507	36,501	35
DAHAR	Rate	Rs 1 7 3		1 7 0	1 8 5	0 15 9	1 7 1		
	Area	Acres 3,686		26,225	39,698	8,473	77,385		
	Amount	Rs 4,194		38,669	60,551	8,341	1,11,785	1,01,251	10
BANGAR	Rate	Rs 1 13 9	1 6 0	1 6 0	1 6 0	0 11 6	1 5 7		
	Area	Acres 4,876	23,273	1,023	50,929	6,879	86,985		
	Amount	Rs 9,066	32,000	1,413	69,927	4,944	1,17,350	1,00,307	17
TOTAL	Rate	Rs 1 16 4	1 6 0	1 7 5	1 5 11	0 12 8	1 6 9		
	Area	Acres 13,147	23,273	29,041	1,16,776	23,298	2,05,537		
	Amount	Rs 25,712	32,000	42,504	1,69,926	15,500	2,02,840	2,38,112	23

The results given by the cash rents are invariably lower than those of the produce estimate. This is of course due to the batai rate, which, as I pointed out when dealing with the abstract of the produce estimate, is too severe for this tahsil. In the Tho'u and Dahar Circles the results of the cash rents give in my opinion a very full half-net-assets jama. In the Bangar Circle the result is vitiated by the nahri rents, which are ridiculously inadequate. I have previously suggested that the chahi rate should be assumed to apply to the nahri area in order to correct to some extent this false result. If this be done the nahri jama is raised to Rs. 43,273, and the total jama to Rs. 1,30,623. Even this is not sufficient, because the produce estimate shows that the nahri land is distinctly more valuable than the chahi, taking into consideration the difference in the proportions of irrigation. This is exactly what would be expected, as the Bangar chahi is inferior, whereas the nahri, though not so good as that in the Palwal Tahsil is still a very good irrigated soil, and one that is particularly useful on account of the inferiority of the chahi irrigation. The half-net-assets nahri cash rent rate in Palwal is Rs. 2-12-0 and in Firozpur Re 1-12-6. It is probably fairly correct to assume that the Bangar Circle stands about midway between these two. This indicates a rate of about Rs 2-4-0 for nahri, and if this assumption be made, the cash rent jama will be raised to Rs. 1,37,714 which is a fairly close approximation to the produce estimate figures. The difference would then, as in the other circles, be attributable to the rate of batai.

---

## PART II.—FISCAL AND MISCELLANEOUS.

## CHAPTER I—FISCAL HISTORY.

36. The tahsil, as at present constituted, contains 289 villages of Parganas Nuh, Taoru, Hathin, Sohna, Bahora and Palwal. At last settlement there were 311 villages included in the tahsil, and the present numbers are the result of a redistribution carried out by Mr Channing. The history of the various parganas after annexation is given in paragraphs 8 to 15 of the Nuh Report. Some were farmed out for short periods, but in all cases as soon as settlements were arranged a very heavy Summary Settlement was fixed which proved too much for the people. Pargana Taoru broke down and several reductions had to be granted, while all the other parganas were more or less distressed. In 1841 Mr. Barnes resettled the whole of the present tahsil, and finding a state of almost universal poverty he granted large reductions, which had a most beneficial effect. The jama of the Taoru, Hathin and Nuh Parganas, and of the Bahora, Sohna and Palwal villages was reduced by him from Rs. 3,11,697 to Rs 2,37,448. In the case of the Bahora villages apparently no re-assessment was made.

Mr Channing quotes Mr Fraser as speaking well of the working of all these settlements, but owing to the destruction of records in the mutiny no detailed account of the working up to 1857 could be given. However there seems no doubt that the general condition of the people was good.

37. The second Regular Settlement was begun in 1872 and completed under circumstances that are well known in 1883. Mr Channing found everywhere signs of great prosperity, and partly owing to the fact that the seasons at that time were particularly favourable, he was led to impose a heavy increase on the tahsil. In summing up the position as he found it, Mr Channing notes that the assessments were the result of reductions in the past amounting to 27 per cent, while on the other hand cultivation had increased by 42 per cent, and the value of produce even at a low calculation by 11 per cent. Irrigation had developed, and the increase in population was proportionate to the increase in resources. Transfers were light on the whole, and except in inundated tracts the revenue demand had been paid with great regularity. Mr Channing based his proposals upon the results of his produce estimate. Except that the outturns in the Dahar Circle were rather high owing to the abnormally good seasons and were applied to the whole area cultivated during the year of measurement, there is nothing to which exception can be taken in the produce estimate. The value of the gross produce of the whole district as calculated in Form D was Rs 21,48,038, one-sixth of which is Rs 3,58,007. The total given by the circle rates was Rs 2,72,385 and the jama actually imposed was Rs 2,59,984. This, however, is only for the present 289 villages, and therefore no comparison with the assessment made by Mr Barnes is possible, but the increase was fairly considerable. The settlement broke down almost immediately, and Mr Wilson was appointed to carry out a revision of the demand in 1882. The plan adopted is clearly explained in the Revision Report printed with the Gurgaon Settlement Report, and I do not propose to add to what has already been said there. The result of these proposals is given in Appendix II of Mr Wilson's Report and shows a permanent reduction of the demand to Rs 2,41,584, with an additional reduction of Rs 28,187 for seven years. These proposals were sanctioned, and it is with them working that we are principally concerned now. In the Taoru Circle the expiring settlement has worked very well, though the average collections are only Rs 31,124 against a demand of Rs 36,501, or 85 per cent. In the Bangar Circle also, owing to the introduction of irrigation from the Agra Canal, the general condition of the people is good, but the individual circumstances vary. The portion which is now benefited by the canal was originally the worst in the circle, and consequently was lightly treated. The result is that now we have part of the circle lightly assessed with all the benefits of irrigation to be

taken into account, while the remainder, which was not so leniently treated in the first instance, has suffered during the past dry years. Still even here there is no real distress, and on the whole the assessment has worked very well. The average collections amount to Rs 87,148 against a demand of Rs 1,00,360, or 86 per cent. As the demand in canal villages has always been collected in full almost without exception this shows that in the unirrigated portion of the circle a good deal of relief has been required. Turning to the Dahar Circle the first point to which I would call attention is the change introduced by Mr Channing in the fluctuating assessment of the portion now known as Chak Jhil. The villages whose lands were liable to flooding from the waters of the Kotila Jhil were assessed with a fluctuating assessment. The conditions have altered considerably since Mr Channing's time. The enormous fluctuations in cultivation, which were then caused by submersion, are now due to drought, but the effect is the same. At the time of revision some modifications in Mr Channing's proposals were sanctioned, allowance being made for failure, and revenue only levied from harvested crops. This system is most popular, and indeed it is difficult to imagine what would have happened if some such system had not been in force. As it is the people are very poor, and the large area out of cultivation shows that they are unable to fully develop their resources. In paragraph 62 of the Revision Report Mr. Wilson has worked out the average fluctuating revenue at Rs 8,566, but the average since 1883 is only Rs 3,487. The reductions in the case of fixed revenue are given in paragraph 13 of the Revision Report, and amount to Rs. 11,861, the jama coming to Rs 1,03,236 against Rs 1,15,097 imposed by Mr Channing. Making allowance for the difference due to the introduction of the fluctuating assessment this was an increase of about Rs. 10,000 on Mr. Barnes' assessment, but even this has proved too much for the people to pay. Collections have amounted to 84 per cent since 1883, which is almost exactly the same as in the other circles. In other respects, however, there is no comparison between the three circles. The Dahar Circle is infinitely the poorest, and in spite of the drainage schemes, which it was thought would improve its condition considerably, there can be no doubt that the account given by Mr. Barnes and quoted by Mr Channing in paragraph 11 of the Nuh Report is fairly applicable to the Dahar Circle at the present time. This is I think almost conclusive evidence that this circle cannot stand a heavy assessment, and is not inclined to deteriorate under lenient treatment. Mr Barnes found the tract suffering a great deal from the severe summary assessments that had been imposed, and by judicious reduction of the demand not only saved the circle from further ruin, but actually ensured a fair amount of prosperity during the whole course of his settlement. The position was not quite so good as appeared to Mr Channing, because the period of settlement was abnormally prosperous for a tract so entirely dependent on the rainfall. Still the area mortgaged was small compared with the present state of things, and the people were by no means overburdened. Now the decrease in cattle, and the very serious extent to which transfers have taken place indicate a real poverty, which a good season now and then is powerless to avert. No doubt the present position is abnormally bad just as it was abnormally good at last settlement, but there is this great difference, that the effect of a few good seasons may wear off very quickly, whereas the results of drought tend to handicap the people for a long time. More than anything else the history of the past settlement shows the fatal results of an inelastic system of revenue administration on a tract where the variations in harvests are so great.

The following statement shows the various jamas that have been imposed on the tahsil since annexation —

1	2	3
Periods	Jama in rupees	Incidence
	Rs	Rs a p
First Regular Settlement	2,86,346	1 6 9
Second Regular Settlement	2,59,879	1 3 11
1883-84 Settlement	2,18,155	1 0 11
1889-90	2,38,129	1 2 6
1905-06	2,38,112	1 2 2
	176	

The appended statement shows the suspensions, remissions and collections of revenue during the last 21 years in percentages on the average khalsa demand —

YEAR.	SUSPENSIONS				REMISSIONS.				COLLECTIONS				
	Dabar			Total	Tuoru	Dabar		Bangar	Total	Dabar			
	Tuoru	Bangar	Total			Tuoru	Dabar			Bangar	Total	Tuoru	Bangar
1885-86		10 8	02	4 8		10 8	02	4 8	95 9	Fixed	87 6	100 1	94 1
										Fluctuating	89 9		95 1
1886-87		..							97 8	Fixed	97 3	93 2	95 6
										Fluctuating	99 8		98 7
1887-88		6 4	00 4	2 7		6 4	00 4	2 7	93 4	Fixed	9 5	92 5	95
										Fluctuating	84 3		89 1
1888-89									93 6	Fixed	86 3		90 0
										Fluctuating	13 4	92 4	13 4
1889-90		9 2	1	4 5					97 3	Fixed	90 0		91 5
	3 8									Fluctuating	91 6	101 5	92 2
1890-91		2 0		1 1					104 5	Fixed	93 2		98 6
		Fixed		1 1						Fluctuating	92 7	101 5	97 1
1891-92		3		3					101 9	Fixed	294 5	101 8	294 5
		Fluctuating		3						Fluctuating	108 8		104 4
1892-93		1 4		6		1 0		4	101 9	Fixed	105 0	101 8	108 6
		Fixed		0 7						Fluctuating	171 0		171 0
1893-94		44 5		44 5					101 6	Fixed	119 6	101 8	108 6
		Fluctuating		5						Fluctuating	106 3		108 7
1894-95		1 6		7		1 2		6	101 6	Fixed	264 9	101 7	264 9
										Fluctuating	104 2	101 7	102 8
1895-96		7 6		8 3		9 3		8 1	101 6	Fixed	101 3		101 5
										Fluctuating	210 2		210 2
1896-97		8 8	2	3 0					101 6	Fixed	101 1	101 7	101 4
		Fixed		2 9						Fluctuating	100 4		101 2
1897-98		6 5		15 9					101 6	Fixed	100 4	101 5	101 0
		Fluctuating		3 4						Fluctuating	85 6		85 5
1898-99		5 4	3	2 4		1 3		5	101 6	Fixed	109 2	102 3	105 2
										Fluctuating	106 5		104 0
1899-1900		10 3	1 0	4 9					100 8	Fixed	204 9	106 6	204 9
										Fluctuating	59 8		95 0
1900-01		80 3	49 2	66 5					25 6	Fixed	91 7		95 9
										Fluctuating	22 6	52 5	22 6
1901-02		6 1	3	2 7		5 6		2 4	15 4	Fixed	21 3		35 0
										Fluctuating	11 1		35 3
1902-03		22 5	7 7	13 1					101 4	Fixed	116 2	122 4	124 4
										Fluctuating	117 0		124 8
1903-04		38 3	10 5	31 2	20 8	75 2	28 9	47 5	99 4	Fixed	86 8		86 8
	5 9									Fluctuating	89 2	92 2	83 3
1904-05		9 6	2 1	5 0					105 1	Fixed	60 5		83 7
										Fluctuating	47 1		47 1
1905-06		22 5	7 7	13 1					101 4	Fixed	107 5	106 7	106 8
										Fluctuating	108 5		107 2
1906-06		57 2	32 2	39 2		2 4		1 0	90 6	Fixed	70 0		70 0
	11 0									Fluctuating	61 5	9 1	95 7
										Fixed	81 0		93 0
										Fluctuating	100 7		100 7
										Fixed	105 0	111 5	116 8
										Fluctuating	123 7		115 6
										Fixed	20 0		21 0
										Fluctuating	43 2	6 5	61 7
										Fixed	44 0		62 1
										Fluctuating	25 4		25 4

The remissions in 1901-02 were on account of the Coronation, and in 1905-06 were of sums outstanding for more than three years

The amount under suspension at the end of Rabi 1907 was as follows:—

1				2	3	4	5
				Taorn	Dahar	Bangar.	Total.
1	On account of previous years	...	...	..	23,075	2,915	25,990
2	Do 1905-06	...	...	3,799	56,696	31,924	92,419
3.	Total	...	...	3,799	79,771	34,839	1,18,409
4	Proposed for recovery with rabi instalment of 1907			1,459	15,592	14,528	31,579
5.	Proposed for remission (rabi 1907)				8,960	132	9,092
6	Total proposed recoveries and remissions	..		1,459	24,552	14,660	40,671
7	Balance outstanding	...	..	2,340	55,219	20,179	77,738

All unrecovered balances existing when the new demand is announced should be remitted

## CHAPTER II.—MISCELLANEOUS.

38 The total population at the last census was 145,931. Separate figures for the children of each tahsil are not available, but taking the average of the whole district the figures are—

1		2	3	4
Detail		Males	Females	Children under ten (excluding infants)
Urban		8,864	8,160	3,968
Rural		46,578	42,805	20,835

Infants have been estimated to number 10 per cent of the total population. The diet of the zamindars of the district has been described in the Rewari Report. I do not think that any changes need be made for this tahsil, and shall therefore adopt the same scale of diet as was assumed there. For purposes of reference it is shown in the following table —

1		2	3	4	5	6	7
		MALES		FEMALES		CHILDREN	
		Chataks per diem	Maunds per annum	Chataks per diem	Maunds per annum	Chataks per diem	Maunds per annum
Urban	...	10	5 $\frac{1}{2}$	8	4 $\frac{1}{2}$	6	3 $\frac{1}{2}$
Rural	...	12	7	9	5	6	3 $\frac{1}{2}$

The total annual consumption is therefore 714,569 maunds. The yield of food grains is given in the detailed produce estimate, and the tahsil totals in maunds, after making the fodder deductions shown in paragraph 30 are as follows.—

Jowar	60,622	Chaula	11,978
Bajra	239,847	Wheat	59,792
Maize	1,209	Barley	166,340
Mung	12,446	Gojra	12,623
Mash	1,707	Gram	127,236
Moth	6,516	Gochri	47,832

Except in the case of wheat, the amount of seed sown, and the failed area percentages may be taken to be the same as in the Palwal Tahsil. The large flooded area sown with a wheat crop, and the peculiar system of well irrigation must be taken into account, and I have therefore allowed 20 per cent for wheat as for barley, and also for the mixtures. The deductions for conversion into flour are given in the appended table:—

Jowar	} 1½ per cent.	Wheat	} 5 per cent.	Barley, 10 per cent.
Bajra		Pulses		
Maize		Mixtures		

The result of the above calculations is tabulated as follows:—

1	2	3	4	5	6
Crop	Seed per acre in sars	Percentage of failed area.	Total amount of seed sown in maunds	Net produce in maunds	Net produce converted
Jowar . . . . .	15	25	7,965	52,657	52,627
Bajra . . . . .	3	25	5,119	284,728	231,794
Maize . . . . .	7	14	88	1,171	1,156
Mung . . . . .	3	25	424	12,022	11,421
Mash . . . . .	3	25	51	1,657	1,575
Moth . . . . .	5	25	330	6,184	5,875
Chaula . . . . .	1	25	117	11,861	11,268
Wheat . . . . .	50	20	10,307	49,485	47,011
Barley . . . . .	50	20	29,778	136,562	122,906
Gojra . . . . .	50	20	2,387	10,236	9,715
Gram . . . . .	25	22	14,106	113,130	107,473
Goobni . . . . .	40	20	7,371	40,561	38,533
Total		...		6,70,254	6,41,354

This gives a deficit of 78,215 maunds of food crops yearly. There is, however, a large area of non-food crops, the total value of which, as taken from the produce estimate, is Rs 3,98,292. In the above calculations half the value of the cane, and one-tenth of the value of the cotton have been deducted as part of the cost of production, and some further deductions are necessary on account of seed. This does not leave a very large margin to provide clothing and the necessaries of life, but the calculations can at best be only a rough guide. Unfortunately no figure of exports and imports are available, as the railway does not run through the tahsil, and consequently it is impossible to apply any test to these assumptions. The people do not as a rule, either in their dress or style of living, give any indication of prosperity, and except in the canal tract, there is a good deal of poverty. To some extent the constitutional thriftlessness of the Meo is responsible for this, as even with a light assessment and a hardy soil, such as is found in the Taoru Circle, he cannot be said to be really prosperous, but there can be no doubt that the recent dry cycle has had a great effect on the welfare of the tahsil as a whole, and of the Dehar Circle in particular. This is important in this connection, as the Dahar Circle is the only one which is capable of showing any great variations in cropping according to the state of the seasons. While, therefore, admitting the general poverty of the tahsil, I do not think that the position is quite as bad as these figures make out, and under normal conditions the tahsil may be assumed to be self-supporting.

demonstrated. Although the recent drought may have been responsible for some of this development originally, the system is now so popular that I do not think there need be any fear of a contraction of irrigation in the future. on the contrary it is more probable that after settlement there will be a further increase, as the tendency is for irrigation to be rather restricted during a settlement, in order to avoid a chahi assessment. The position of the flooded lands has now greatly improved. The drainage from the hills has been controlled by some excellent bunds, with the result that in place of rather precarious dahri, the circle now contains good abi. In the statistics in the previous paragraph the two soils have been classed together, but the superiority of the abi is shown in the following comparison of their matured areas, which put in the form of percentages are—

Abi	..	...	...	...	...	110
Dahri	..	...	.	...	...	68

This is perhaps an exaggeration of the difference between the two soils, but there can be no doubt that the abi is distinctly the better soil of the two. For this reason I propose to retain the present system of levying abiana from these bunds. Not only will this serve to equalise the difference between the flooded soils, but in the case of land that may be brought within the operation of the bunds in future it will be useful. The bund system is capable of very great improvement, and if this be carried out, the flooded area will be substantially increased. Finally the operation of properly controlled floods is extremely beneficial to the light Taoru soil, and this advantage over the dahri land can be best accounted for by a fluctuating rate. The present abiana rate is 8 annas per pakka bigha. The rates proposed by Diwan Tek Chand in his No 207 L F, dated 30th April 1904, to the Commissioner Delhi Division, which was forwarded to Government with Commissioner's No 208, dated 9th May 1904, were Re. 1 per pakka bigha for all the bunds in the Nuh Tahsil, but these proposals have not as yet been put into force. From the produce estimate it will be seen that the difference between the value of a matured acre of abi and barani land is Re 1. As I am proposing to assess abi land at a higher fixed rate than barani, I think that a fluctuating rate of 8 annas per pakka bigha, or Re. 0-12-9 per acre will be sufficient. In other respects there has not been any great development since last settlement. Population has increased, but there is not a corresponding increase in cultivation, while bullocks and ploughs have actually decreased. The results of the produce estimate and cash rents indicate that a large increase can be taken, but there are the following reasons for caution. In the first place the circle has always been lightly assessed in the past. It is natural to compare the rich soil below the hills with this sandy table-land, and fix much lower rates for it than for the Dahar Circle. This is to some extent incorrect, as the circle, though lighter, is far more secure than the heavy clay and loam lands. On the other hand the circle is divided up into small estates owned by Meos, who never manage to accumulate any wealth, and cannot stand any very great increase in their assessment.

The rates adopted by Mr. Channing and Mr. Wilson are compared with those deduced from the produce and cash rent estimates in the following statement:—

1	2	3	4	5	6	7	8	9
	Ohahi.	Abi dahri.	Narmot.	Magda.	Bhqr	Rate on total cultivation	Jama	Actually assessed.
	Rs a	Rs a	Rs a	Rs a	Rs a p	Rs a p	Rs	Rs.
Mr Channing	2 8	1 12	1 2	0 14	0 9 0	0 15 4	39,789	38,988
" Wilson	2 1	1 8	1 2	0 14	0 7 0	0 14 6	36,097	..
Produce estimate	...	...				1 7 5	59,900	..
Cash rents	2 5	1 7	Rs 1-2-0		0 10 6	1 3 3	49,507	.

The very high-rate of batai is responsible for the difference between the jama according to the produce estimate and that given by the cash rents. In Section 26 of the Nuh Report Mr. Channing notes that only 3 per cent of the tenancy lands were held on kind rents, the usual rate being one-third. I do not know what has been responsible for the change, but the universal rate throughout the whole tahsil is now one-half. The area under cash rents is not large, but the proportion has risen from 7 per cent. to 17 per cent. of the cultivated area, so the rents may be taken to be fairly representative, especially as the largest number are on the characteristic magda soil of the circle.

The rates which I propose are—

1	2	3	4	5	6
Soil.	Rate.	Area.	Demand	Total	Incidence.
	Rs a p	Acres	Rs.	Rs.	Rs a p
Chahi pakka .. .. .	2 4 0	3,897	8,768	...	..
„ kachcha ... .. .	1 12 0	1,488	2,604	...	...
Flooded ... .. .	1 4 0	1,685	2,106	...	...
Barani ... .. .	0 15 0	26,149	24,515	...	...
Bhur .. .. .	0 8 6	7,946	4,221	42,214	1 0 5

This is an increase of 14 per cent. on the present assessment. It is 82 per cent. of the cash rent estimate, and 71 per cent. of the half-net-assets as given by the produce estimate after making the necessary deductions. It is only slightly more than one-eighth of the gross produce, and may therefore be considered to be rather light, but the circle is not wealthy, and I think that the increase is quite as much as can safely be taken. The proportions of the proposed rates agree fairly closely with those of the cash rents. The chahi rate appears to be high, but the area cash rented is very small, and is hardly representative of the chahi of the circle. Moreover, the kachcha chahi is being assessed at a lower rate on account of its instability, so that there is a fair difference between the proposed rate and the rent actually taken. My village assessments in the villages which I have inspected for assessment give a total of Rs. 19,147 against an existing demand of Rs. 16,720, or an increase of almost exactly 14 per cent.

41. This circle contains 106 villages. At last settlement Mr. Channing found it in a very prosperous condition.

The Dahar Circle.

The reductions granted by Mr. Barnes at the previous settlement had enabled the tract to recover from the poverty in which he had found it, and a series of good harvests still further improved the position. The danger which Mr. Channing had to face was that owing to excessive flooding a great deal of the dahar area was liable to submersion, and so in a year of good rainfall large remissions of revenue were necessary. The part most affected by this was the Kotila Jhil land, which for three years had been almost totally submerged. In order to cope with this Mr. Channing proposed that this area should be given a fluctuating assessment, and this was eventually sanctioned. Mr. Wilson, when revising the assessment, came to the conclusion that the rules required further modification in favour of the zamindars, and accordingly proposed the rules contained in paragraph 62 of the Revision Report, which are still in force. The number of villages affected by this arrangement is seven, and the total area under fluctuating assessment is now 4,152 acres. A slight modification of the fixed and fluctuating areas may be found necessary in accordance with the wishes of the people, but the difference will be small and the actual details can be settled after the sanction of Government to

the general proposal has been obtained. The position has of course entirely altered since settlement owing to the way in which the Kotla Jhil has been drained, but the effect is the same, where formerly they suffered from submer- sion, drought now causes at least as much distress. All the villages under the fluctuating assessment are wretchedly poor, and the appended statement will serve to show how the area capable of cultivation varies according to the seasons. I do not propose to make any change in the existing arrangements as there is no justification for any increase in the rate to be applied to the matured area, while the fluctuations of cultivation indicate that a fixed assessment is not advisable. In this connection I would refer to paragraph 46 of the Ferozpur Report. As in that taluk none of the villages were ready for inspection, but as far as I can see no change in the rates or rules is called for. With regard to the land, which, though coming under the fixed assessment, was liable to submer- sion, Mr. Channing proposed that if in any village 10 per cent. of the lands were submerged in one harvest the revenue demand on the submerged area should be remitted. This rule is I think no longer required. Under the present condi- tions it seems likely that only a very small area is liable to be submerged in a year of ordinary rainfall, and in an abnormal season it is better that the Deputy Com- missioner should be free to use his own discretion as to remission without being tied down by any rules as to the proportion that must be submerged before relief can be claimed. Moreover, the difficulty in the future is likely to be one of drought rather than of overflowing, and the 10 per cent rule seems unnecessary, but the importance of careful revenue administration cannot be too strongly emphasised. Mr Channing made a similar remark in Section 220 of the Settle- ment Report, but his idea that the tract requires a heavy assessment does not seem to have been borne out by the fiscal history. The great prosperity that attended the reduced assessment imposed by Mr Barnes shows either that the people will work with a light assessment or else that the ideas of what constituted a light assessment were wrong. Certainly Mr Channing's demand was extremely heavy. It was based on the results of a produce estimate which contained the cultivated area of a single year admittedly far above the average, and though the commutation prices appear to have been moderate the outturns assumed—especially on the large flooded area—were somewhat high. Mr Wilson made considerable reductions at revision but even this demand has proved too heavy for the people to pay, and there are now unmistakeable signs of distress. Cultivation had reached its limit at last settlement, and though population has not increased to any great extent both mortgages and sales are far too common, and the unencumbered area is terribly small. Ploughs and bullocks have decreased, and there is a general state of indebtedness, from which the people will take a long time to recover. The rates adopted by Mr Channing and Mr. Wilson are compared with those deduced from the produce and cash rent estimates in the following table —

1	2	3	4	5	6	7	8
	Chabi.	Flooded	Chiknot and narmot	Magda	Bhar.	Rate on total cultivation	Jawa
	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs a p	Rs
Mr Channing	2 8 0	2 0 0	1 6 6	1 4 0	0 10 6		
Mr Wilson	2 0 0	1 12 0	1 5 0	1 2 0	0 7 0		
Produce esti- mate	..	...	...		..	2 2 5	1,26,093
Cash rents ...	1 7 3	1 7 6	1 8 5		0 15 9	1 7 1	1,11,785

440  
Statement of the cultivated and matured areas in the villages now paying fluctuating assessment.

1	2	3	4	5
Year.	Fluctuating area	Area matured.	Area failed	Total area sown
Last Settlement ..	6,812	4,355	...	7,935
1883-84 ... ..	7,908	5,795	3	5,798
1884-85 ... ..	7,908	2,981	...	2,981
1885-86 ... ..	7,910	234	35	269
1886-87 ... ..	7,917	298	9	307
1887-88 ... ..	7,000	417	54	471
Total of five years ...	38,643	9,725	101	9,826
Average of five years	7,729	1,945	20	1,965
1888-89 ... ..	1,355	1,193	77	1,270
1889-90 ... ..	7,326	6,682	453	7,035
1890-91 ... ..	7,415	3,820	183	4,003
1891-92 ... ..	7,463	6,891	154	7,045
1892-93 ... ..	7,397	3,694	144	3,838
Total of five years ...	30,956	22,180	1,011	23,191
Average of five years	6,191	4,436	202	4,638
1893-94 ... ..	7,398	2,894	85	2,979
1894-95 ... ..	7,205	2,203	86	2,289
1895-96 ... ..	7,029	956	674	1,630
1896-97 ... ..	7,155	1,786	1,046	2,832
1897-98 ... ..	7,324	4,574	1,008	5,582
Total of five years ...	36,111	12,418	2,899	15,312
Average of five years	7,222	2,483	580	3,062
1898-99 ... ..	7,362	553	1,101	1,654
1899-1900 ... ..	7,378	265	1,904	2,169
1900-01 ... ..	7,270	2,541	1,129	3,670
1901-02 ... ..	7,274	1,060	1,236	2,296
1902-03 ... ..	7,149	1,579	774	2,353
Total of five years ..	36,433	5,998	6,144	12,142
Average of five years	7,287	1,200	1,229	2,428
1903-04 ... ..	7,165	2,242	1,205	3,447
1904-05 ... ..	7,162	5,269	915	6,184
1905-06 ... ..	7,187	569	2,387	2,956
Total of 23 years	163,657	58,396	14,662	73,058
Average of 23 years	7,116	2,539	637	3,176

As elsewhere in this taluk the difference between the jama given by the produce estimate and that of the cash rents is due to the high rate of baram which prevails. The cash rent jama is that given after making the deductions for non-realisation. The extraordinary similarity of all rents except those on bhur shows that at present no difference is being recognised between the various classes of soil. In the case of the flooded lands I think that this is only temporary. When seasons are bad the first land to suffer is the heavy abi or dabri, which deprived of its normal moisture is practically useless. The result of the recent bad harvests has been to diminish the value of this land, but there can, I think, be no question of its real superiority. To a less extent the same is true of the chahi. At first sight it would seem that in a tract where the wells are purely protective a series of dry years would tend to increase their value, and this would be the case here but for the fact that the water is as a rule so salt that its continued use is most harmful to the soil. Moreover, owing to the poverty of the people, the expense of working a well makes it unpopular at the present time. While therefore admitting the similarity between the two cases I should say that the depreciation in value of the chahi land will be more lasting than in the case of flooded lands, as in the former instance the recovery depends upon the recovery of the circle which is likely to be very slow on the other hand the value of flooded land will go up at once with the advent of one or two good harvests, and this will be the chief factor in restoring the general prosperity of the tract. Accordingly in my rates I have recognised no superiority of well lands over abi and dabri, but have not maintained the close similarity between the various soils that is indicated by the cash rents. I propose to assess all abi land to a fixed assessment, and not levy any abiana in this circle. I except from this rule the irrigation by sluices on the Khabipur and Qutabgarh Bunds, which will ordinarily pay a baram assessment, but when flood water is received a fluctuating rate will be charged. For these lands and any others which, under the new rules that are being proposed, may become liable to pay a fluctuating rate, I propose that a rate of 10 annas per pakka bigha be sanctioned. This is very nearly the amount of the difference between the values of a matured acre of flooded and baram land as shown in the produce estimate, and is as high as I think can fairly be imposed.

The rates which I propose are—

1	2	3	4	5	6
Soil	Rate	Area.	Demand	Total	Incidence
	Rs s p.	Acres	Rs	Rs	Rs a p
Chahi and Flooded ...	1 7 0	29,214	41,995		
Baram .. ..	1 3 6	39,698	48,381		
Bhur .. ..	0 10 0	8,473	5,296	95,672	1 3 9

The new demand is 81 per cent of the cash rent estimate and 78 per cent of the half-net-assets as given by the produce estimate. It is almost exactly one-seventh of the gross produce, which under present circumstances is fully as high a proportion as can be taken from the circle. My assessments in the villages which I have inspected come to Rs. 35,261 against a present demand of Rs. 36,537, or a decrease of 4 per cent. against one of 6 per cent according to my proposals.

42. This circle contains 99 villages. Like the Dabar Circle it was heavily assessed at last settlement, but

The Bangar Circle

fortunately, owing to the introduction of canal irrigation, it is in a most flourishing condition now, though of course the area which is not served by the canal presents a marked contrast to the remainder. The soil is a fair level loam, and in a good year the unirrigated crops are nearly equal to those of the Dahar Circle. The canal lands lie at the extreme edge of the distribution area, and consequently there is often a shortage of water. Very few cases of water-logging have come to my notice, but the soil has undoubtedly been weakened by irrigation in places. The great difficulty in assessing the tract now is that the unirrigated area was apparently

the best at last settlement and so <sup>442</sup> the introduction of the canal would have made the assessment light on that portion in any case, we find that the prosperous villages were more leniently treated than those which have not as yet benefited by the canal at all. The statistics of the circle as a whole do not emphasise this position, and I have therefore drawn attention to it here, as it has a very important bearing on the amount of increase that can safely be taken. Apart from canal irrigation the circle is singularly devoid of advantages. The wells are merely protective as in the Dahar Circle, and the water being generally salt they are little used. There is no flooded land, and very little benefit has been derived from the bunds. It is therefore hard to imagine a greater contrast than that presented by the two parts of this circle. Certainly there is not the same poverty as exists in the Dahar Circle, because the people as a whole are more thrifty, but on the other hand the canal villages are extremely well off, and could have afforded to pay a higher revenue than has been exacted. The rates adopted by Mr. Channing and Mr. Wilson are compared with those deduced from the produce and cash rent estimates in the following statement.—

1	2	3	4	5	6	7	8	9
	Chahi	Nahri	Flooded	Chiknot and Narmot	Magda	Bhur	Total cultivation	Jama.
	Rs a p	Rs a	Rs a	Rs a	Rs a	Rs a p	Rs a p	Rs.
Mr Channing ..	2 10 0	..	1 12	1 4	1 1	0 10 6	1 3 9	1,05,772
„ Wilson ...	1 12 0	..	1 4	1 4	1 0	0 6 0	1 2 9	1,00,444
Produce estimate ...	..	..	..	..	..	..	1 13 5	1,51,408
Cash rents ..	1 13 9	1 6	1 6	1 6	1 6	0 11 6	1 5 7	1,17,350

The present assessment is Rs 1,00,360, and the increase given by the kind and cash rent jamas is 56 per cent and 17 per cent respectively. As pointed out in paragraph 35 the nahri cash rent rate is unreliable, and should be increased to about Rs. 2-4-0, making the total jama Rs 1,37,000, and giving an increase of 37 per cent. The difference between the two jamas may then be attributed entirely to the high rate of batai. I have made no difference between the abi and unirrigated rates, as the area of abi land is too small to afford any real indication of its letting value. The unirrigated rates may be compared with those in force in the Dahar Circle. The higher chahi rate does not indicate superiority in the well irrigation, but is the result of the greater prosperity of the circle, which allows advantage to be taken of the wells to a degree impossible there.

Turning to the actual assessment, I must begin by noting that I propose to levy a fixed assessment on canal lands, as was done in the Palwal Tahsil. The point has been discussed in paragraph 41 of that report, and here too I shall make no distinction between "lift" and "flow" irrigation for the same reasons as were given there. The difficulty of taking a full increase from the canal villages has already been touched upon. Most of the canal area was leniently assessed at unirrigated rates, and no attempt has been made to give Government a share in the increased profits that have accrued for some years past. Consequently in some cases a full half net assets demand would entail a perfectly impossible increase in the revenue. Probably a short term assessment would be best for this tract, but as the orders of Government have already been asked for on this point there is nothing further to say. If progressive assessments are sanctioned, the necessary proposals will be put forward later.

The rates which I propose are—

1	2	3	4	5	6	7
Soil	Rate	Area	Demand	Total	Incidence	REMARKS
	Rs a p	Acres	Rs	Rs	Rs a p	
Chahi	1 8 0	4,876	7,314			
Nahri	1 11 0	23,273	39,273			
Barani	1 3 6	51,957	64,321			Barani includes 1,028 acres of flooded land
Bhur	0 10 0	6,879	4,299	1,14,267	1 5 0	

This gives an increase of 14 per cent. My village assessments in the villages inspected, by me give a total of Rs. 48,743 against a previous assessment of Rs. 48,983, or an increase of about 11 per cent. I had originally proposed an increase of only 12 per cent, but the present rates have been arrived at in consultation with Mr. Gibson, with whose suggestions I entirely agree. I do not think that the village notes require revision at present, but if after inspecting the remaining villages this is found necessary, I do not anticipate that there will be any difficulty in making the slight enhancement. The new demand is 83 per cent. of the corrected cash rent estimate and 73 per cent. of the half net assets as given by the produce estimate. It is over 97 per cent. of the actual cash rent jama, and if there were the slightest fear that the nahri rents represented the true state of things, it would be impossible to approach so closely to it. This point has, however, been fully discussed, and I will merely repeat that I think that the corrected estimate is as near the truth as one can hope to get with an assumption as against actual facts.

43. By these proposals the fixed demand of the tahsil is raised from Rs. 2,38,113 to Rs. 2,52,093, giving an increase of nearly 6 per cent. The incidence on the cultivated area is Re. 1-3-7 per acre. I have not included the assessment of the fluctuating area, as it is impossible to estimate with any accuracy what the yearly collections from it will be. At present owing to the dry seasons, the demand runs very small. However as no change is being proposed in the existing arrangements, it would probably be better to omit it from our calculations in any case.

44. Before leaving the question of assessment it will be as well to summarise the effect of the new proposals regarding the method of dealing with abiana land. From the attached statement of the receipts of abiana from bunds in the Nuh Tahsil, it will be seen that the average receipts amount to Rs. 2,826 per annum. The abiana area in the Dahar Circle is now 6,615 acres (Statement II), and according to the new proposals this will be assessed at Re. 1-7-0 per acre, or Re. 0-5-5 per acre above the all-round barani rate. This gives a total advantage of Rs. 2,239. In the Taoru circle 1,088 acres are assessed at Re. 1-4-0 against an all-round barani rate of 13 annas, giving a total advantage of Rs. 476. To this must be added the abiana from the Taoru bunds, which according to the statement comes to Rs. 582 per annum. The total advantage according to the new system is therefore Rs. 3,297, or a net advantage of Rs. 471 over the present abiana system. As a matter of fact the advantage is probably even greater, as the amount of abiana collected of recent years has been much smaller, and the average collection includes some of the first years, when the flooded area was abnormally large. Even granting that the existing position is principally due to the recent drought, it must be remembered that for some time abiana was levied off dahri land, and in fact this practice has only recently been stopped. Under these circumstances we are probably justified in assuming the net advantage under the new system will not be less than Rs. 471, and may well be more. That it will be a popular departure with the people I have no doubt, as in the Dahar Circle the abiana system is hated, and the almost universal request has been that it may be abandoned.

Statement showing the annual collections of *absana* in the *Nuh Tahsil*.

1	2	3	4	5	6	7	8	9	10	11	12	13	14
YEAR	Kotla	Qutabgarh	Khalipor	Taoru Bahora road	Taoru.	Dhulavab.	Rahori.	Sabrus	Falla.	Palra.	Akers	Total	REMARKS
	Rs a p	Rs a. p	Rs a. p	Rs a p	Rs a. p	Rs a p	Rs. a p	Rs a p	Rs n p	Rs a p	Rs a. p	Rs a p	The average collection is Rs 2,826
1893-94	5,232 11 0		33 12 8	..	..	55 5 0	..	..	9 11 3	3 7 6	503 13 9	5,838 13 2	
1894-95	3,969 9 6	3,486 14 7	247 15 9	863 0 3	467 10 0	90 0 6	..	9 2 6	1 6 3	..	59 3 3	9,144 14 7	
1895-06	306 6 9	601 8 0	726 5 3	365 4 0	126 7 6	56 12 0	..	..	..	..	..	2,182 11 6	
1896-97	4,123 6 0	2,742 13 11	303 15 0	375 8 3	106 2 9	08 15 0	..	..	14 9 0	11 6 6	902 13 9	8,649 9 2	
1897-98	15 10 9	..	..	625 9 6	158 13 2	27 4 6	..	..	16 6 6	17 11 6	..	861 7 11	
1898-99	75 14 5	..	..	413 12 0	192 6 6	28 11 5	51 14 0	..	..	..	..	762 10 4	
1899-1900	..	..	..	10 0 0	..	..	..	..	..	..	..	10 0 0	
1900-01	560 10 7	1,664 4 5	651 5 4	421 2 9	202 3 6	40 11 5	110 15 7	148 7 5	13 15 9	10 7 3	45 13 0	3,869 15 0	
1901-02	38 3 2	78 5 3	166 15 9	256 8 5	209 1 3	47 10 0	173 5 3	44 14 3	0 10 4	..	20 12 6	991 6 2	
1902-03	719 14 2	919 5 5	350 9 10	454 11 9	233 3 3	45 10 0	255 1 5	80 14 6	6 5 0	1 14 5	24 13 8	3,092 7 3	
1903-04	..	..	8 6 9	25 11 0	48 11 8	35 4 7	30 8 0	0 10 4	..	..	45 9 6	184 13 10	
1904-05	354 2 1	..	43 14 2	174 13 6	39 1 0	53 0 0	28 9 10	28 8 9	..	..	28 13 2	761 8 3	
1905-06	25 10 2	..	..	122 13 9	162 2 8	22 7 1	30 5 8	12 1 6	0 1 7	2 11 8	20 4 4	388 9 7	
Total	15,417 2 7	9,443 3 11	2,583 4 1	4,118 15 2	1,935 15 0	572 5 0	630 11 4	324 11 8	63 2 2	47 10 5	1,651 13 11	80,738 14 10	
Average	1,185 15 0	726 6 0	194 18 10	316 13 6	148 14 8	44 0 5	48 8 3	24 15 8	4 13 8	3 10 8	127 1 1	2,826 1 2	

## CHAPTER II.—MISCELLANEOUS

45. Owing to the peculiar system of irrigation in force in this tahsil it is difficult to put up any proposal for protective leases by which the cultivator can be adequately recouped. No definite scheme can be made until orders are received upon the proposals made in the Rewari Report, but the following details will suffice to show what the problem in the Nuh Tahsil is —

1	2	3
Circle	All round barani rate	Government share of the profit due to irrigation.
Taoru ... ..	Rs a p 0 13 0	Rs a p 2 0 0
Dahar	1 1 7	1 0 0
Bangar .. .	1 2 4	1 0 0

Where there is so little regular chahi it is impossible to make any difference between the ordinary barani crops and those grown without irrigation on chahi land. Indeed in some places in the Dahar and Bangar Circles the effects of irrigation are to injure the succeeding dry crops, and this counterbalances any advantage of situation or manuring that would otherwise have to be taken into account.

The results of the calculation therefore are as follows—

1	2	3	4
Circle	Area in acres irrigated per pacca well, Statement III, columns 6 and 33	Owner's annual net profit	Cost of pacca well
Taoru ... ..	7½	Rs 30	Rs. 750
Dahar ... ..	4½	9	450
Bangar .	6	12	750

46. The rules in Financial Commissioner's Circular letter No 5890, dated 30th September 1904, as amended by Financial Commissioner's Circular Memo No. 1, dated 10th April 1907, are suitable and should be extended to this tahsil. In the Taoru Circle where irrigation is regular and the chahi land valuable, it is probable that a number of villages will distribute their revenue on soil rates. In the other circles the tendency appears to be to an all-round rate.

47. The various questions arising out of canal irrigation have been dealt with in the Palwal Report. The rules in force should be the same as far as possible over the whole area irrigated by the Agra Canal. Certainly in the Nuh Tahsil there are no special features that call for any separate treatment. I have elsewhere stated that in my opinion a short term assessment would be better than progressive assessments in certain villages, but if the latter system is adopted a separate scheme will be submitted as soon as all the villages have been inspected.

48. In paragraph 52 of the Ferozpur Report detailed proposals for rules to regulate the assessment of abri land have been submitted. It is desirable to have only one set of rules for the district, and I have nothing to add to those

proposals. But assuming that they 446 sanctioned, it will be necessary to make certain exceptions in the Nuh Tahsil. I therefore propose to make the following addition to Rule 1 (a):—except (i) the land classed as abī in the Taoru Circle, and (ii) the land inside the Kahlpur and Qutabgarh bunds in the Dahar Circle, which is irrigated by means of sluices. As regards (b) it should be laid down that the chahi land in the village of Qutabgarh, which is situated inside the bund is not referred to in this sub-section. This explanation is necessary, as the sluice is always opened at the request of the people, and the water has to pass over land, which is protected by the wells, though the latter are never used in a year when the flooding is sufficient. The position of this land will be taken into account in the village assessment and no abiana should be levied.

49 The term of settlement, which is suitable is 30 years. If a shorter term is finally sanctioned for the canal villages in the other tahsils, it will be advisable to fix the same term here as well, but no orders are required on this point at present. The existing settlement expired with the rabi instalment of 1907. In paragraph 53 of the Ferozpur Report it has been shown that there is no possibility of the new demand being imposed before Kharif 1908, and provided that orders are received in time, that date will be suitable for this tahsil also.

Cesses	50. The sanctioned cesses are—
Local rate . . . . .	Rs a. p 8 5 4
Lambardari . . . . .	5 0 0
	<hr style="width: 50%; margin-left: auto; margin-right: 0;"/>
	Total . . . 13 5 4
	<hr style="width: 50%; margin-left: auto; margin-right: 0;"/>

These should be continued

- Points on which orders are required.
51. The points upon which orders are required are—
- (a) The proposed rates and assessments including the method of assessing nahri and abī lands (paragraphs 40—42).
  - (b) Adoption of the rules for the remission of the wet assessment when a well falls out of use (paragraph 46)
  - (c) Adoption of the rules proposed in paragraphs 47 and 48 of the Palwal Report, if they or similar rules have been sanctioned (paragraph 47)
  - (d) Adoption of the rules proposed for lands flooded by water from bunds, but not classed as abī (paragraph 48).
  - (e) Cesses (paragraph 49).
  - (f) Date of Imposition of the new demand (paragraph 50).

GURGAON: }  
Dated 8th October 1907. }

G. M. BOUGHEY,  
Assistant Settlement Officer.

## GLOSSARY OF VERNACULAR TERMS USED IN THE REPORT

Vernacular	English
Abson	An assessment levied in addition to the assessment at unirrigated rates on account of the advantage derived from irrigation
Abadi	Inhabited site of village
Adar	A Hindu caste
Anr	One sixteenth part of a rupee
Bayra	Spiked millet ( <i>Pennisetia spicata</i> )
Be p r	Upland
Bhau	A Hindu caste
Bhau	Rent taken by division of crop
Bph -	A mixed crop of barley and gram
De s h r	A form of tenure where possession is the measure of right
Bgha	A measure of area 1 pakka bigha = $\frac{2}{3}$ of an acre
braba n	A Hindu caste
Bna	Protective embankment
Ch a r	A Muslim (Q V)
Ch a r	Jowar grown thick for fodder
Ch a r	One sixteenth part of a ser
Chaula	An autumn pulse ( <i>Vigna catiwng</i> )
D a r	Flooded land
D a r	A hand-lever well
D a r	Yielding two crops in each agricultural year
Fahar	Religious mendicant
Gorhu	A mixed crop of wheat and gram
Geyra	A mixed crop of wheat and barley
Gur	An autumn pulse ( <i>Cyamopsis psoraloides</i> )
Gaur	A Hindu caste
Gur	Unrefined sugar
Hita	A measure equal to one and a-half feet
Jagir	An assignment of land revenue
Jama	Land revenue demand
Jat	A Hindu caste
Jhil	A sheet of water
Jhola	A man who tends the fire on which the juice of the sugarcane is boiled
Jmawar	Harvest crop statement
Jover	Great millet ( <i>Sorghum vulgare</i> ).
Kahl Abpishu	Capable of irrigation
Kachcha	(Of a well) not lined with masonry
Kallar	Barren land, also applied to reh efflorescence
Kamin	A village servant
Karl	A wild shrub
Kasni	Chickory ( <i>chickorum tutybas</i> ).
Kaystha	A Hindu caste
Khalea	Revenue credited to Government as contrasted with jagir (Q V)
Khanzada	A Muhammadan caste
Kharaba	Portion of a crop which has failed to come to maturity
Kharif	Autumn harvest
Khasra girdawari	Harvest inspection register
Khud Kasht	Land cultivated by the owner himself.
Kurand	Hand-picked stone wells
Lambardar	Village headman
Lao	Laterally well rope. Well area worked by two (generally) yoke of bullocks
Mahajan	A Hindu caste.
Mohal	Estado
Mah	A Hindu caste
Malikana	Fee paid in recognition of proprietary title
Maab	An autumn pulse ( <i>Phaseolus radiatus</i> )
Maund	A measure of weight equal to 80 lbs
Mco	A Muhammadan caste
Moth	An autumn pulse ( <i>Phaseolus acontifolius</i> ).
Mung	An autumn pulse ( <i>Phaseolus mungo</i> )

Vernacular.	English.
Nadi ... ..	A small stream.
Nullah ... ..	A stream.
Pakka ... ..	(Of a well) lined with masonry.
Pala ... ..	The dwarf ber (plum).
Pargana ... ..	A group of estates forming a sub-division of a district or tahsil.
Pattdari .. ..	Held on ancestral or customary shares (a form of village tenure).
Patwari ... ..	A village accountant.
Pula ... ..	Munj grass
Rabi .. ..	Spring harvest.
Rajput ... ..	A Hindu caste.
Sahj .. ..	Partner in cultivation.
Sarson ... ..	Rape seed
Ser .. ..	A measure of weight=one-fortieth of a maund (Q. V.)
Sbeikh ... ..	A Muhammadan caste
Tahsil .. ..	Sub-division of a district in charge of a Tahsildar
Taramira .. ..	Rape seed.
Taria . . .	A man who makes gur (Q. V.)
Til ... ..	Sesamum.
Zabt ... ..	Cash rents levied on account of crops of which the produce is not divided.
Zamindar .. .	Landowner
Zamindari .. ..	A form of tenure where the village is owned by a single proprietor or set of joint proprietors
Zira	Cummin seed.

311

20 मरच 2014 को 28 माघ 2114 हि. 1935  
 आज के राज बाहुम जिला राज्य अधिकारी स्व. भूमि अधिग्रहण कर्ता  
 मेवात जूँ मारफत तहसीलदार जूँ पत्र क्रमांक 268/0.क दिनांक 19-2-14  
 गांव आकडा में अनवरत आवाज दे मारफत जूँ मारफत जूँ मारफत  
 दे वा-आवाज पुलन्द इस क्रमांक की मुजादी मुजादी मुजादी  
 अधिसूचना दिनांक 20-01-2014 क्रमांक 894/स्व.स.सा - 111 - यू

Whereas the Governor of Haryana is satisfied that the land specified below is required by the Government, at public expense, for a public purpose, namely, for the constructing Reservoir for irrigation in Kotla Depression in Village, Hara, Tehsil-Nuh, Distt. Meewat, for which notification No. 1897/LC - III dt. 18th November, 2013 has been issued U/S 4 and published in the Haryana Govt. Gazette, it is declared that the land described in the specification below is required urgently for the above purpose. The declaration is made under the provision of Section-6 of the land acquisition Act 1894 for the information of all to whom it may concern and under the provision of Section 7 of the said Act. The District Revenue officer - cum Land Acquisition Collector, Meewat Nuh is hereby directed to take order of the acquisition of the said land, in view of the urgency of acquisition Governor of Haryana in exercise of the power under Section 7(a) of the said Act is further pleased to direct that the District Revenue officer - cum - Land Acquisition Collector, Meewat Nuh shall proceed to take possession

मुजादी  
 मुजादी  
 सेशन-6  
 नम आकडा

of the land herewith specified in accordance herewith. The plan of the land may be inspected in the office of the District Revenue Officer - cum Land Acquisition Collector, Meerut Noh, or Executive Engineer, Meerut Water Services Division, Noh. 44

12/5 मिन - 13/2 मिन - 14/1 मिन - 14/2 मिन  
(0-1) (2-3) (1-2) (1-4)

44

15 मिन - 18/1 मिन - 18/3 - 19/1 मिन - 19/2 मिन 20 मिन - 21 मिन | 45  
(1-2) (0-12) (0-3) (2-19) (2-12) (0-11) (0-2) (1-6) (2-19)

52

2/2 मिन - 3 मिन - 4 मिन - 8/1 मिन - 9/1 मिन - 9/2 मिन - 10/2 मिन - 10/3 मिन - 11/1 मिन 11/2 मिन  
(0-3) (2-15) (1-17) (0-5) (1-4) (1-11) (1-0) (0-19) (1-17) (0-5)

51

15 मिन - 14 मिन - 16 मिन - 17/1 मिन - 17/2 मिन - 18 मिन - 21/3 मिन - 22 मिन - 23 मिन | 70  
(3-12) (0-6) (0-9) (3-9) (0-4) (1-18) (0-3) (3-7) (2-9) (4-7) (3-6)

70

1/1 - 1/2 - 1/3 - 10/1 - 10/2 - 10/3 - 10/4 - 10/5 - 11/1 - 11/2 - 11/3 - 11/4 - 20/1  
(1-17) (1-1) (5-1) (1-1) (1-1) (1-1) (1-7) (3-9) (2-3) (4-0) (1-1) (0-16) (1-17)

70

20/2 - 20/3 - 20/4 - 21/1 - 21/2 - 21/3 - 21/4 - 21/5 | 71  
(1-17) (1-12) (2-13) (2-8) (2-3) (2-3) (0-16) (0-11) (1-1) (1-17) (5-1) (1-1) (1-17)

71

2/3 - 3/1 - 3/2 - 3/3 - 4/1 - 4/2 - 4/3 - 5/1 - 5/2 - 5/3 - 6/1 - 6/2 - 6/3  
(5-1) (1-1) (1-17) (5-1) (1-1) (1-17) (5-1) (1-1) (1-17) (5-1) (1-1) (1-1) (1-1)

71

6/4 - 6/5 - 7/1 - 7/2 - 7/3 - 7/4 - 7/5 - 8/1 - 8/2 - 8/3 - 8/4 - 8/5 - 9/1  
(1-7) (3-9) (1-1) (1-1) (1-1) (1-7) (3-9) (1-1) (1-1) (1-1) (1-7) (3-9) (1-1)

71

9/2 - 9/3 - 9/4 - 9/5 - 10/1 - 10/2 - 10/3 - 10/4 - 11/1 - 11/2 - 11/3 - 12/1  
(1-1) (1-1) (1-7) (3-9) (1-1) (1-1) (1-1) (4-16) (2-3) (5-1) (0-16) (2-3)

71

12/2 - 12/3 - 12/4 - 13/1 - 13/2 - 13/3 - 13/4 - 14/1 - 14/2 - 14/3 - 14/4 - 15/1  
 (4-0) (1-1) (0-16) (2-3) (4-0) (1-1) (0-16) (2-3) (4-0) (1-1) (0-16) (2-3)

71

15/2 - 15/3 - 15/4 - 16/1 - 16/2 - 16/3 - 16/4 - 17/1 - 17/2 - 17/3 - 17/4 - 18/1 - 18/2  
 (4-0) (1-1) (0-16) (1-17) (1-17) (1-12) (2-13) (1-17) (1-17) (1-12) (2-13) (1-17) (1-17)

71

18/3 - 19/1 - 19/2 - 19/3 - 20/1 - 20/2 - 20/3 - 21/1 - 21/2 - 21/3 - 21/4 - 22/1  
 (4-5) (1-17) (1-17) (4-5) (1-17) (1-17) (4-5) (4-11) (2-3) (0-16) (0-11) (4-11)

71

22/2 - 22/3 - 22/4 - 23/1 - 23/2 - 23/3 - 23/4 - 24/1 - 24/2 - 24/3 - 24/4  
 (2-3) (0-16) (0-11) (4-11) (2-3) (0-16) (0-11) (4-11) (2-3) (0-16) (0-11)

71

25/1 - 25/2 - 25/3 - 25/4 - 25/5 - 72 | 4/1 - 4/2 - 4/3 - 4/4 - 5 - 6 - 7/1  
 (2-5) (2-5) (2-3) (0-16) (0-11) (3-4) (0-16) (2-19) (1-1) (7-13) (7-13) (7-7)

72

7/2 - 7/3 - 7/4 - 14/1 - 14/2 - 14/3 - 14/4 - 14/5 - 15 - 16 - 17/1 - 17/2  
 (3-9) (1-12) (1-12) (0-11) (1-7) (0-16) (4-5) (1-1) (7-13) (7-13) (2-3) (1-7)

72

17/3 - 17/4 - 24 - 25 - 75 | 4 - 5 - 6/1 - 6/2 - 7/1 - 7/2 - 14 - 15/1  
 (2-3) (2-8) (7-3) (8-0) (7-13) (8-0) (1-1) (6-19) (2-1) (5-12) (7-13) (1-17)

75

15/2 - 16/1 - 16/2 - 16/3 - 17/1 - 17/2 - 17/3 - 24/1 - 24/2 - 25/1 - 25/2  
 (6-3) (1-7) (1-17) (4-16) (1-6) (1-16) (4-12) (2-11) (3-17) (2-13) (4-0)

76

1/1 - 1/2 - 2/1 - 2/2 - 2/3 - 3/1 - 3/2 - 3/3 - 4/1 - 4/2 - 4/3 - 5/1 - 5/2  
 (6-12) (1-8) (3-4) (1-7) (3-9) (3-4) (1-7) (3-9) (3-4) (1-7) (3-9) (3-4) (1-7)

76

5/3 - 6/1 - 6/2 - 7/1 - 7/2 - 8/1 - 8/2 - 9/1 - 9/2 - 10/1 - 10/2 - 10/3  
 (3-9) (4-0) (4-0) (4-0) (4-0) (4-0) (4-0) (4-0) (4-0) (2-0) (2-0) (4-0)

76

11/1 - 11/2 - 12/1 - 12/2 - 13/1 - 13/2 - 13/3 - 14/1 - 14/2 - 14/3 - 15/1 - 15/2  
 (1-13) (6-3) (1-17) (6-3) (1-17) (1-17) (4-16) (1-17) (1-7) (4-16) (1-17) (1-7)

76

15/3 - 16/1 - 16/2 - 16/3 - 17/1 - 17/2 - 17/3 - 18/1 - 18/2 - 18/3 - 19/1 - 19/2  
 (4-16) (1-7) (1-17) (4-16) (1-7) (1-17) (4-16) (1-7) (1-17) (4-16) (1-7) (4-17)

76

19/3 - 20/1 - 20/2 - 20/3 - 21/1 - 21/2 - 22/1 - 22/2 - 23/1 - 23/2 - 24/1  
 (4-16) (1-7) (1-17) (4-16) (2-13) (4-0) (2-13) (4-0) (2-13) (4-0) (2-13)

76

24/2 - 25/1 - 25/2 - 1/1 - 1/2 - 1/3 - 10/1 - 10/2 - 11/1 - 11/2 - 11/3 - 20/1  
 (4-0) (2-13) (4-0) (3-4) (1-7) (3-9) (4-0) (4-0) (1-17) (1-7) (4-16) (1-7)

77

20/2 - 20/3 - 21/1 - 21/2 | 1/1 - 1/2 - 1/3 - 1/4 - 10/1 - 10/2 - 10/3 11/1  
 (1-17) (4-16) (2-13) (4-0) (2-3) (0-16) (3-4) (1-17) (1-1) (5-1) (1-17) (1-7)

96

1/2 - 11/3 | 1/1 - 1/2 - 1/3 - 2/1 - 2/2 - 2/3 - 3/1 - 3/2 - 3/3 - 4/1  
 (1-7) (1-7) (2-19) (3-4) (1-17) (2-19) (3-4) (1-17) (2-19) (3-4) (1-17) (2-19)

97

4/2 - 4/3 - 5/1 - 5/2 - 5/3 - 6/1 - 6/2 - 6/3 - 7/1 - 7/2 - 7/3 - 8/1 - 8/2  
 (3-4) (1-17) (2-19) (3-4) (1-17) (1-1) (5-1) (1-17) (1-1) (5-1) (1-17) (1-1) (5-1)

97

8/3 - 9/1 - 9/2 - 9/3 - 10 - 11/1 - 11/2 मि - 12/1 - 12/2 - 13/3 मि - 13/1 - 13/2  
 (1-17) (1-1) (5-1) (1-17) (1-17) (2-13) (1-6) (1-7) (1-7) (1-7) (1-7) (1-7)

97

13/3 मि - 14/1 - 14/2 - 14/3 मि - 15/1 - 15/2 - 15/3 मि | 4/1 - 4/2 - 4/3 - 5/1 - 5/2  
 (1-6) (1-7) (1-7) (1-6) (1-7) (1-7) (1-6) (2-16) (3-1) (1-16) (2-19) (3-4)

98

5/3 - 6 - 7 - 14/1 - 14/2 - 14/3 - 15/1 - 15/2 मि - 17 मि - 28 मि - 1126 मि  
 (1-17) (8-0) (2-13) (2-11) (1-16) (3-6) (2-13) (1-7) (7-2) (0-8) (0-2)

1127 मि - 1129 मि - 280 मि - 1158 मि कुला 865 - मा 108 एम्स बाण  
 (0-4) (0-8) (0-12) (5-1)

पुनाबी पुत्रावहरी रपट रोजनाप्रत्या हज दजे नी गठि इस आदेश नी एक प्रति

चीपाल स्थान पर यस्या कारनाला चौकीदार करवाडि अडि

AbdulGomari

मोवा जाडे  
खाना

आर. सी. सिगल  
अधीसिक अफिसर  
अमुना जल सेवाए परिमण्डल  
मरीवावाप।

0



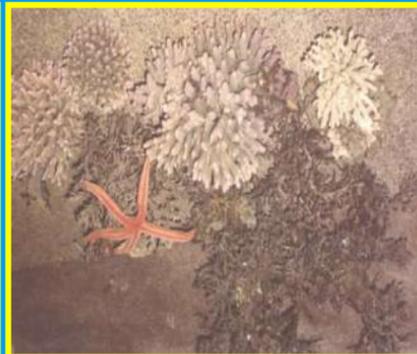
# NATIONAL WETLAND ATLAS: *HARYANA*



Sponsored by  
Ministry of Environment and Forests  
Government of India



Space Applications centre  
Indian Space Research Organisation  
Ahmedabad – 380 015



This publication deals with the updated database and status of wetlands, compiled in Atlas format. Increasing concern about how our wetlands are being influenced has led to formulation of a project entitled “National Wetland Inventory and Assessment (NWIA)” to create an updated database of the wetlands of India. The wetlands are categorised under 19 classes and mapped using satellite remote sensing data from Indian Remote Sensing Satellite: IRS P6- LISS III sensor. The results are organised at 1: 50, 000 scales at district, state and topographic map sheet (Survey of India reference) level using Geographic Information System (GIS). This publication is a part of this national work and deals with the wetland status of a particular State/Union Territory of India, through text, statistical tables, satellite images, maps and ground photographs.

The atlas comprises wetland information arranged into nine sections. How the NWIA project work has been executed highlighted in the first six sections viz: Introduction, NWIA project, Study area, Data used, Methodology, and Accuracy. This is the first time that high resolution digital remote sensing data has been used to map and decipher the status of the wetlands at national scale. The methodology highlights how the four spectral bands of LISS III data (green, red, near infra red and short wave infra red) have been used to derive various indices and decipher information regarding water spread, turbidity and aquatic vegetation. Since, the aim was to generate a GIS compatible database, details of the standards of database are also highlighted in the methodology.

The results and finding are organised in three sections; viz: Maps and Statistics, Major wetland types, and Important Wetlands of the area. The Maps and Statistics are shown for state and district level. It gives details of what type of wetlands exists in the area, how many numbers in each type, their area estimates in hectare. Since, the hydrology of wetlands are influenced by monsoon performance, extent of water spread and their turbidity (qualitative) in wet and dry season (post-monsoon and pre-monsoon period) are also given. Similarly the status of aquatic vegetation (mainly floating and emergent types) in two seasons is also accounted for. Status of small wetlands are also accounted as numbers and depicted in maps as points. Wetland map also show important ancillary information like roads/rail, relevant habitations. False Colour Composite (FCC) of the satellite image used (any one season) is shown along with the derived wetland map to give a feeling of manifestation of wetlands in remote sensing data and synoptic view of the area. The status of some of the important wetlands like Ramsar sites, National Parks are shown with recent field photographs.

For further details contact:

Director,  
Space Applications Centre, ISRO,  
Ambawadi Vistar (P.O.)  
Ahmedabad – 380 015

[director@sac.isro.gov.in](mailto:director@sac.isro.gov.in)

# **NATIONAL WETLAND ATLAS**

## ***HARYANA***

**Sponsored by  
Ministry of Environment and Forests, Government of India**

**As a part of the project on National Wetland Inventory and Assessment (NWIA)**

**Space Applications Centre (ISRO), Ahmedabad**

**and**

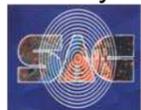
**Haryana Space Applications Centre, Hisar**

**and**

**M. G. Science Institute, Ahmedabad**

**February 2010**

**First Publication:** February 2010, Space Applications Centre (ISRO), Ahmedabad



**Copyright:** 2010, SAC, ISRO

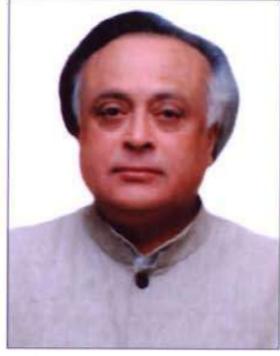
This publication may be produced in whole or in part and in any form for education or non-profit uses, without special permission from the copyright holder, provided acknowledgement of source is made. SAC will appreciate a copy of any publication which uses this publication as a source.

**Citation:** National Wetland Atlas: Haryana, SAC/RESA/AFEG/NWIA/ATLAS/15/2010, Space Applications Centre (ISRO), Ahmedabad, India, 148p.

**Available from:** Space Applications Centre, ISRO, Ahmedabad – 380 015, India

**Production:** SAC carried out the work jointly with Haryana Space Applications Centre, Hisar, Sponsored by Ministry of Environment and Forests, Govt. of India.

जयराम रमेश  
JAIRAM RAMESH



राज्य मंत्री (स्वतंत्र प्रभार)  
पर्यावरण एवं वन  
भारत सरकार  
नई दिल्ली-110003  
MINISTER OF STATE (INDEPENDENT CHARGE)  
ENVIRONMENT & FORESTS  
GOVERNMENT OF INDIA  
NEW DELHI - 110 003

18<sup>TH</sup> JANUARY 2010

### MESSAGE

It gives me great pleasure to introduce this Atlas, the latest in a series, prepared by Space Applications Centre, Ahmedabad in connection with the National Wetland Inventory and Assessment Project.

This Atlas maps and catalogues information on Wetlands across India using the latest in satellite imaging, one of the first of its kind. Wetlands are areas of land critical ecological significance that support a large variety of plant and animal species adapted to fluctuating water levels. Their identification and protection becomes very important.

Utility-wise, wetlands directly and indirectly support millions of people in providing services such as food, fiber and raw materials. They play important roles in storm and flood control, in supply of clean water, along with other educational and recreational benefits. Despite these benefits, wetlands are the first target of human interference and are among the most threatened of all natural resources. Around 50% of the earth's wetlands are estimated to already have disappeared worldwide over the last hundred years through conversion to industrial, agricultural and residential purposes. Even in current scenario, when the ecosystem services provided by wetlands are better understood - degradation and conversion of wetlands continues.

Aware of their importance, the Government of India has formulated several policies and plans for the conservation and preservation of these crucial ecosystems. Realising the need of an updated geospatial data base of these natural resources as the pre-requisite for management and conservation planning, National Wetland Inventory and Assessment (NWIA) project was formulated as a joint vision of Ministry of Environment & Forestry, Govt. India, and Space Applications Centre (ISRO). I am told that the latest remote sensing data from Indian Remote Sensing satellite (IRS P6) have been used to map the wetlands. The present atlas is part of this project and highlights the results of the study state in terms of statistics of various types of wetlands, extent of water, aquatic vegetation and turbidity in pre and post monsoon period. I also note that special efforts are made to provide detailed information of important wetlands like Ramsar sites, National Parks etc.

I am certain that this Atlas will raise the bar in developing such database and will be of great use for researchers, planners, policy makers, and also members of the general public.

  
(Jairam Ramesh)



डॉ. रंगनाथ आर. नवलगुंद  
निदेशक

Dr. Ranganath R. Navalgund  
Director



भारत सरकार GOVERNMENT OF INDIA  
अंतरिक्ष विभाग DEPARTMENT OF SPACE

अंतरिक्ष उपयोग केन्द्र  
SPACE APPLICATIONS CENTRE

अहमदाबाद AHMEDABAD - 380 015

(भारत) (INDIA)

दूरभाष PHONE : +91-79-26913344, 26764956

फैक्स/FAX : +91-79-26915843

ई-मेल E-mail : [director@sac.isro.gov.in](mailto:director@sac.isro.gov.in)

## FOREWORD

Wetlands defined as areas of land that are either temporarily or permanently covered by water exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry. Wetlands are one of the most productive ecosystems and play crucial role in hydrological cycle. Utility wise, wetlands directly and indirectly support millions of people in providing services such as storm and flood control, clean water supply, food, fiber and raw materials, scenic beauty, educational and recreational benefits. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven percent of the earth's surface and deliver 45% of the world's natural productivity and ecosystem services. However, the very existence of these unique resources is under threat due to developmental activities, and population pressure. This calls for a long term planning for preservation and conservation of these resources. An updated and accurate database that will support research and decision is the first step towards this. Use of advanced techniques like Satellite remote sensing, Geographic Information System (GIS) is now essential for accurate and timely spatial database of large areas. Space Applications Centre (ISRO) took up this challenging task under the project "NWIA" (National Wetland Inventory and Assessment) sponsored by Ministry of Environment & Forests. To account for numerous small yet important wetlands found in the country, mapping at 1:50,000 scales has been taken up. Two date IRS LISS III data acquired during pre and post monsoon season are used for inventory to account for wet and dry season hydrology of wetlands. The map outputs include the status of water spread, aquatic vegetation and turbidity. Ancillary layers like road/rail, habitations are also created. Very small wetlands below the mappable unit are also identified and shown points. The results are compiled as Atlases of wetlands for states/Union Territories of India. This Atlas highlights results for a particular state/UT and hopes to improve our understanding of the dynamics and distribution of wetlands and their status in the area.

I congratulate the team for bringing out this informative atlas and sincerely hope that this will serve as a useful source of information to researchers, planners and general public.

January 25, 2010

(Ranganath R. Navalgund)

भारत सरकार  
अन्तरिक्ष विभाग  
अन्तरिक्ष उपयोग केन्द्र  
आंबावाडी विस्तार डाक घर,  
अहमदाबाद - 380 015. (भारत)  
दूरभाष : +91-79-26912000, 26915000  
फैक्स :



*Dr. Sushma Panigrahy*  
Group Director, AFEG & Project Director, NWIA

Government of India  
Department of Space  
SPACE APPLICATIONS CENTRE  
Ambawadi Vistar P.O.  
Ahmedabad - 380 015. (INDIA)  
Telephone : +91-79-26912000, 26915000  
Fax :

Tel. 079-26914020 (O)  
Fax : 079-26915823

## ACKNOWLEDGEMENTS

The project "National Wetland Inventory & Assessment (NWIA)" is sponsored by Ministry of Environment & Forestry (MoEF), Govt. of India and executed by Space Applications Centre, Ahmedabad. We are grateful to Dr. Ranganath R. Navalgund, Director, Space Applications Centre, for his encouragement to take up this challenging task and formulation of the project team for timely implementation. Earnest thanks are also due to Dr. Jai Singh Parihar, Dy. Director, Remote Sensing Applications Area, Space Applications Centre, for his overall guidance and support. The present Atlas for the state of Haryana is a part of the "National Wetland Atlas".

This project has benefited from the wisdom of many people. It is a pleasure to acknowledge the contributions made by the wetland experts especially to Prof. C.K. Varshney, Former Dean, School of Environmental Sciences, Jawaharlal Nehru University, New Delhi, Prof. A.R. Yousuf, The University of Kashmir, Srinagar, Prof. Pradeep Shrivastava, Head, Wetland Research Centre, Barakatullah University, Bhopal, Dr. Prikshit Gautam, Director, WWF-India, Dr. S. Narendra Prasad, Salim Ali Centre for Ornithology and Nature, Coimbtore and Dr. R.K. Suri, Additional Director, Ministry of Environment and Forests, Govt. of India, New Delhi, and the database experts from ISRO who participated in the peer Review meeting to finalise the "Wetland Classification System" followed in this project.

We acknowledge the positive role played by 16<sup>th</sup> SC-B (Standing Committee on Bioresources and Environment) of NNRMS (National Natural Resources Management System) meeting in formulating this project. We are extremely thankful to the members of the "Steering Committee" of the project, under the chairmanship of Dr E J James, Director – Water Institute, Karunya University, for their periodical review, critical comments and appreciation of the efforts by the project team. We are thankful to SC-B under the chairmanship of Secretary, MoEF, for periodical review of the progress of the project and guidance towards timely completion of the work. We acknowledge the valuable contributions made by Dr J K Garg, the then scientist of SAC for his active role in formulation of this project, co-authoring the procedure manual document.

We are grateful to Dr G V Subramanyam, Adviser, MoEF, for his very active and positive role for implementation of the project. We are thankful to Dr Jag Ram, Director, MoEF and Dr Harendra Kharwal, MoEF for their support in budget and project management related issues. We acknowledge the support received from Dr P S Roy, Dy Director, NRSC and Dr S Sudhakar, Head, LRD, NRSC in terms of valuable suggestions and providing the geo-referenced image of NRC-LU&LC project for use as master image in this project. We are thankful to the "Technical Review" team of SAC for critical comments and suggestion to finalise the Atlas.

*Sushma Panigrahy*  
(Sushma Panigrahy)

**PROJECT TEAM**

**Project Director:** Dr. (Mrs) Sushma Panigrahy

**Space Applications Centre, ISRO, Ahmedabad**

Dr T. S. Singh

Shri J. G. Patel

**Haryana Space Applications Centre, Hisar**

Dr. R. S. Hooda

Dr. K. E. Mothikumar

Ms. Rekha Rani

**M. G. Science Institute, Ahmedabad**

Dr. R. D. Shah

Shri Pragnesh kumar Vaishnav

Ms Yatisha Vaishnav

## CONTENTS

### 1.0 INTRODUCTION

- 1.1 Wetlands
- 1.2 Mapping and geospatial techniques
- 1.3 Wetland Inventory of India

### 2.0 NATIONAL WETLAND INVENTORY AND ASSESSMENT

- 2.1 Wetland Classification System
- 2.2 GIS database contents

### 3.0 STUDY AREA

### 4.0 DATA USED

### 5.0 METHODOLOGY

- 5.1 Creation of spatial framework
- 5.2 Geo-referencing of satellite data
- 5.3 Mapping of wetlands
- 5.4 Conversion of raster (indices) into a vector layer
- 5.5 Generation of reference layers
- 5.6 Coding and attribute scheme
- 5.7 Map composition and output

### 6.0 ACCURACY ASSESSMENT

### 7.0 WETLANDS OF HARYANA: MAPS AND STATISTICS

- 7.1 District-wise Wetland Maps and Statistics
  - 7.1.1 Panchkula
  - 7.1.2 Ambala
  - 7.1.3 Yamunanagar
  - 7.1.4 Kurukshetra
  - 7.1.5 Kaithal
  - 7.1.6 Kamal
  - 7.1.7 Panipat
  - 7.1.8 Sonapat
  - 7.1.9 Jind
  - 7.1.10 Fatehabad
  - 7.1.11 Sirsa
  - 7.1.12 Hisar
  - 7.1.13 Bhiwani
  - 7.1.14 Rohtak
  - 7.1.15 Jhajar
  - 7.1.16 Mahendragarh
  - 7.1.17 Rewari
  - 7.1.18 Gurgaon
  - 7.1.19 Faridabad

### 8.0 MAJOR WETLAND TYPES OF HARYANA

### 9.0 IMPORTANT WETLANDS OF HARYANA

### 10.0 SOI SHEET-WISE WETLAND MAPS (selected sheets)

### References

**Annexure–I:** Definitions of wetland categories used in the project.

**Annexure–II:** Details of district information followed in the atlas

## List of Figures

- Figure 1: Spectral Signature of various targets  
 Figure 2: Various land features as they appear in four spectral bands and in a typical three band FCC.  
 Figure 3: Location map  
 Figure 4: Spatial framework of Haryana  
 Figure 5: IRS P6 LISS-III coverage of Haryana  
 Figure 6: IRS LISS-III FCC (Post-monsoon and Pre-monsoon): Part of Haryana state  
 Figure 7: Flow chart of the methodology used  
 Figure 8: Steps in the extraction of wetland components  
 Figure 9: Various combinations of the indices/spectral bands used to identify wetland components  
 Figure 10: Type-wise wetland distribution  
 Figure 11: District-wise graphical distribution of wetlands

## List of Tables

- Table 1: Wetland Classification System and coding  
 Table-2: Satellite data used  
 Table 3: Qualitative turbidity ratings  
 Table 4: Area estimates of wetlands in Haryana  
 Table-5: District-wise wetland highlights  
 Table 6: Area estimates of wetlands in Panchkula  
 Table 7: Area estimates of wetlands in Ambala  
 Table 8: Area estimates of wetlands in Yamunanagar  
 Table 9: Area estimates of wetlands in Kurukshetra  
 Table 10: Area estimates of wetlands in Kaithal  
 Table11: Area estimates of wetlands in Kamal  
 Table 12: Area estimates of wetlands in Panipat  
 Table 13: Area estimates of wetlands in Sonipat  
 Table 14: Area estimates of wetlands in Jind  
 Table 15: Area estimates of wetlands in Fatehabad  
 Table 16: Area estimates of wetlands in Sirsa  
 Table 17: Area estimates of wetlands in Hisar  
 Table 18: Area estimates of wetlands in Bhiwani  
 Table 19: Area estimates of wetlands in Rohtak  
 Table 20: Area estimates of wetlands in Jhajar  
 Table 21: Area estimates of wetlands in Mahendragarh  
 Table 22: Area estimates of wetlands in Rewari  
 Table 23: Area estimates of wetlands in Gurgaon  
 Table 24: Area estimates of wetlands in Faridabad

## List of Plates

- Plate-1: Major wetland types of Haryana  
 Plate-2a and 2b: Field photographs and ground truth data of different wetland types in Haryana  
 Plate 3: Sultanpur Bird Sanctuary  
 Plate 4: Wetland map - 5 km buffer area of Sultanpur Bird Sanctuary  
 Plate 5: IRS LISS-III FCC - 5 km buffer area of Sultanpur Bird Sanctuary  
 Plate 6: Bhindawas Bird Sanctuary  
 Plate 7: Wetland map - 5 km buffer area of Bhindawas Bird Sanctuary  
 Plate 8: IRS LISS-III FCC - 5 km buffer area of Bhindawas Bird Sanctuary  
 Plate 9: Damdama Lake  
 Plate 10: Wetland map - 5 km buffer area of Damdama Lake  
 Plate 11: IRS LISS-III FCC - 5 km buffer area of Damdama Lake  
 Plate 12: Brahm Sarovar  
 Plate 13 Wetland map - 5 km buffer area of Brahm Sarovar  
 Plate 14: IRS LISS-III FCC - 5 km buffer area of Brahm Sarovar

## 1.0 INTRODUCTION

It is increasingly realized that the planet earth is facing grave environmental problems with fast depleting natural resources and threatening the very existence of most of the ecosystems. Serious concerns are voiced among scientists, planners, sociologists, politicians, and economists to conserve and preserve the natural resources of the world. One of the difficulties most frequently faced for decision making is lack of scientific data of our natural resources. Often the data are sparse or unconvincing, rarely in the form of geospatial database (map), thus open to challenges. Thus, the current thrust of every country is to have an appropriate geospatial database of natural resources that is based on unambiguous scientific methods. The wetland atlas of Haryana, which is part of the National Wetland Atlas of India, is an attempt in this direction.

### 1.1 Wetlands

Wetlands are one of the crucial natural resources. Wetlands are areas of land that are either temporarily or permanently covered by water. This means that a wetland is neither truly aquatic nor terrestrial; it is possible that wetlands can be both at the same time depending on seasonal variability. Thus, wetlands exhibit enormous diversity according to their genesis, geographical location, water regime and chemistry, dominant plants and soil or sediment characteristics. Because of their transitional nature, the boundaries of wetlands are often difficult to define. Wetlands do, however, share a few attributes common to all forms. Of these, hydrological structure (the dynamics of water supply, throughput, storage and loss) is most fundamental to the nature of a wetland system. It is the presence of water for a significant period of time which is principally responsible for the development of a wetland. One of the first widely used classifications systems, devised by Cowardin *et al*, (1979), was associated to its hydrological, ecological and geological aspects, such as: marine (coastal wetlands including rock shores and coral reefs, estuarine (including deltas, tidal marshes, and mangrove swamps), lacustrine (lakes), riverine (along rivers and streams), palustrine ('marshy'- marshes, swamps and bogs). Given these characteristics, wetlands support a large variety of plant and animal species adapted to fluctuating water levels, making the wetlands of critical ecological significance. Utility wise, wetlands directly and indirectly support millions of people in providing services such as food, fiber and raw materials, storm and flood control, clean water supply, scenic beauty and educational and recreational benefits. The Millennium Ecosystem Assessment estimates conservatively that wetlands cover seven percent of the earth's surface and deliver 45% of the world's natural productivity and ecosystem services of which the benefits are estimated at \$20 trillion a year (Source : [www.MAweb.org](http://www.MAweb.org)). The Millennium Assessment (MA) uses the following typology to categorise ecosystem services:

**Provisioning services:** The resources or products provided by ecosystems, such as food, raw materials (wood), genetic resources, medicinal resources, ornamental resources (skin, shells, flowers).

**Regulating services:** Ecosystems maintain the essential ecological processes and life support systems, like gas and climate regulation, water supply and regulation, waste treatment, pollination, etc.

**Cultural and Amenity services:** Ecosystems are a source of inspiration to human culture and education throughout recreation, cultural, artistic, spiritual and historic information, science and education.

**Supporting services:** Ecosystems provide habitat for flora and fauna in order to maintain biological and genetic diversity.

Despite these benefits, wetlands are the first target of human interference and are among the most threatened of all natural resources. Around 50% of the earth's wetlands is estimated to already have disappeared worldwide over the last hundred years through conversion to industrial, agricultural and residential developments. Even in current scenario, when the ecosystem services provided by wetlands are better understood - degradation and conversion of wetlands continues. This is largely due to the fact that the 'full value' of ecosystem functions is often ignored in policy-making, plans and corporate evaluations of development projects.

### 1.2 Mapping and Geospatial technique

To conserve and manage wetland resources, it is important to have inventory of wetlands and their catchments. The ability to store and analyse the data is essential. Digital maps are very powerful tools to achieve this. Maps relating the feature to any given geographical location has a strong visual impact. Maps are thus essential for monitoring and quantifying change over time scale, and assist in decision making. The technique used in the preparation of map started with ground survey. The Survey of India (SOI) topographic maps are the earliest true maps of India showing various land use/cover classes including wetlands. Recent years have seen advances in mapping technique to prepare maps with much more information. Of particular importance is the remote sensing and geographic information system (GIS) technique. Remote sensing is

now recognized as an essential tool for viewing, analyzing, characterizing, and making decisions about land, water and atmospheric components.

From a general perspective, remote sensing is the science of acquiring and analyzing information about objects or phenomena from a distance (Jensen, 1986; Lillesand and Keifer, 1987). Today, we define satellite remote sensing as the use of satellite borne sensors to observe, measure, and record the electromagnetic radiation (EMR) reflected or emitted by the earth and its environment for subsequent analysis and extraction of information. EMR sensors includes visible light, near-, mid- and far-infrared (thermal), microwave, and long-wave radio energy. The capability of multiple sources of information is unique to remote sensing. Of specific advantage is the spectral, temporal, and spatial resolution. Spectral resolution refers to the width or range of each spectral band being recorded. Since each target affects different wavelengths of incident energy differently, they are absorbed, reflected or transmitted in different proportions. Currently, there are many land resource remote sensing satellites that have sensors operating in the green, red, near infrared and short wave Infra red regions of the electromagnetic spectrum giving a definite spectral signature of various targets due to difference in radiation absorption and reflectance of targets. These sensors are of common use for land cover studies, including wetlands. Figure 1 shows typical spectral signature of few targets from green to SWIR region. Converted to image, in a typical false colour composite (FCC) created using NIR, red and green bands assigned as red, green and blue colour, the features become very distinct as shown in Figure 2 - A typical wetland located in Taoru block, Mewat district. In FCC, the vegetation thus appears invariably red (due to high reflection in NIR from green leaves).

Since the early 1960s, numerous satellite sensors have been launched into orbit to observe and monitor the earth and its environment. Most early satellite sensors acquired data for meteorological purposes. The advent of earth resources satellite sensors (those with a primary objective of mapping and monitoring land cover) occurred, when the first Landsat satellite was launched in July 1972. Currently, more than a dozen orbiting satellites of various types provide data crucial to improving our knowledge of the earth's atmosphere, oceans, ice and snow, and land. Of particular interest to India is the indigenous series of satellites called Indian Remote Sensing satellites (IRS-Series). Since the launch of the first satellite IRS 1A in 1987, India has now a number of satellites providing data in multi-spectral bands with different spatial resolution. IRS P6/RESOURCESAT 1 is the current generation satellite that provides multi-spectral images in spatial resolution of 5.8 m (LISS IV), 23.5 m (LISS III) and 56m (AWiFS). Over the past few decades, Indian remote sensing data has been successfully used in various fields of natural resources ( Navalgund et al. 2002 ).

Development of technologies like Geographic Information System (GIS) has enhanced the use of RS data to obtain accurate geospatial database. GIS specialises in handling related, spatially referenced data, combining mapped information with other data and acts as analytical tool for research and decision making. During the past few decades, technological advances in the field of satellite remote sensing (RS) sensors, computerized mapping techniques, global positioning system (GPS) and geographic information system (GIS) has enhanced the ability to capture more detailed and timely information about the natural resources at various scales catering to local, regional, national and global level study.

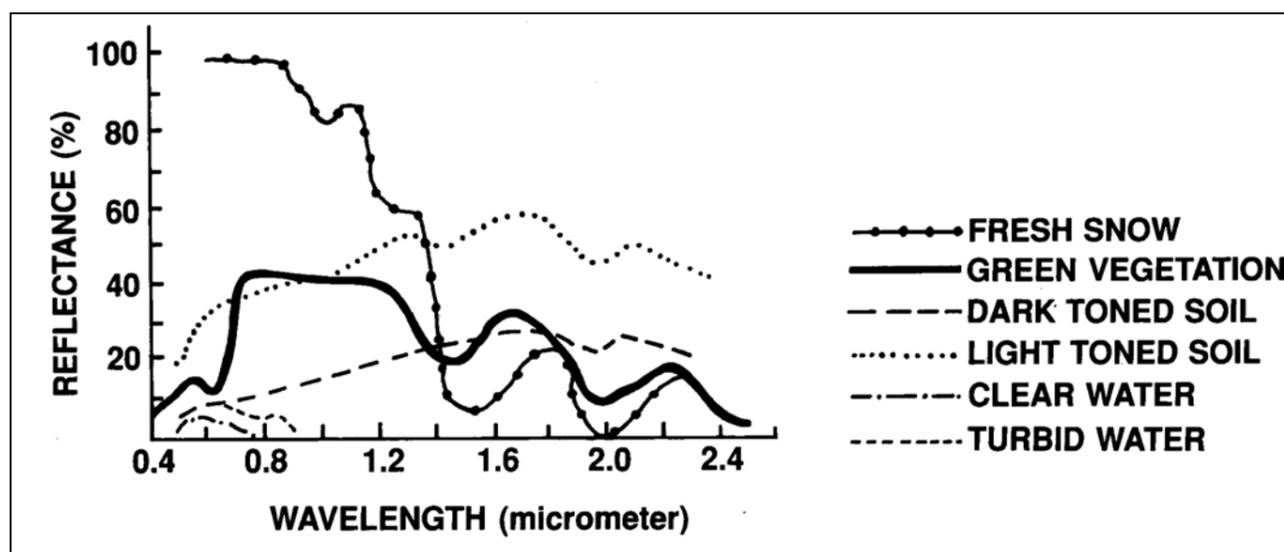


Figure 1: Spectral Signature of various targets

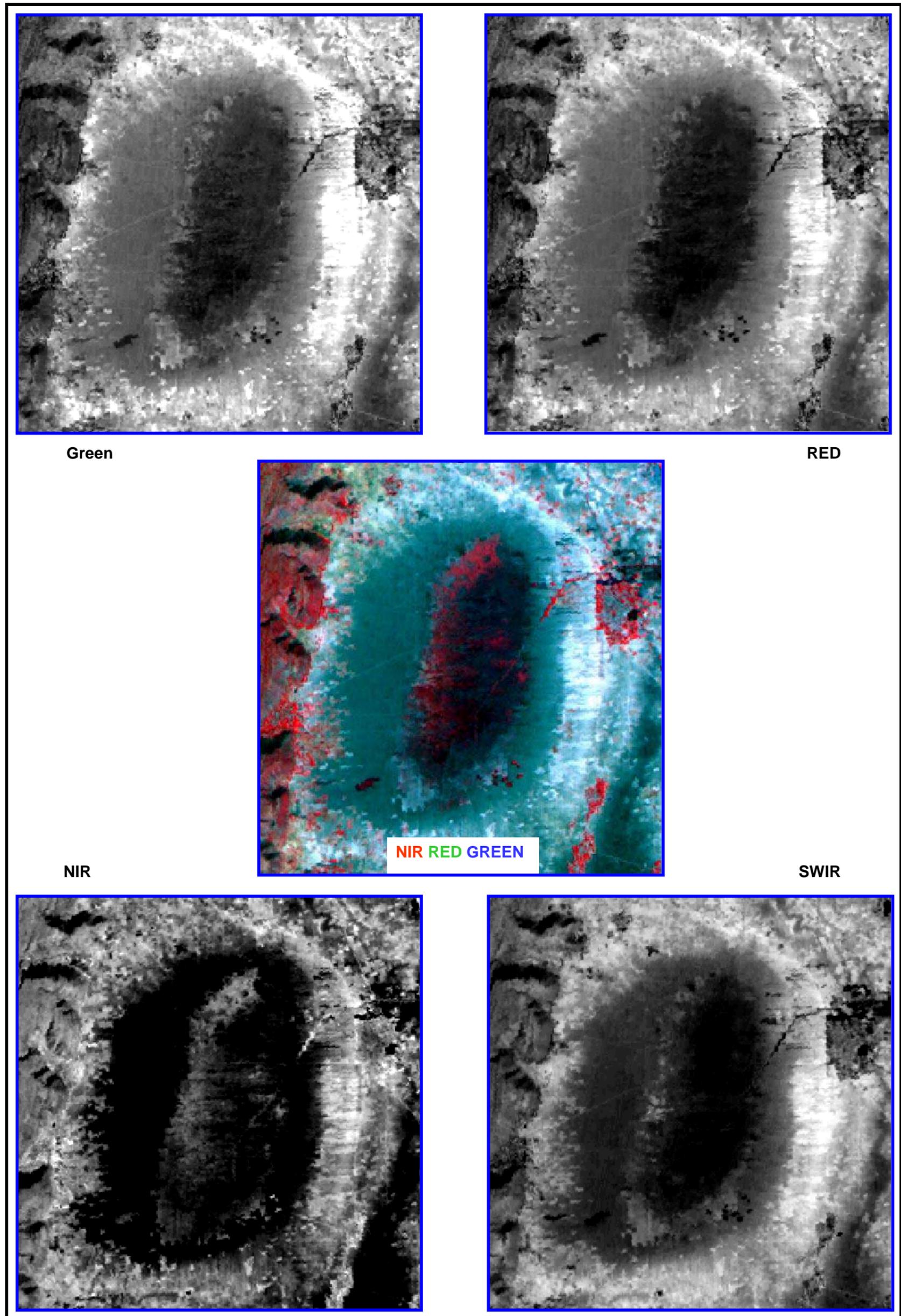


Figure 2: Various wetland features as they appear in four spectral bands and in a typical three band FCC.

### 1.3 Wetland Inventory of India

India with its large geographical spread supports large and diverse wetland classes, some of which are unique. Wetlands, variously estimated to be occupying 1-5 per cent of geographical area of the country, support about a fifth of the known biodiversity. Like any other place in the world, there is a looming threat to the aquatic biodiversity of the Indian wetlands as they are often under a regime of unsustainable human pressures. Sustainable management of these assets therefore is highly relevant. Realising this, Govt. of India has initiated many appropriate steps in terms of policies, programmes and plans for the preservation and conservation of these ecosystems. India is a signatory to the Ramsar Convention for management of wetland, for conserving their biodiversity and wise use extending its scope to a wide variety of habitats, including rivers and lakes, coastal lagoons, mangroves, peatlands, coral reefs, and numerous human-made wetland, such as fish and shrimp ponds, farm ponds, irrigated agricultural land, salt pans reservoirs, gravel pits, sewage farms, and canals. The Ministry of Environment and Forests has identified a number of wetlands for conservation and management under the National Wetland Conservation Programme and some financial assistance is being provided to State Governments for various conservation activities through approval of the Management Action Plans. The need to have an updated map database of wetlands that will support such actions has long been realized.

Mapping requires a standard classification system. Though there are many classification systems for wetlands in the world, the Ramsar classification system is the most preferred one. The 1971 Ramsar Convention on Wetlands of International Importance especially as Waterfowl Habitat is the oldest conservation convention. It owes its name to its place of adoption in Iran. It came into being due to serious decline in populations of waterfowl (mainly ducks) and conservation of habitats of migratory waterfowl. Convention provides framework for the conservation and 'wise use' of wetland biomes. Ramsar convention is the first modern global intergovernmental treaty on conservation and wise use of natural resources ([www.ramsar.org](http://www.ramsar.org)). Ramsar convention entered into force in 1975. Under the text of the Convention (Article 1.1) wetlands are defined as:

“areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters”.

In addition, the Convention (Article 2.1) provides that wetlands:

“may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands”.

The first scientific mapping of wetlands of India was carried out during 1992-93 by Space Applications Centre (ISRO), Ahmedabad, at the behest of the Ministry of Environment and Forests (MoEF), Govt. of India using remote sensing data from Indian Remote Sensing satellites (IRS-Series). The mapping was done at 1:250,000 scale using IRS 1A LISS-I/II data of 1992-93 timeframe under the Nation-wide Wetland Mapping Project. Since, no suitable wetland classification existed for comprehensive inventory of wetlands in the country at that time, the project used a classification system based on Ramsar Convention definition of wetlands. The classification considers all parts of a water mass including its ecotonal area as wetland. In addition, fish and shrimp ponds, saltpans, reservoirs, gravel pits were also included as wetlands. This inventory put the wetland extent (inland as well as coastal) at about 8.26 million ha. (Garg et al, 1998). These estimates (24 categories) do not include rice/paddy fields, rivers, canals and irrigation channels.

Further updating of wetland maps of India was carried out by SAC using IRS P6/Resourcesat AWiFS data of 2004-05 at 1:250000 scale. In recent years, a conservation atlas has been brought out by Salim Ali Centre for Ornithology and Natural History (SACON, 2004), which provide basic information required by stakeholders in both wetland habitat and species conservation. Space Applications Centre has carried out many pilot projects for development of GIS based wetland information system (Patel et al, 2003) and Lake Information system (Singh et al, 2003).

## 2.0 NATIONAL WETLAND INVENTORY AND ASSESSMENT (NWIA) PROJECT

Realising the importance of many small wetlands that dot the Indian landscape, it has been unanimously felt that inventory of the wetlands at 1:50,000 scale is essential. The task seemed challenging in view of the vast geographic area of our country enriched with diverse wetland classes. Space Applications Centre with its experience in use of RS and GIS in the field of wetland studies, took up this challenging task. This is further strengthened by the fact that guidelines to create geospatial framework, codification scheme, data base structure etc. for natural resources survey has already been well established by the initiative of ISRO under various national level mapping projects. With this strength, the National Wetland Inventory and Assessment (NWIA) project was formulated by SAC, which was approved and funded by MoEF.

The main objectives of the project are:

- To map the wetlands on 1:50000 scale using two date (pre and post monsoon) IRS LISS III digital data following a standard wetland classification system.
- Integration of ancillary theme layers ( road, rail, settlements, drainage, administrative boundaries)
- Creation of a seamless database of the states and country in GIS environment.
- Preparation of State-wise wetland atlases

The project was initiated during 2007. The first task was to have a classification system that can be used by different types of users while amenable to database. An expert/peer group was formed and the peer review was held at SAC on June 2007 where wetland experts and database experts participated and finalized the classification system. It was agreed to follow the classification system that has been used for the earlier project of 1:250,000 scale, with slight modification. Modified National Wetland Classification system for wetland delineation and mapping comprise 19 wetland classes which are organized under a Level III hierarchical system. The definition of each wetland class and its interpretation method was finalized. The technical/procedure manual was prepared as the standard guideline for the project execution across the country (Garg and Patel, 2007). The present atlas is part of the national level data base and deals with the state of Haryana.

### 2.1 Wetland Classification System

In the present project, Modified National Wetland Classification system is used for wetland delineation and mapping comprising 19 wetland classes which are organized under a Level III hierarchical system (Table 1). Level one has two classes: inland and coastal, these are further bifurcated into two categories as: natural and man-made under which the 19 wetland classes are suitably placed. Two date data pertaining to pre-monsoon and post monsoon was used to confirm the classes. Wetlands put to agriculture use in any of the two dates are not included as wetland class. Definitions of wetland categories used in the project is given in Annexure-I.

#### 2.2.1 Spatial Framework and GIS Database

The National Spatial Framework) (NSF) has been used as the spatial framework to create the database (Anon. 2007). The database design and creation standard suggested by NRDB/NNRMS guidelines is followed. Feature codification scheme for every input element has been worked out keeping in view the nationwide administrative as well as natural hierarchy (State-district- within the feature class for each of the theme. All data elements are given a unique name, which are self explanatory with short forms.

Following wetland layers are generated for each inland wetland:

- Wetland extent: As wetlands encompass open water, aquatic vegetation (submerged, floating and emergent), the wetland boundary should ideally include all these. Satellite image gives a clear signature of the wetland extends from the imprint of water spread over the years.
- Water spread: There are two layers representing post-monsoon and pre-monsoon water spread during the year of data acquisition.

- Aquatic vegetation spread: The presence of vegetation in wetlands provides information about its trophic condition. As is known, aquatic vegetation is of four types, viz. benthic, submerged, floating, and emergent. It is possible to delineate last two types of vegetation using optical remote sensing data. A qualitative layer pertaining to presence of vegetation is generated for each season (as manifested on pre-monsoon and post-monsoon imagery).
- Turbidity level of open water: A layer pertaining to a qualitative turbidity rating is generated. Three qualitative turbidity ratings ( low, medium and high) is followed for pre and post-monsoon turbidity of lakes, reservoirs, barrages and other large wetlands.
- Small wetlands (smaller than minimum mappable unit) are mapped as point features.
- Base layers like major road network, railway, settlements, and surface drainage are created (either from the current image or taken from other project data base).

In the case of coastal wetlands only wetland extent is given.

Table 1: Wetland Classification System and coding

*Wettcode	Level I	Level II	Level III
1000	Inland Wetlands		
1100		Natural	
1101			Lakes
1102			Ox-Bow Lakes/ Cut-Off Meanders
1103			High altitude Wetlands
1104			Riverine Wetlands
1105			Waterlogged
1106			River/stream
1200		Man-made	
1201			Reservoirs/ Barrages
1202			Tanks/Ponds
1203			Waterlogged
1204			Salt pans
2000	Coastal Wetlands		
2100		Natural	
2101			Lagoons
2102			Creeks
2103			Sand/Beach
2104			Intertidal mud flats
2105			Salt Marsh
2106			Mangroves
2107			Coral Reefs
2200		Man-made	
2201			Salt pans
2202			Aquaculture ponds

\* Wetland type code

### 3.0 STUDY AREA

Haryana is a small state situated between 27° 29' to 30° 56' N latitudes and 74° 27' to 77° 36' E longitudes, covering an area of about 44, 212 sq. km. The State mainly occupies the Indo- Gangetic Alluvial Plain. It is basically an agriculture state and about 75 % of the population is engaged in agriculture and related activities. Haryana is known as 'land' of milk. The state covers about 3.3 % cultivated area of the country and contributes about 5.6 % to the total food grain production. The per capita availability of the land has been decreasing progressively over the years and is likely to decrease further due to the population pressure, urbanization and the industrial expansion of the arable lands. The state came into existence on 1<sup>st</sup> January 1966. The state shares a common border with the states of Delhi, Rajasthan, Punjab, Himachal Pradesh and Uttar Pradesh. Location map is shown in Figure-3.

The state represents a variety of landscapes varying from hills in the northern region to almost flat alluvial plains in the central parts, and sand dunes in the southern regions. The state has mainly 4 physiographic regions namely, i) Siwalik Hills: ii) Alluvial Plains: iii) Aravalli Hills, and iv) Aeolian plains. The general slope of the state is from north to south but the slopes become steeper further south and southwest due to the presence of subdued ranges of Aravalli Hills. The entire state is drained by the tributaries mainly the Markanda, the Saraswati, The Chautung, and the Tangri apart from other seasonal streams. The Sahibi, the Dohan and the Krishnavati originating from Aravalli ridges are flowing from south to north.

The Geological formations range from Precambrian to the recent and can be divided into three geological systems namely - i) Aravalli system, ii) Siwalik system and iii) Indo-Gangetic. Soils in the state are mainly derived from these geological units.

The climate of the state is sub-tropical, semi-arid to sub-humid, continental and monsoonal. The average annual rainfall of the state is about 650 mm which varies from less than 300 in south western parts to over 1000 mm in the hilly tracts of Siwalik. The state has 3 main climatic regions- Hot Arid region, Hot semi arid region and Hot sub humid region. The mean rainfall (mm) in hot arid region ranges from 300 -500, whereas 500- 750 mm in hot semi arid region and 750- 1050 in hot sub humid region of Haryana. The mean temperature ranges from 27° c, 26° c, and 24° c respectively. The soil temperature regime is Hyperthermic and the soil moisture regimes are Ustic Aridic.

Among the flora of Haryana, the largest of truly indigenous trees namely Shisham (*Dalbergia sisso*) and Kikar (*Acacia Arabica*). The shrub comprises Jal (*Salvadora oleodes*), Jand (*Prosopis specigera*) and coral flowered leafless Kair (*Capparis aphylla*) besides other common trees and grasses.

Forest area in Haryana is limited to only 1,66,000 ha (3.7) of which 85% is under state forest and rest is under private forests.

The state has fourteen districts and is covered by 102 Survey of India topographical maps on 1:50,000 scale that form the spatial framework for mapping (Figure 4). The spatial framework was prepared using 15' x 15' grid.

A detail of district information followed in the atlas is given in Annexure-II.

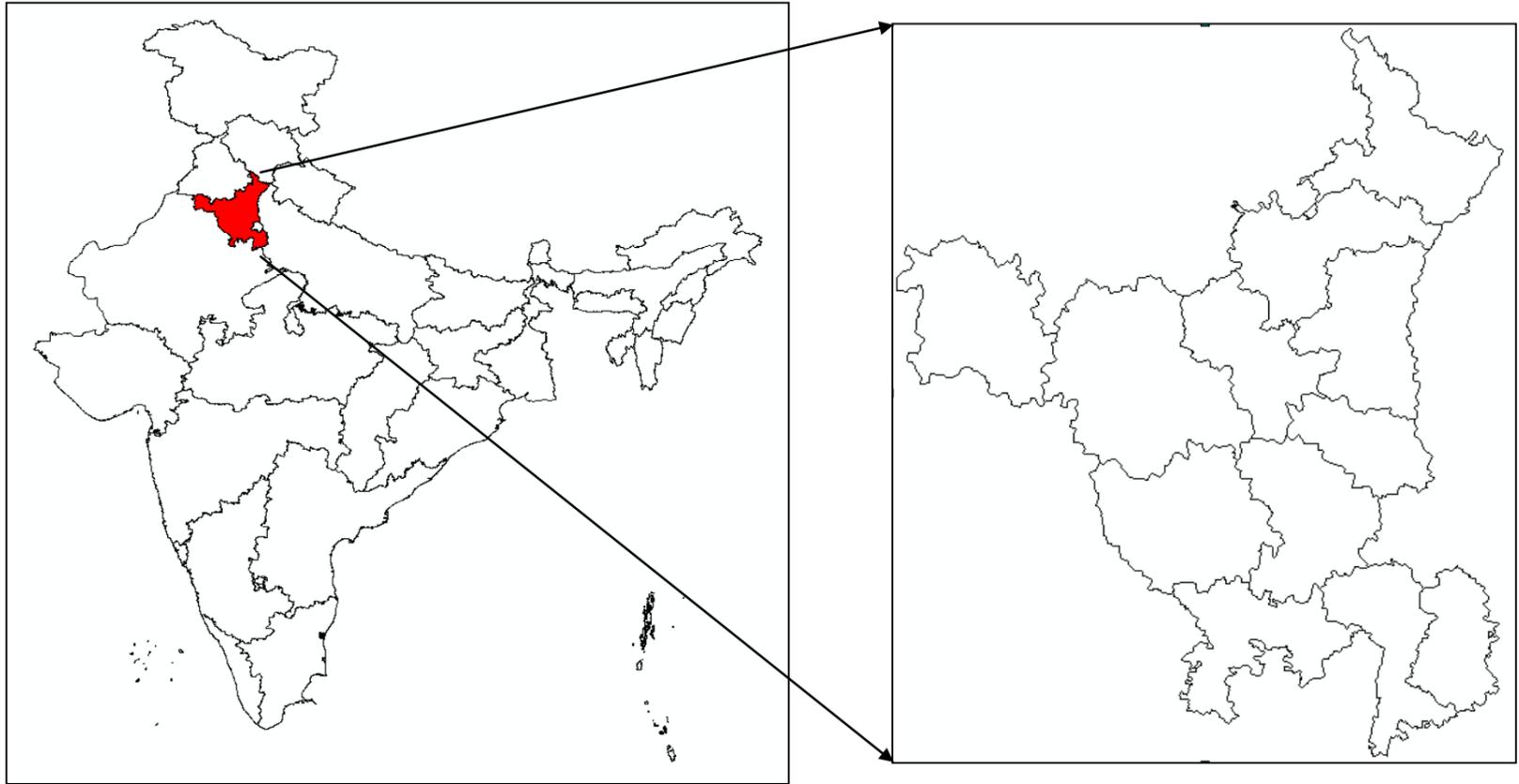


Figure 3: Location Map

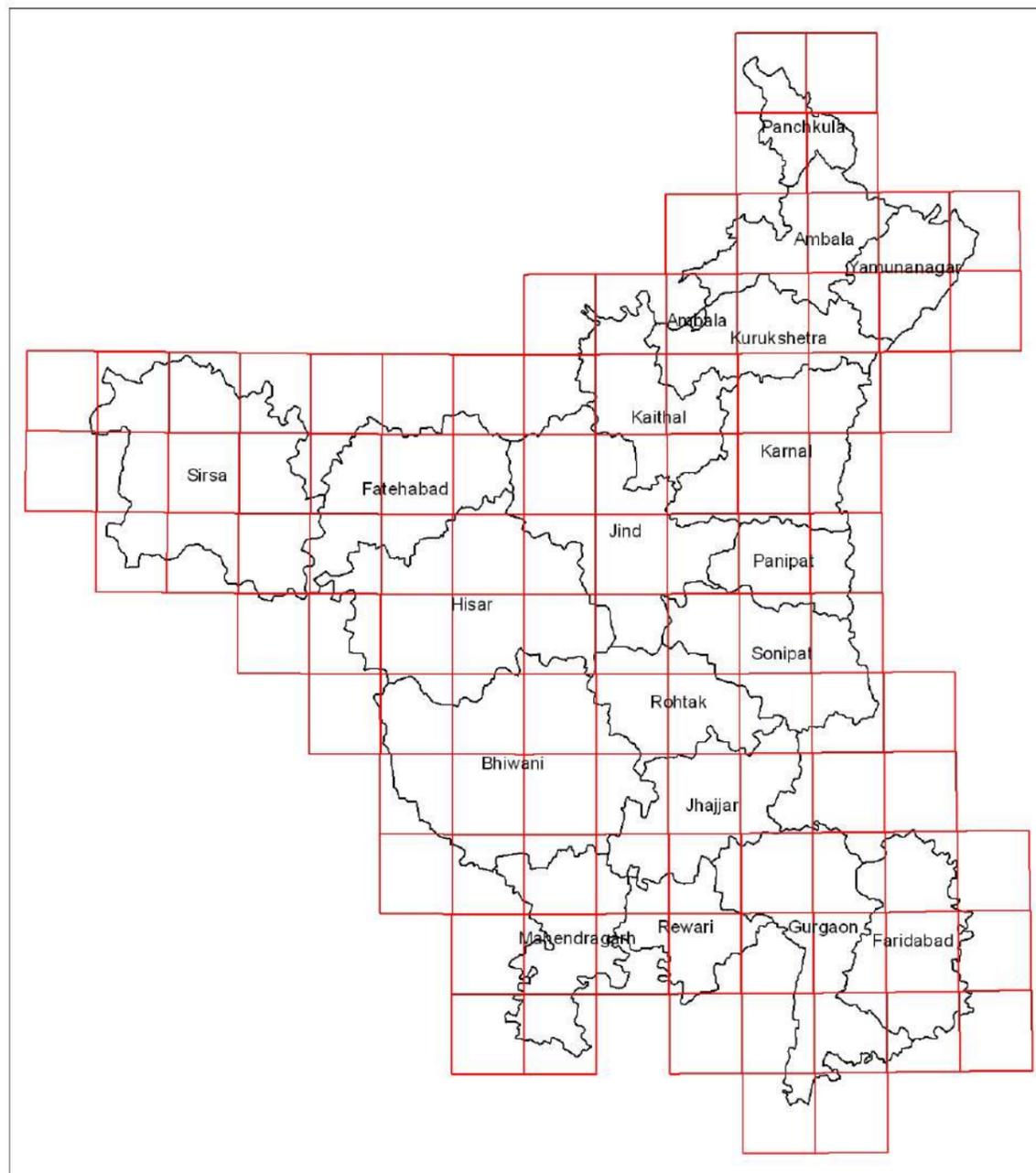


Figure 4: Spatial Framework of Haryana

#### 4.0 DATA USED

##### *Remote sensing data*

IRS P6 LISS III data was used to map the wetlands. IRS P6 LISS III provides data in 4 spectral bands; green, red, Near Infra Red (NIR) and Short wave Infra Red (SWIR), with 23.5 m spatial resolution and 24 day repeat cycle. The spatial resolution is suitable for 1:50,000 scale mapping. The state of Haryana is covered in 9 IRS LISS III scene (Figure 5). Two date data, one acquired during March and another during January were used to capture the pre-monsoon and post-monsoon hydrological variability of the wetlands respectively (Table-2). Figure 5 shows the overview of the part of Haryana as seen in the LISS III FCC of post- monsoon pre-monsoon data respectively.

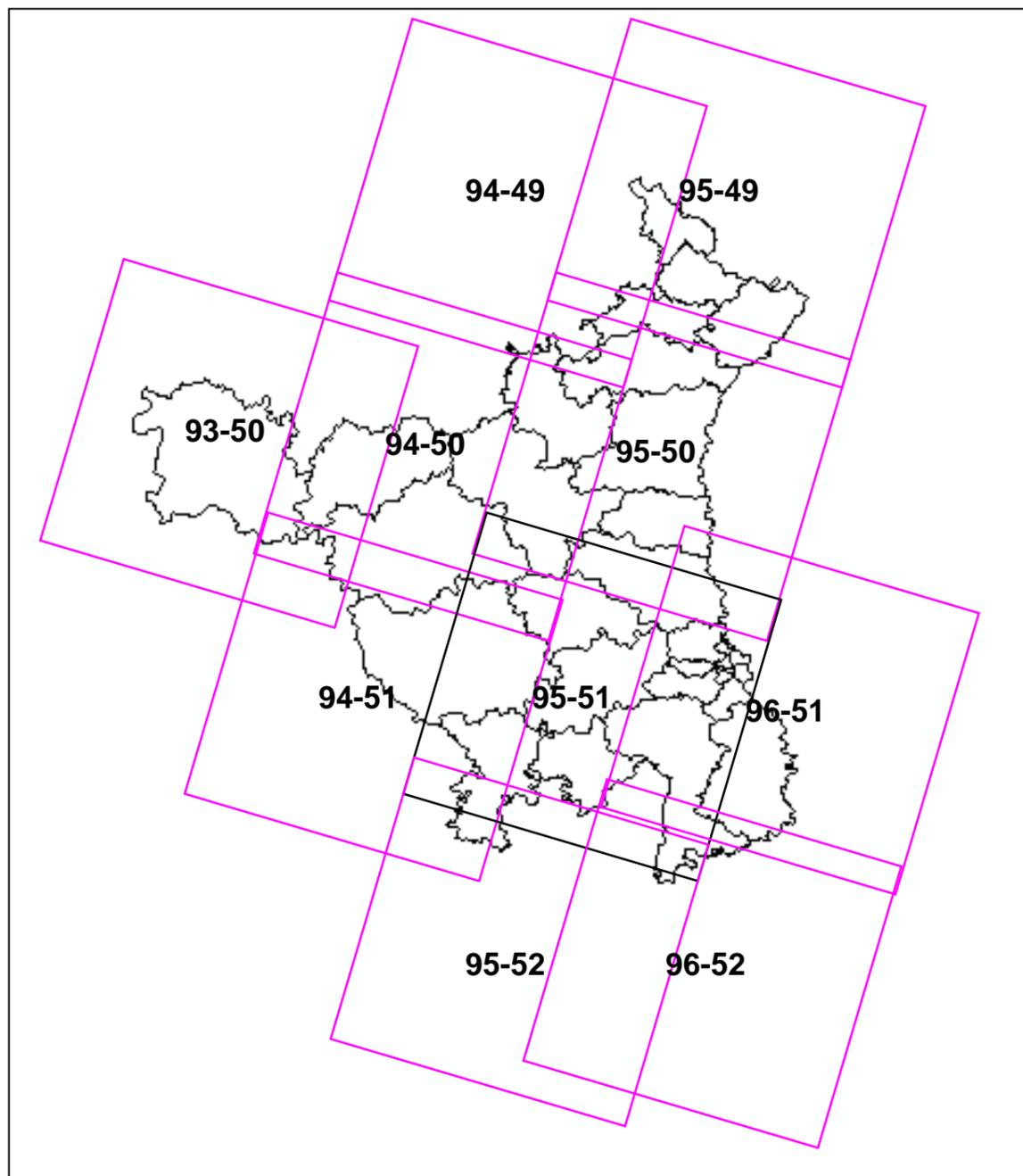


Figure 5: IRS P6 LISS-III coverage (path-row) of Haryana

Table-2: Satellite data used

Sr. No.	Sensor	Path-Row	Date of acquisition	
			Post-monsoon	Pre-monsoon
1.	LISS-III	94-50	Sep 30, 2006	Apr 10, 2007
2.	LISS-III	94-51	Sep 30, 2006	Apr 10, 2007
3.	LISS-III	96-51	Oct 10, 2006	May 14, 2007
4.	LISS-III	93-50	Oct 24, 2006	May 23, 2007
5.	LISS-III	95-49	Oct 5, 2006	May 9, 2007
6.	LISS-III	95-50	Oct 5, 2006	May 9, 2007
7.	LISS-III	95-51	Oct 10, 2005	March 3, 2006
8.	LISS-III	95-52	Oct 10, 2005	Feb 7, 2006
9.	LISS-III	96-52	Oct 10, 2006	May 14, 2007

**Ground truth data**

Remote sensing techniques require certain amount of field observation called “ground truth” in order to convert into meaningful information. Such work involves visiting a number of test sites, usually taking the satellite data. The location of the features is recorded using the GPS. The standard proforma as per the NWIA manual was used to record the field data. Field photographs are also taken to record the water quality (subjective), status of aquatic vegetation and water spread. All field verification work has been done during October and November 2008.

**Other data**

Survey of India topographical maps (SOI) were used for reference purpose. Lineage data of National Wetland Maps at 1:250,000 scale was used for reference.

**5.0 METHODOLOGY**

The methodology to create the state level atlas of wetlands is adhered to NWIA technical guidelines and procedure manual (Garg and Patel, 2007). The overview of the steps used is shown in Figure 7. Salient features of methodology adopted are

- Generation of spatial framework in GIS environment for database creation and organisation.
- Geo-referencing of satellite data
- Identification of wetland classes as per the classification system given in NWIA Manual and mapping of the classes using a knowledge based digital classification and onscreen interpretation
- Generation of base layers (rail, road network, settlements, drainage, administrative boundaries) from satellite image and ancillary data.
- Mosaicing/edge matching to create district and state level database.
- Coding of the wetlands following the standard classification system and codification as per NWIA manual.
- Preparation of map compositions and generation of statistics
- Outputs on A3 size prints and charts for atlas.

Work was carried out using ERDAS Imagine, Arc/Info and Arcgis softwares.

**5.1 Creation of spatial framework**

This is the most important task as the state forms a part of the national frame work and is covered in multiple map sheets. To create NWIA database, NNRMS/NRDB standards is followed and four corners of the 1:50,000 (15' x 15') grid is taken as the tics or registration points to create each map taking master grid as the reference. Spatial framework details are given in NWIA manual (Garg and Patel 2007). The spatial framework for Haryana state is shown in Figure 4.

**5.2 Geo-referencing of satellite data**

In this step the raw satellite images were converted to specific map projection using geometric correction. This is done using archived geometrically corrected LISS III data (ISRO-NRC-land use / land cover project ). Standard image processing software was used for geo-referencing. First one date data was registered with the archived image. The second date data was then registered with the first date data.

**5.3 Mapping of wetlands**

The delineation of wetlands through image analysis forms the foundation for deriving all wetland classes and results. Consequently, a great deal of emphasis has been placed on the quality of the image Interpretation. In the present study, the mapping of wetlands was done following digital classification and onscreen visual interpretation. Wetlands were identified based on vegetation, visible hydrology and geography. There are various methods for extraction of water information from remote sensing imagery, which according to the number of bands used, are generally divided into two categories, i.e. Single-band and multi-band methods. Single-band method usually involves choosing a band from multi-spectral image to distinguish water from land by subjective threshold values. It may lead to over- or under-estimation of open water area. Multi-band method takes advantage of reflective differences of each band. In this project, five indices known in literature that enhances various wetland characteristics were used (McFeetres, 1986; Xu Hanqiu, 2006; Lacaux *et al*, 2007; Townshend and Justice, 1986; Tucker and Sellers, 1986) as given below:

- i) Normalised Difference Water Index (NDWI) =  $(\text{Green} - \text{NIR}) / (\text{Green} + \text{NIR})$
- ii) Modified Normalised Difference Water Index (MNDWI) =  $(\text{Green} - \text{MIR}) / (\text{Green} + \text{MIR})$
- iii) Normalised Difference Vegetation Index (NDVI) =  $(\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$
- iv) Normalised Difference Pond Index (NDPI) =  $(\text{MIR} - \text{Green}) / (\text{MIR} + \text{Green})$
- v) Normalised Difference Turbidity Index (NDTI) =  $(\text{Red} - \text{Green}) / (\text{Red} + \text{Green})$

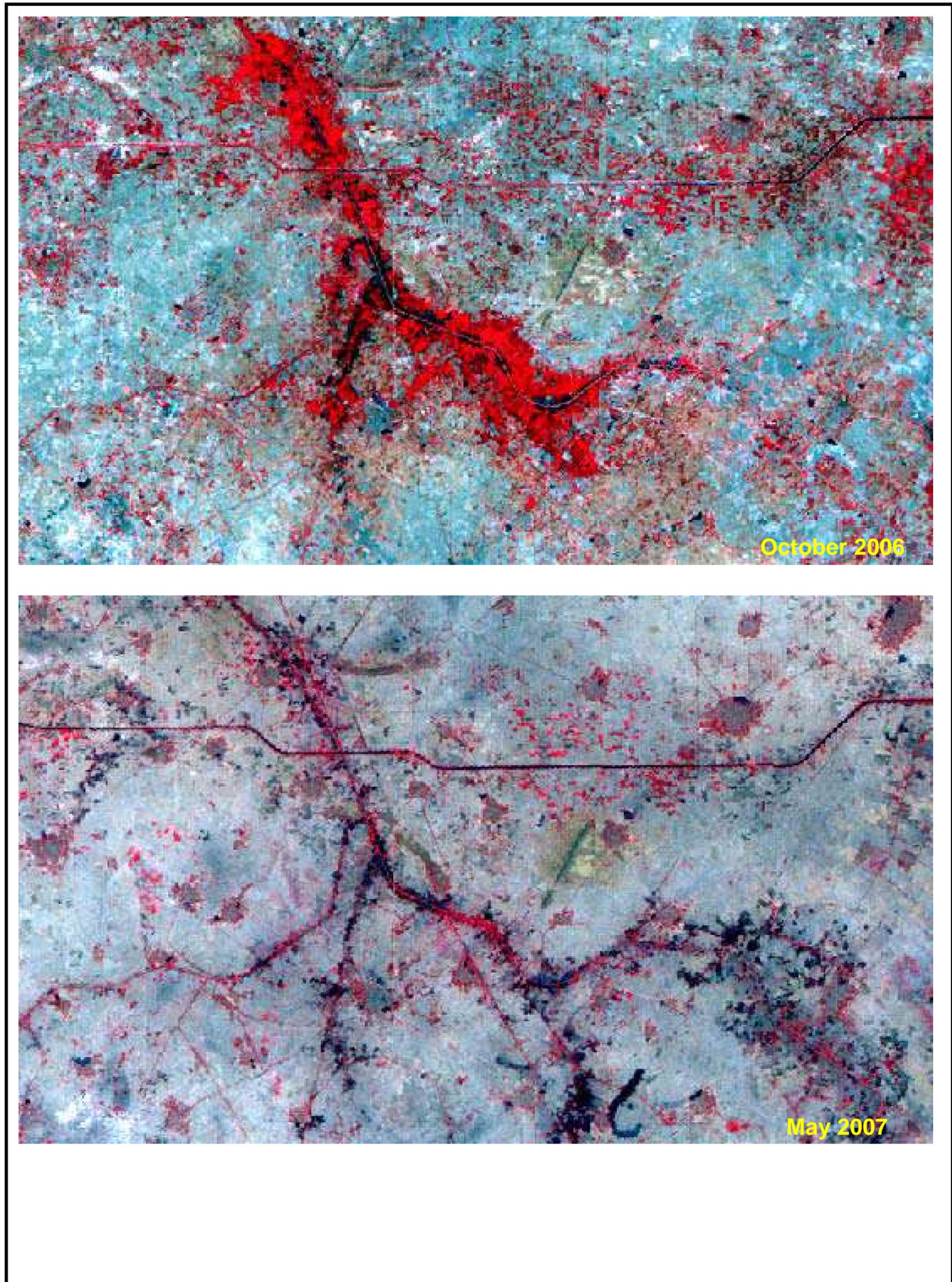


Figure 6: IRS LISS-III FCC (Post-monsoon and Pre-monsoon): Part of Haryana state

The indices were generated using standard image processing software, stacked as layers. (Figure 8). Various combinations of the indices/spectral bands were used to identify the wetland features as shown in Figure 9. The following indices were used for various layer extractions:

- Extraction of wetland extent :

MNDWI, NDPI and NDVI image was used to extract the wetland boundary through suitable hierarchical thresholds.

- Extraction of open water :

MNDWI was used within the wetland mask to delineate the water and no-water areas.

- Extraction of wetland vegetation :

NDPI and NDVI image was used to generate the vegetation and no-vegetation areas within a wetland using a suitable threshold.

- Turbidity information extraction :

NDTI and MNDWI image was used to generate qualitative turbidity level (high, moderate and low) based on signature statistics and standard deviations. In the False Colour Composite (FCC) these generally appear in different hues (Table-3).

Table 3: Qualitative turbidity ratings

Sr. No.	Qualitative Turbidity	Conditional criteria	Hue on False Colour Composite (FCC)
1.	Low	$> +1\sigma$	Dark blue/blackish
2.	Moderate	$> -1\sigma$ to $\leq +1\sigma$	Medium blue
3.	High/Bottom reflectance	$\leq \mu - 1\sigma$	Light blue/whitish blue

#### 5.4 Conversion of the raster (indices) into a vector layer

The information on wetland extent, open water extent, vegetation extent and turbidity information was converted into vector layers using region growing properties or on-screen digitisation.

#### 5.5 Generation of reference layers

Base layers like major rail, road network, settlements, drainage are interpreted from the current image or taken from other project database. The administrative boundaries (district, state) are taken from the known reference data.

#### 5.6 Coding and attribute scheme

Feature codification scheme for every input element has been worked out keeping in view the nationwide administrative as well as natural hierarchy (State-district-taluka) within the feature class for each of the theme. All data elements are given a unique name/code, which are self explanatory with short forms.

#### 5.7 Map composition and output

Map composition for atlas has been done at district and state level. A standard color scheme has been used for the wetland classes and other layers. The digital files are made at 1:50,000 scale. The hard copy outputs are taken on A3 size.

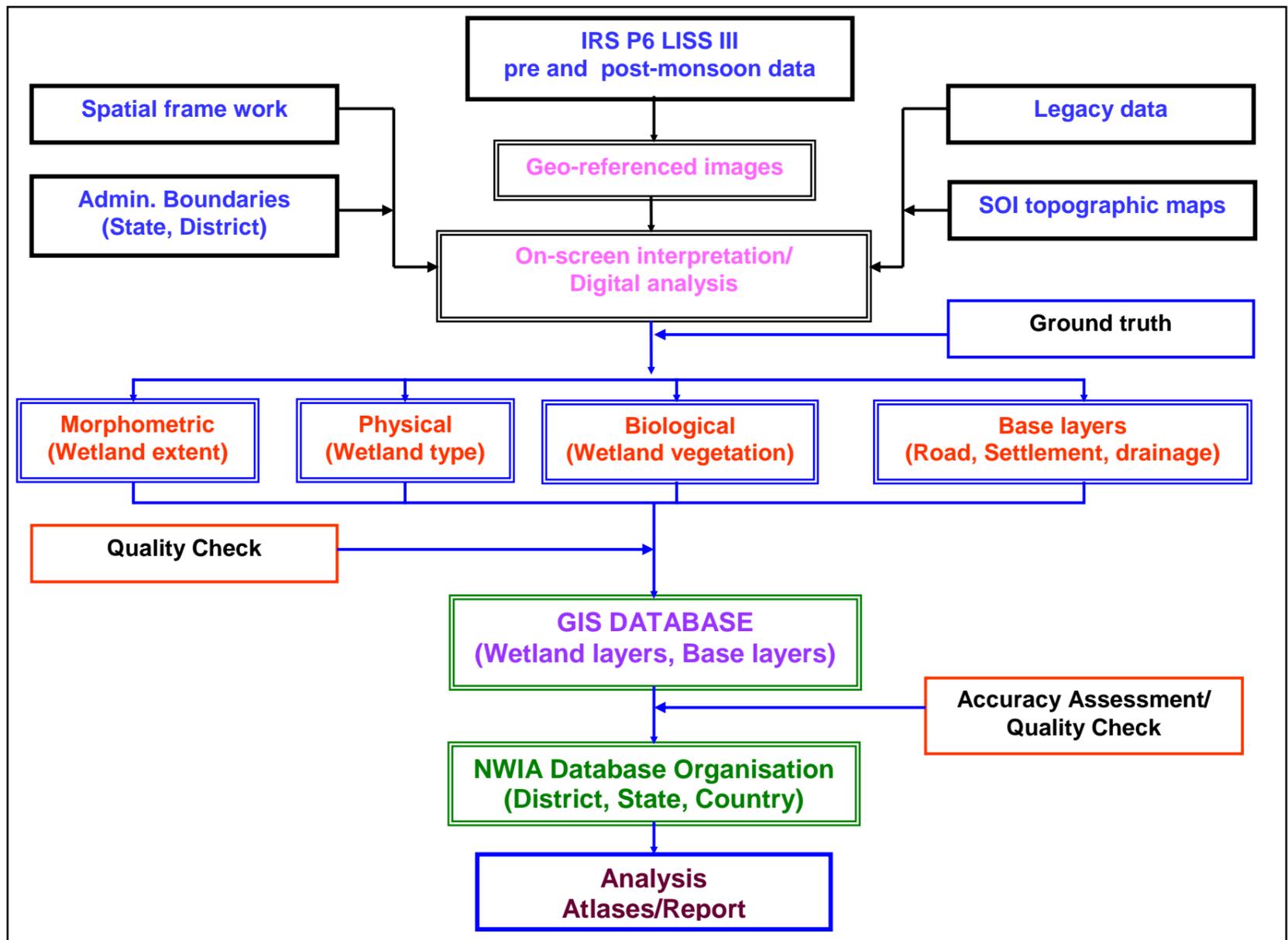


Figure 7: Flow chart of the methodology used

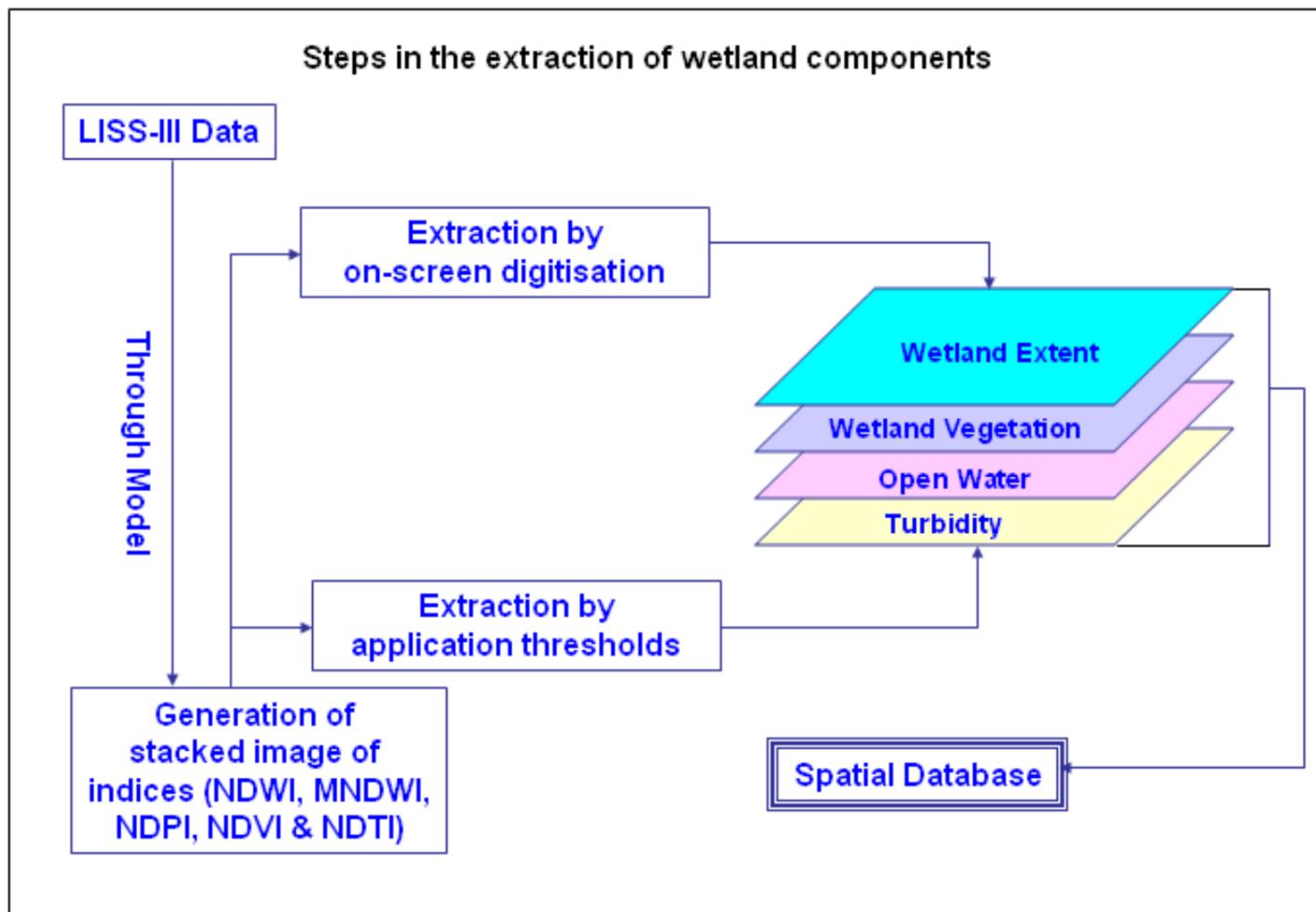


Figure 8: Steps in the extraction of wetland components

## **6.0 ACCURACY ASSESSMENT**

A comprehensive accuracy assessment protocol has been followed for determining the quality of information derived from remotely sensed data. Accuracy assessment involves determination of thematic (classification) as well as locational accuracy. In addition, GIS database(s) contents have been also evaluated for accuracy. To ensure the reliability of wetland status data, the project adhered to established quality assurance and quality control measures for data collection, analysis, verification and reporting.

This study used well established, time-tested, fully documented data collection conventions. It employed skilled and trained personnel for image interpretation, processing and digital database creation. All interpreted imageries were reviewed by technical expert team for accuracy and code. The reviewing analyst adhered to all standards, quality requirements and technical specifications and reviewed 100 percent of the work. The various stages of quality check include:

1. Image-to-Image Geo-referencing/Data generation
2. Reference layer preparation using NWIA post monsoon and pre-monsoon LISS-III data.
3. Wetland mapping using visual/digital interpretation techniques.
4. Geo-data base creation and organization
5. Output products.

### **6.1 Data verification and quality assurance of output digital data files**

All digital data files were subjected to rigorous quality control inspections. Digital data verification included quality control checks that addressed the geospatial correctness, digital integrity and some cartographic aspects of the data. Implementation of quality checks ensured that the data conformed to the specified criteria, thus achieving the project objectives. There were tremendous advantages in using newer technologies to store and analyze the geographic data. The geospatial analysis capability built into this study provided a complete digital database to better assist analysis of wetland change information. All digital data files were subjected to rigorous quality control inspections. Automated checking modules incorporated in the geographic information system (Arc/GIS) were used to correct digital artifacts including polygon topology. Additional customized data inspections were made to ensure that the changes indicated at the image interpretation stage were properly executed.

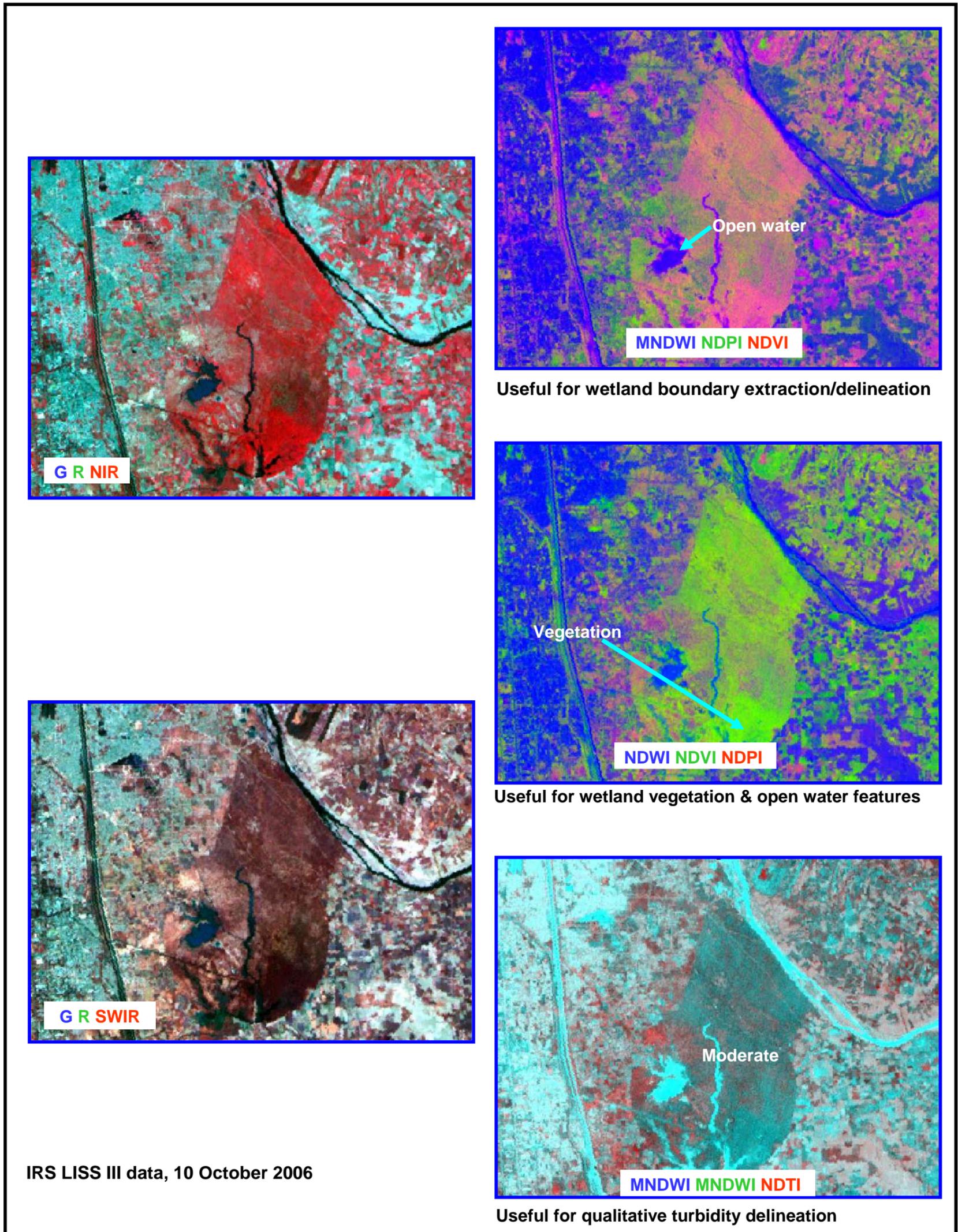


Figure 9: Various combinations of the indices/spectral bands used to identify wetland components

## **MAPS AND STATISTICS**

## 7.0 WETLANDS OF HARYANA: MAPS AND STATISTICS

Area estimates of various wetland categories for Haryana have been carried out using GIS layers of wetland boundary, water-spread, aquatic vegetation and turbidity. Total 1441 wetlands have been mapped at 1:50,000 scale in the state. In addition, 10529 wetlands (smaller than 2.25 ha) have also been identified. Total wetland area estimated is 42478 ha that is around 0.86 per cent of the geographic area (Table 4). The major wetland types are River/Stream accounting for 40.08 per cent of the wetlands (17025 ha), Tank/Ponds (7573 ha), waterlogged (3339 ha) and Reservoirs/Barrage (1775 ha). Graphical distribution of wetland type is shown in Figure 10.

Analysis of wetland status in terms of open water and aquatic vegetation showed that around 14216 ha and 2245 ha respectively. Lotic wetlands include rivers and major streams and contribute an area of 17025 ha. Open water in post-monsoon season is very less (3121 ha). It clearly indicates that these rivers are mainly seasonal and receives scanty rainfall. Perennial rivers are few and river flow is restricted to narrow streams of the river. Presence of aquatic vegetation is more during post monsoon season and it is mainly due to dispersion of floating vegetation by wind and water current. Aquatic vegetation occupies an area of 2245 and 1497 during post-and pre-monsoon respectively. High turbidity (3968 ha) is observed during post-monsoon season. Lakes and ponds showed low turbidity in general where as tanks/ponds located around thermal plants and industrial area showed high turbidity. Inland wetlands mainly lakes and ponds shown drastic decrease in terms of area in pre-monsoon season (20 ha) and it is due to high temperature during this season.

Table 4: Area estimates of wetlands in Haryana

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	5	801	1.89	284	20
2	1102	Ox-bow lakes/ Cut-off meanders	3	24	0.06	17	17
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	76	1412	3.32	1123	819
6	1106	River/Stream	20	17025	40.08	3121	9362
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	4	1775	4.18	59	175
8	1202	Tanks/Ponds	1097	7573	17.83	6782	6344
9	1203	Waterlogged	236	3339	7.86	2830	2175
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>1441</b>	<b>31949</b>	<b>75.21</b>	<b>14216</b>	<b>18912</b>
		Wetlands (<2.25 ha), mainly Tanks	10529	10529	24.79	-	-
		<b>Total</b>	<b>11970</b>	<b>42478</b>	<b>100.00</b>	<b>14216</b>	<b>18912</b>

<b>Area under Aquatic Vegetation</b>	2245	1497
--------------------------------------	------	------

<b>Area under turbidity levels</b>		
Low	6953	6423
Moderate	3295	9481
High	3968	3008

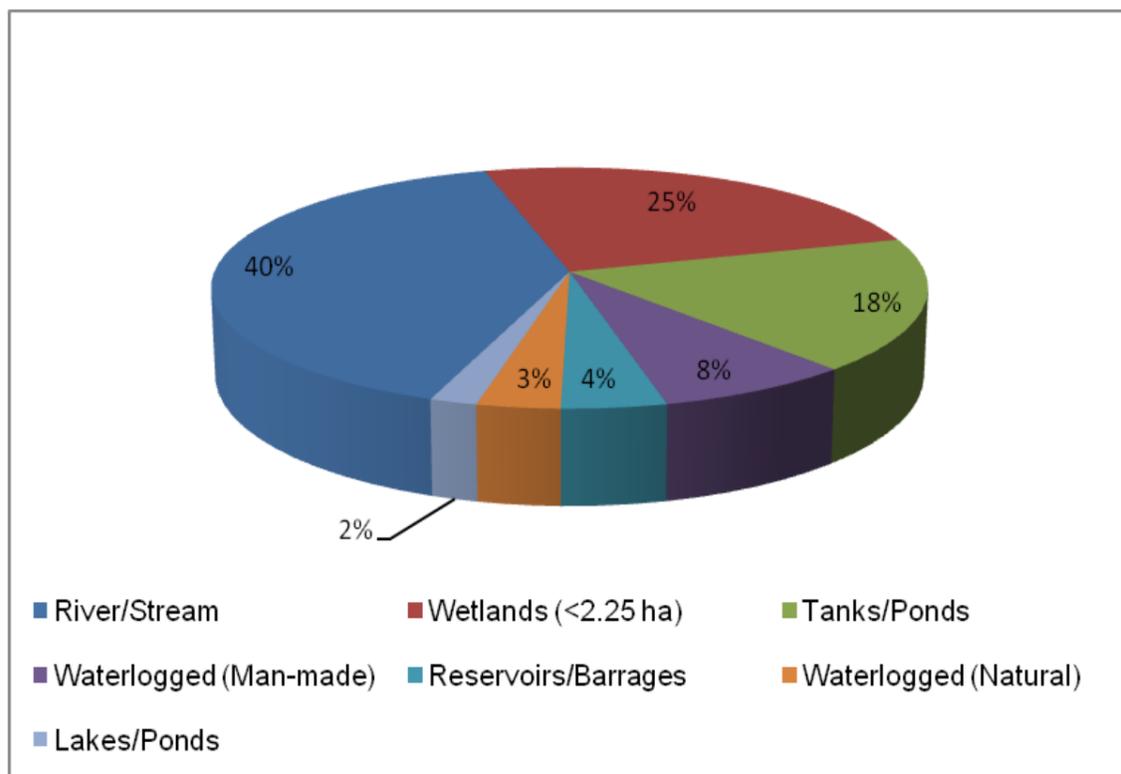


Figure 10: Type-wise wetland distribution in Haryana

### 7.1 DISTRICT-WISE WETLAND MAPS AND STATISTICS

The state has nineteen districts. District-wise distribution of wetlands showed that three districts could be called as wetland rich. Panchkulla has highest concentration which is around 3.53 percent of geographic area under wetland. The other two districts are: Yamunanagar and Karnal have 2.79 and 1.65 per cent area under wetland respectively. Five districts Kaithal Fatehabad, Sirsa, and Bhiwani have least amount of wetland area. These districts are small in terms of geographic area and highly industrialized due to proximity to national capital. District-wise wetland area estimates is given in Table-5. Figure 11 shows district-wise graphical distribution of wetlands. Mahendragadh and Rewari have less wetland area.

Wetland statistics followed by wetland map and corresponding satellite data for each district is given to have a fairly good idea about the distribution pattern and density of wetlands in the district.

Table-5: District-wise wetland area

Sr. No.	District	Geographic Area	Wetland Area	% of total wetland area	% of district geographic area
		(sq. km)	(ha)		
1	Panchkulla	898	3173	7.47	3.53
2	Ambala	2385	3036	7.15	1.27
3	Yamunanagar	1756	4893	11.52	2.79
4	Kurukshetra	1217	1671	3.93	1.37
5	Kaithal	2799	1332	3.14	0.48
6	Karnal	1967	3246	7.64	1.65
7	Panipath	1754	1862	4.38	1.06
8	Sonipath	1385	2154	5.07	1.56
9	Jind	2736	2153	5.07	0.79
10	Fatehabad	2760	1539	3.62	0.56
11	Sirsa	4276	1776	4.18	0.42
12	Hisar	6279	2811	6.62	0.45
13	Bhiwani	5099	1748	4.12	0.34
14	Rohtak	4411	1683	3.96	0.38
15	Jhajjar	1834	2194	5.17	1.20
16	Mehendragarh	1683	442	1.04	0.26
17	Rewari	1559	442	1.04	0.28
18	Gurgaon	2105	2764	6.51	1.31
19	Faridabad	2760	3559	8.38	1.29
	<b>Total</b>	<b>49663</b>	<b>42478</b>	<b>100.00</b>	

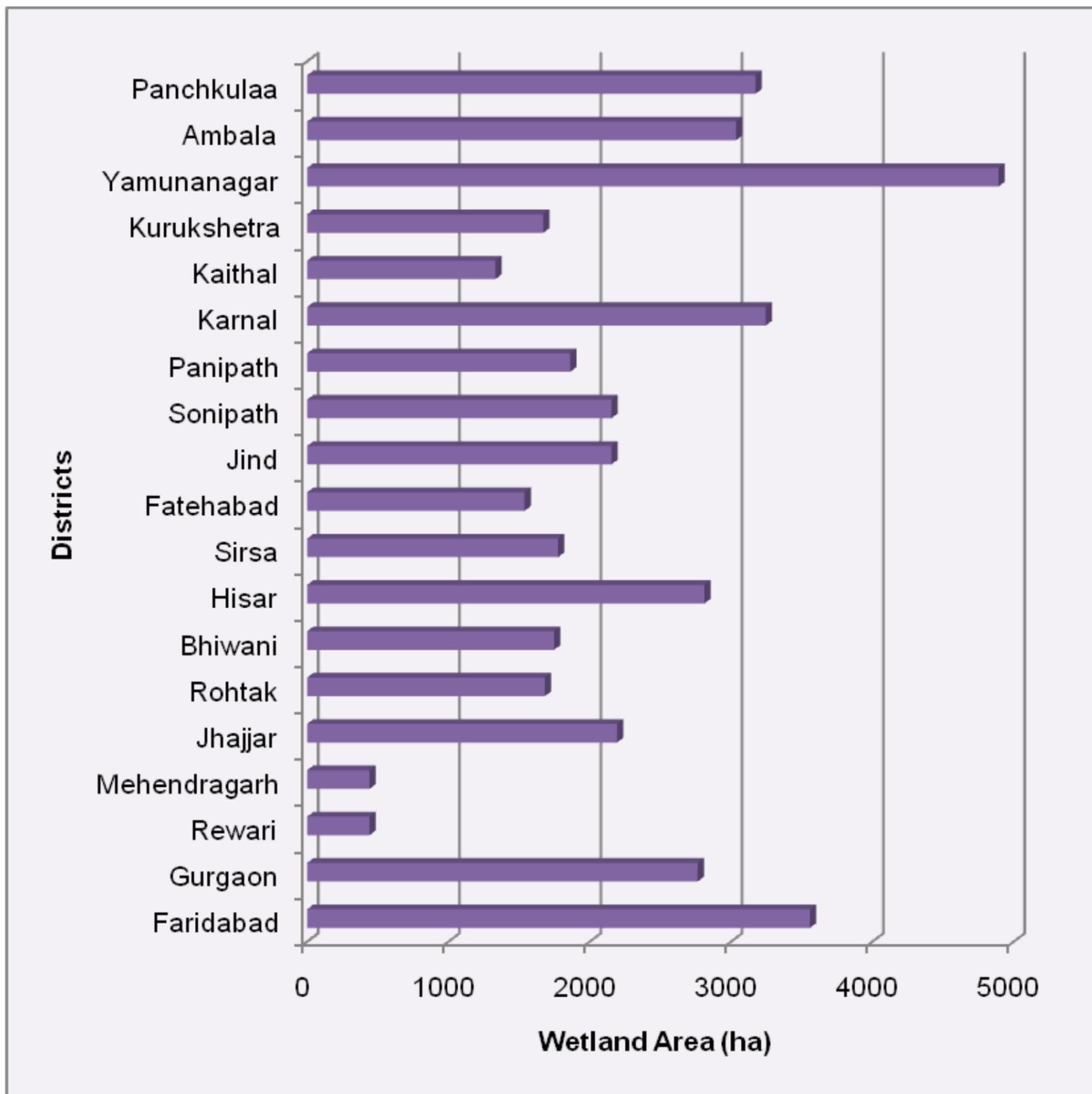


Figure 11: District-wise graphical distribution of wetlands

State : Haryana

WETLAND MAP

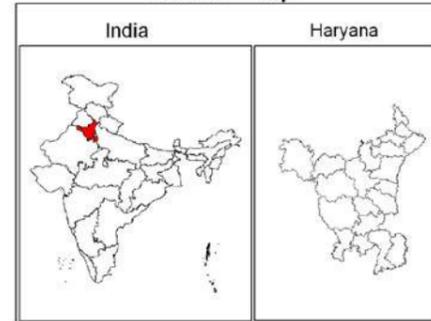


Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
		Natural		
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
		Man-made		
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
		Natural		
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
		Man-made		
	2201			Salt pans
	2202			Aquaculture ponds

Legend

- Wetlands (<2.25ha)
- Settlements
- Drainage (line)
- Major Roads
- Railway
- Town/Settlements
- District Boundary
- State Boundary
- International Boundary

Location Map



0 15 30 60 90 Kilometers

Data Source :  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

Prepared By :  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

Sponsored By :  
Ministry of Environment and Forests  
Government of India

State : Haryana



IRS P6 AWiFS post monsoon data (2004)

### 7.1.1 Panchkula

Panchkula district is the northern most part of the Haryana State. It has been carved out from Ambala district in the year of 1995. It comprises of a total area of about 898 sq. km. It lies between north latitudes 30°21' to 30°56' and 76°48' to 77°10' east longitudes. The average rainfall of Panchkula district is about 1430 mm. about 80 percent of its annual rainfall is received in months of June to September. It also receives some rains in the winter months due to western disturbances. Despite heavy rainfall in this area, the water retention is very low. It is due to high surface runoff because of high slopes in the area. Temperature starts rising steadily from February onwards till the onset of monsoon. The hottest months in the year are May and June with mean daily maximum temperature is about 45° C. The coldest month of the year is January with mean daily minimum temperature of 3° C.

The Panchkula district comprises of four distinct physiographic units, which are roughly parallel to each other. The districts form a part of the Indo-Gangetic plain and the Himalayan ranges. These physiographic units are: Siwalik Hills, Kandi Belt, Intermountain Valley and Alluvial Plain. Siwalik Hills: The Siwalik hills form the north and eastern parts of the area. These hill ranges are roughly run in NNW-SSE direction, attain an altitude of 600 meters and slopes towards southwest with an average gradient of about 28 m/km. These hills are deeply eroded and furrowed to form bad land topography.

The geological milieu in the district represents the lithological formation belonging to the Indo-Gangetic plain and Extra-Peninsular regions. The district can be divided in two different geological units as Tertiary rocks of Lesser Himalayas & Siwalik and Quaternary deposits of Indo-Gangetic Plains.

Details of the wetland statistics of the district are given in Table 6.

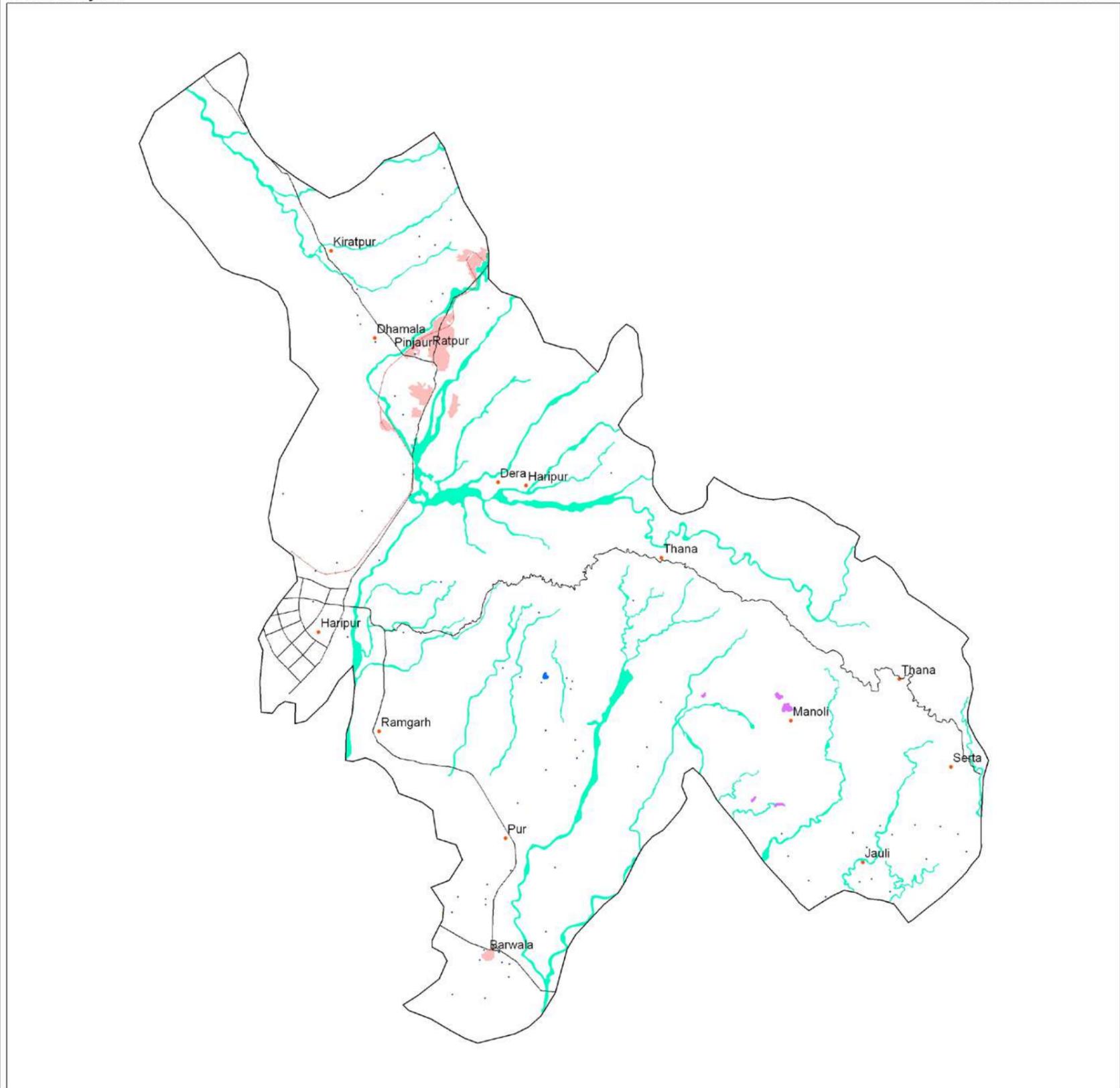
Table 6: Area estimates of wetlands in Panchkula

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	5	37	1.17	37	37
6	1106	River/Stream	15	3051	96.16	43	2680
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	1	7	0.22	6	6
9	1203	Waterlogged	-	-	-	-	-
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>21</b>	<b>3095</b>	<b>97.54</b>	<b>86</b>	<b>2723</b>
		Wetlands (<2.25 ha), mainly Tanks	78	78	2.46	-	-
		<b>Total</b>	<b>99</b>	<b>3173</b>	<b>100.00</b>	<b>86</b>	<b>2723</b>

<b>Area under Aquatic Vegetation</b>	-	-
--------------------------------------	---	---

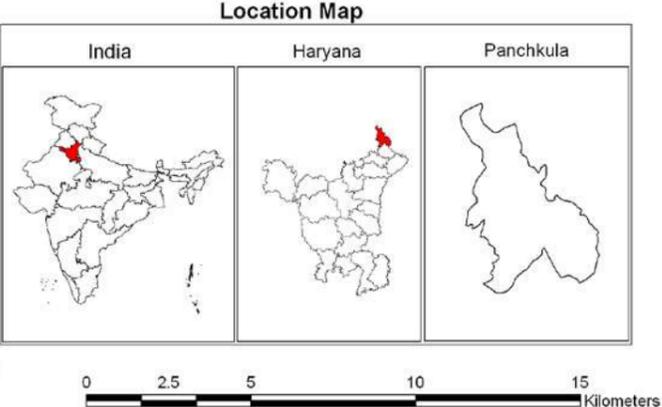
<b>Area under turbidity levels</b>		
Low	6	6
Moderate	42	2681
High	39	36

The total wetland area in the district is 3173 ha and river/streams contribute 96 per cent. Water spread area in post-monsoon season is 86 ha. Where as in pre-monsoon season the area increased to 2723 ha and it is due to melting of snow in the up streams of the snow fed rivers. In all there are only 21 wetlands having area more than 2.25 ha in the district and less than 2.25ha wetlands are 78. Qualitative turbidity ranges from moderate to high and open water devoid of aquatic vegetation in both the season. High turbidity is due to dispersion of silt and clay originated because of erosion.



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			<b>Natural</b>	
				Lakes/Ponds
				Ox-bow lakes/ Cut-off meanders
				High altitude wetlands
				Reverine wetlands
				Waterlogged
				River/Stream
			<b>Man-made</b>	
				Reservoirs/Barrages
				Tanks/Ponds
				Waterlogged
				Salt pans
		<b>Coastal Wetlands</b>		
			<b>Natural</b>	
				Lagoons
				Creeks
				Sand/Beach
				Intertidal mud flats
				Salt marsh
				Mangroves
				Coral reefs
			<b>Man-made</b>	
				Salt pans
				Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



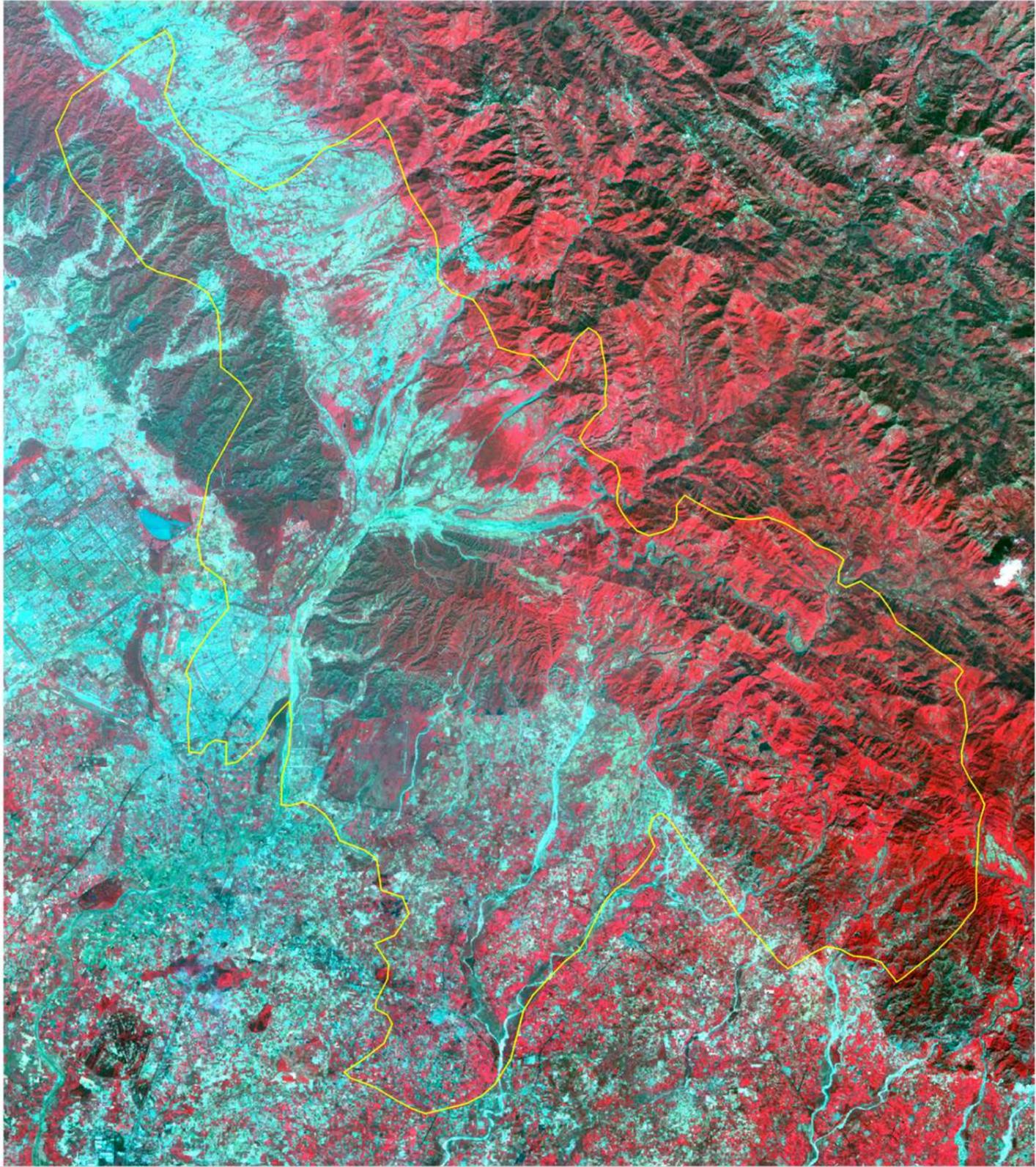
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Panchkula



IRS P6 LISS-III post monsoon data (2006)

### 7.1.2 Ambala

The Ambala district is located between 30°07' N to 30°34' N latitude and 76°20' E to 77°10' E longitude. The total area of the district is 1574 sq. km. A very hot and dry summer, southwest monsoon season and a bracing cold season characterize the climate of district. The average annual rainfall ranges between 1175 to 1345 mm (based on averages of 1995-99, 1996-2000 & 1997-01). About 71 per cent of annual rainfall is received during the short south-western monsoon period. There is a rapid increase in temperature after February. The mean daily maximum temperature is reached up to 43.7 in May, which is the hottest months and lowest reached up to 2.2 °C in January, which is the coldest month. Foothill Rolling Plain is a long belt of undulating, fairly sloping plain with elevation 300-400 meter, adjoining the Shiwalik range. The district is mainly drained by non-perennial stream. From the east to west the drainage system of the district comprises of Chautang, Rakshi, Saraswati, Markanda, and the tributaries and Dangri (Tangri) and its tributaries. The northern part of the district constitutes territory rocks including lime stone, sand stone, shale and boulder conglomerate and these from low lying hill ranges known as the Shiwalik foot hills. The southern part of district is occupies by the Indo-Gangetic alluvial comprising clay, silt and sand.

Details of the wetland statistics of the district are given in Table 7.

Table 7: Area estimates of wetlands in Ambala

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	3	23	0.76	23	23
6	1106	River/Stream	9	2583	85.08	0	934
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	17	85	2.80	79	78
9	1203	Waterlogged	3	27	0.89	26	15
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>32</b>	<b>2718</b>	<b>89.53</b>	<b>128</b>	<b>1050</b>
		Wetlands (<2.25 ha), mainly Tanks	318	318	10.47	-	-
		<b>Total</b>	<b>350</b>	<b>3036</b>	<b>100.00</b>	<b>128</b>	<b>1050</b>

<b>Area under Aquatic Vegetation</b>	4	11
--------------------------------------	---	----

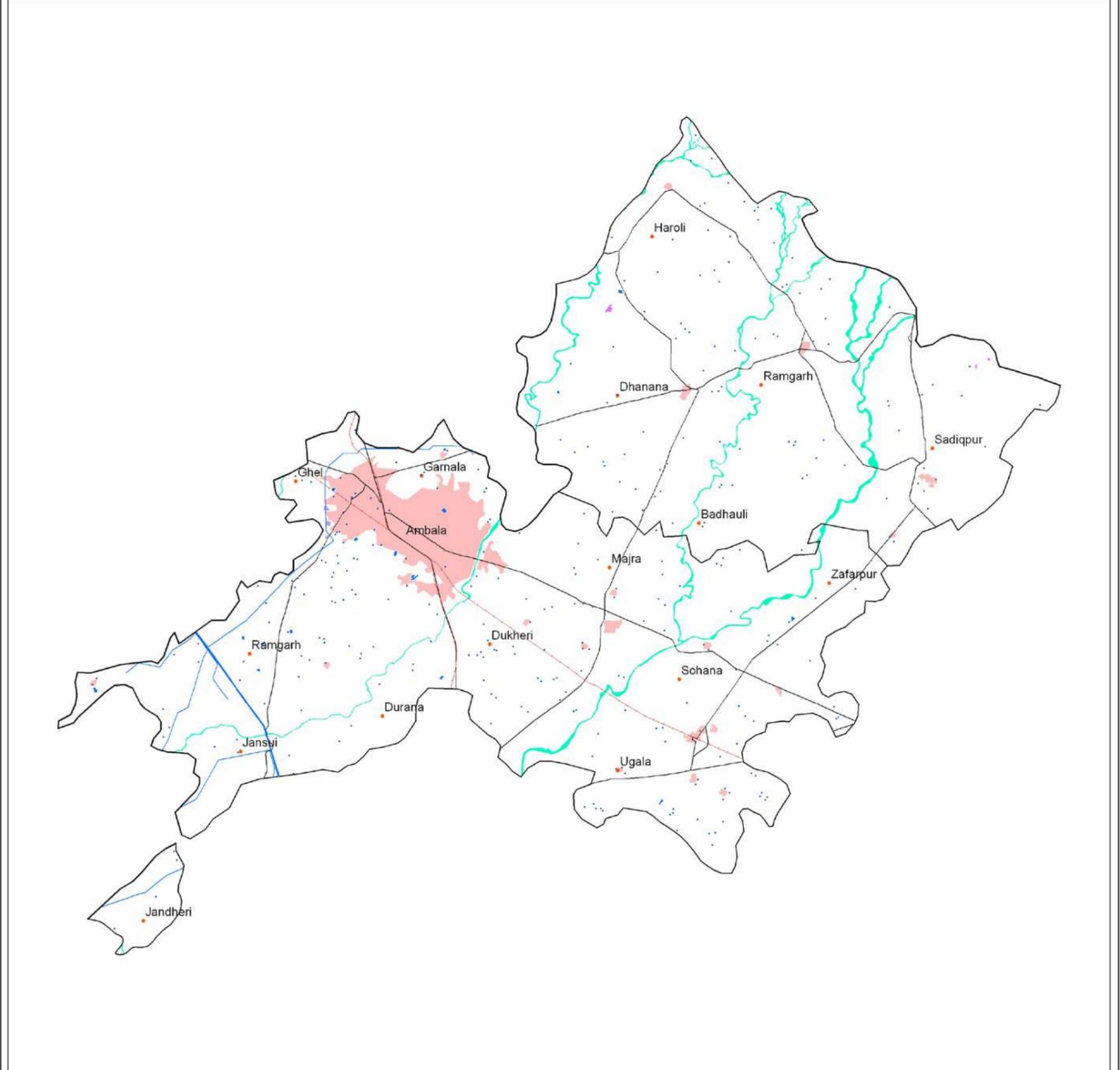
<b>Area under turbidity levels</b>		
Low	78	78
Moderate	0	935

The total wetland area in the district is 3036 ha. and river/streams contribute 95 per cent. Water spread area in post-monsoon season is almost negligible. Where as in pre-monsoon season the area increased to 935 ha. due to melting of snow in upper stretches rivers. In all there are only 32 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 318. Qualitative turbidity ranges from low to high. High turbidity is observed in rivers/ streams during pre-monsoon season. Out of 32 wetlands 4 wetlands infested by aquatic vegetation whereas in pre-monsoon season 11 wetlands. High turbidity is due to dispersion of sediments in rivers.

State : Haryana

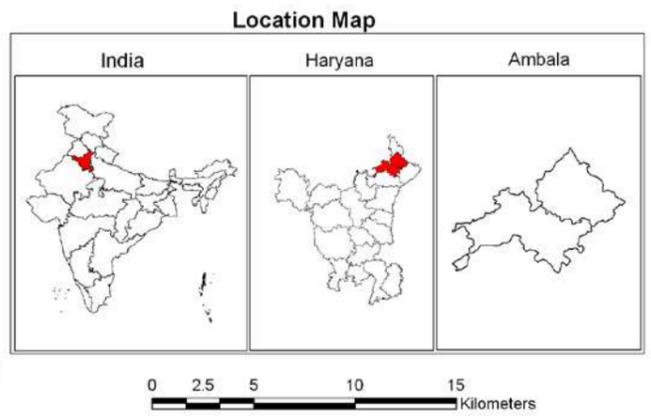
WETLAND MAP

District : Ambala



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



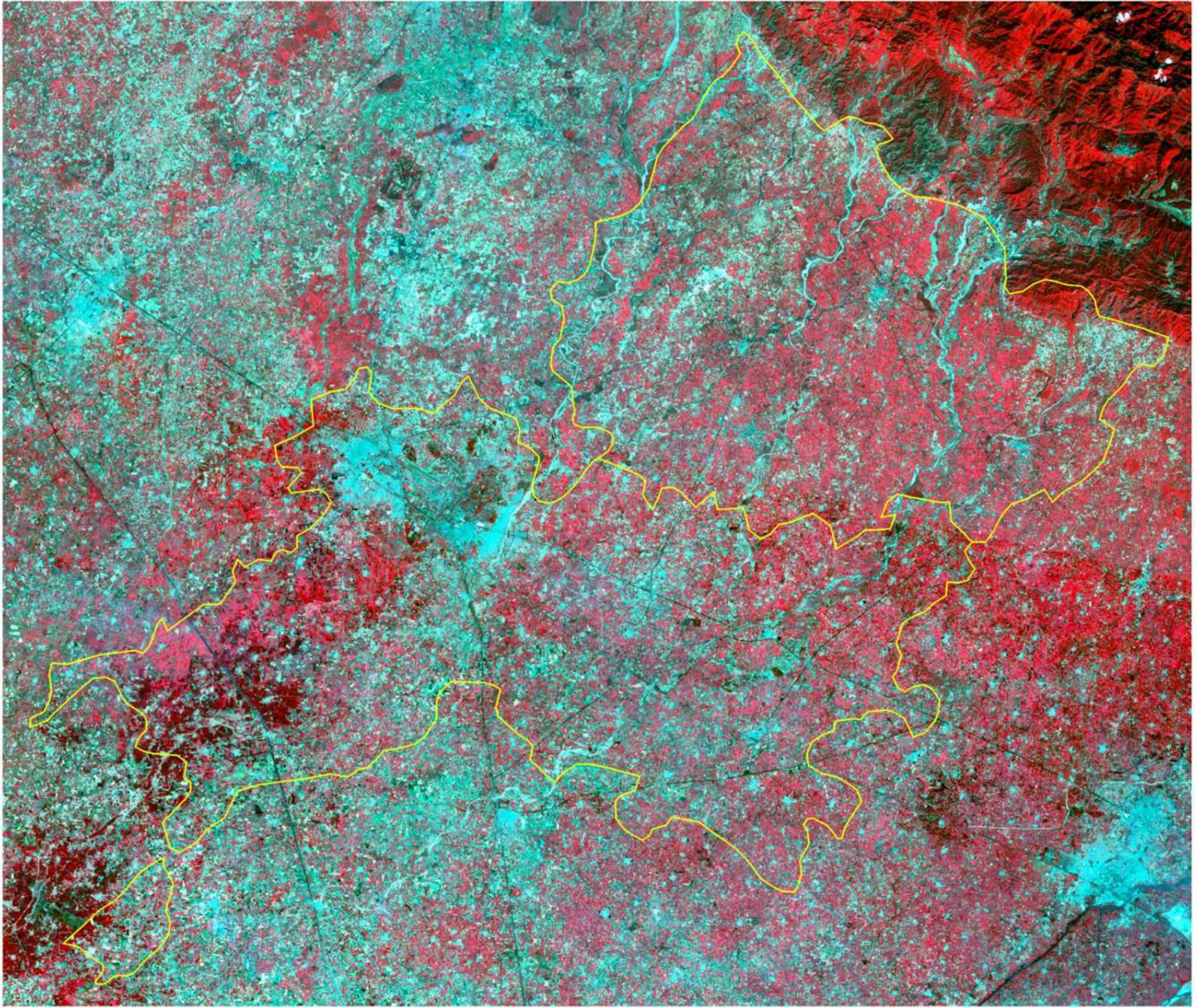
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Ambala



IRS P6 LISS-III post monsoon data (2006)

### 7.1.3 Yamunanagar

The district lies between east longitude 77°13' to 77°36' and northern latitude 29°50'to 30°3'. The area of the district is 1,768 sq. kms. The climate of the district is sub-tropical and characterized by a very hot and dry summer, southwest monsoon season and a bracing cold season. The average annual rainfall in the district is 1116 mm. About 81 per cent of the annual normal rainfall in the district is received during June to September whereas about 11 percent is received in the winter month of December to February. May and June are generally the hottest months in the year with the mean daily maximum temperature at about 41°C and the mean daily minimum at about 25°C to 27°C.

On the basis of similarities in local relief, slope, texture, surface material and arrangement of landform features, the district can be divided into three distinct physiographic units viz. shivalik hill tracts, foothill rolling plain and Yamuna upland plain.

The main rivers/ streams of the district are Yamuna, Markanda, Bata Nala, Giri and Asan most of which are non-perennial streams. The Yamuna is a perennial river, which borders the district on its southeast. The soils in the district are mainly silty loam (Khadar), loam (Bhangar and Nardak), Piedmont (Ghar and Kandi) silty clay (Naili and Chhachhra-Dakar), and light loam (Seoti).

Table 8: Area estimates of wetlands in Yamunanagar

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	-	-	-	-	-
6	1106	River/Stream	5	4335	88.60	391	1963
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	1	37	0.76	34	19
8	1202	Tanks/Ponds	8	34	0.69	24	26
9	1203	Waterlogged	12	240	4.90	240	69
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>26</b>	<b>4646</b>	<b>94.95</b>	<b>689</b>	<b>2077</b>
		Wetlands (<2.25 ha), mainly Tanks	247	247	5.05	-	-
		<b>Total</b>	<b>273</b>	<b>4893</b>	<b>100.00</b>	<b>689</b>	<b>2077</b>

<b>Area under Aquatic Vegetation</b>	9	8
--------------------------------------	---	---

<b>Area under turbidity levels</b>		
Low	57	45
Moderate	392	1965
High	240	67

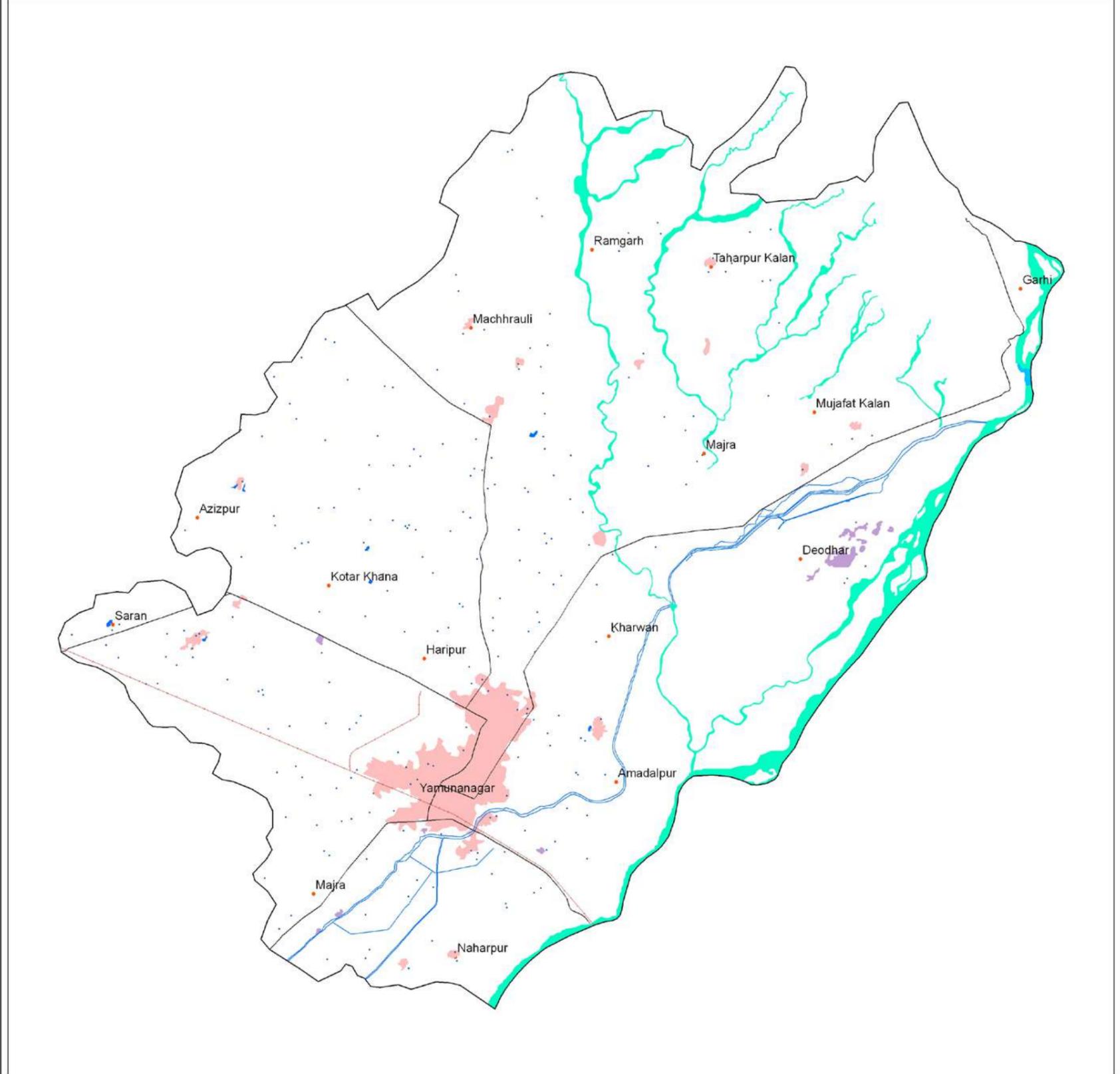
The total wetland area in the district is 4893 ha and river/streams contribute 87 per cent. Water spread area in post-monsoon season is less 689 ha and in pre-monsoon season 2077 ha. In all there are only 26 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 247. Man made waterlogged area is second dominating wetland category which accounts for an area of 240 ha. This wetland type is common in the district due to sugar cane cultivation and well-connected canals and distributaries. Qualitative turbidity ranges from low to high. Most of the wetlands showed moderate turbidity in post monsoon (392 ha) and 1965 ha in pre-monsoon season.

Out of 26 wetlands 9 wetlands are infested by aquatic vegetation during post-monsoon season and 8 in pre-monsoon season.

State : Haryana

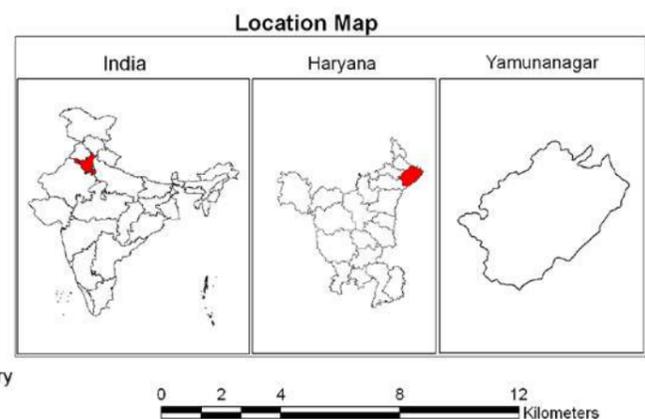
**WETLAND MAP**

District : Yamunanagar



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			<b>Natural</b>	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			<b>Man-made</b>	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			<b>Natural</b>	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			<b>Man-made</b>	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



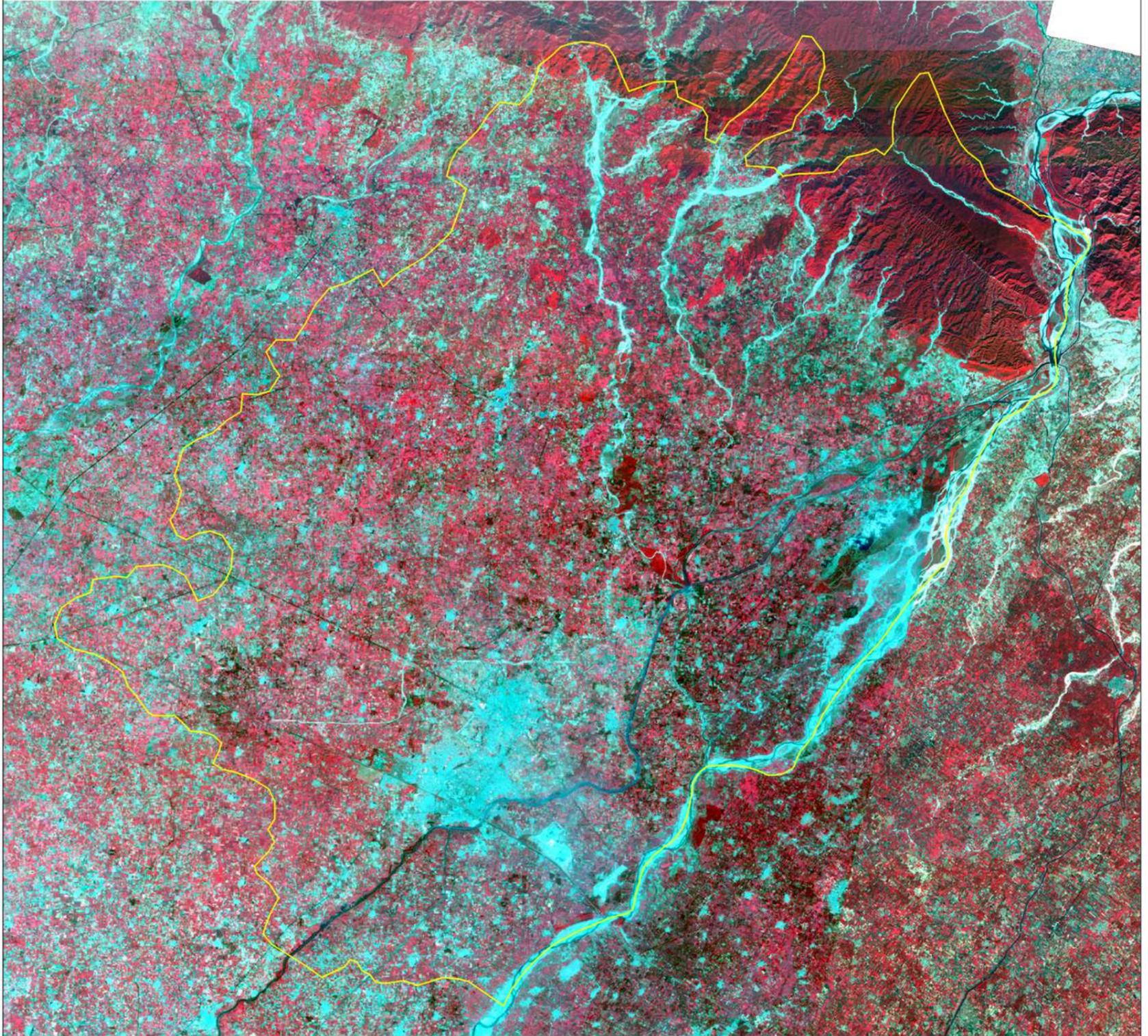
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Yamunanagar



IRS P6 LISS-III post monsoon data (2006)

### 7.1.4 Kurukshetra

The Kurukshetra district is located between 29°36' to 3°18, N latitudes and 76°10, to 77°19' E longitudes. The district covers a total area of 1530 sq.km. Hot summer, cold winter and dry air characterize the climate of district. Only during monsoon period i.e. July to September, the air becomes mild. The average annual rainfall in the district is 742.6mm. About 81 percent of the annual rainfall is received during June to September. Temperature starts rising from March and continues till the end of June. May and June are the hottest months with mean daily maximum temperature at about 40°C. Temperature sometimes may rise to 45° c. During winter the temperature starts decreasing by the middle of November, January is the coldest month.

The district is a part of the alluvial plain and appears monotonous with a general slope of 0.38 meter per kilometer towards southwest. Physiographically the district may be divided into two units (1) the upland plain and (2) the low-lying areas. Seasonal streams including the Ghaggar, the Markanda, the Umls, the Chutang and relicts of the Saraswati run through or form inland drainage. These streams drain large quantity of water during rainy season.

Table 9: Area estimates of wetlands in Kurukshetra

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	7	46	2.75	27	34
6	1106	River/Stream	4	904	54.10	105	123
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	26	181	10.83	153	166
9	1203	Waterlogged	5	67	4.01	55	9
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>42</b>	<b>1198</b>	<b>71.69</b>	<b>340</b>	<b>332</b>
		Wetlands (<2.25 ha), mainly Tanks	473	473	28.31	-	-
		<b>Total</b>	<b>515</b>	<b>1671</b>	<b>100.00</b>	<b>340</b>	<b>332</b>

<b>Area under Aquatic Vegetation</b>	63	65
--------------------------------------	----	----

<b>Area under turbidity levels</b>		
Low	153	167
Moderate	105	117
High	82	49

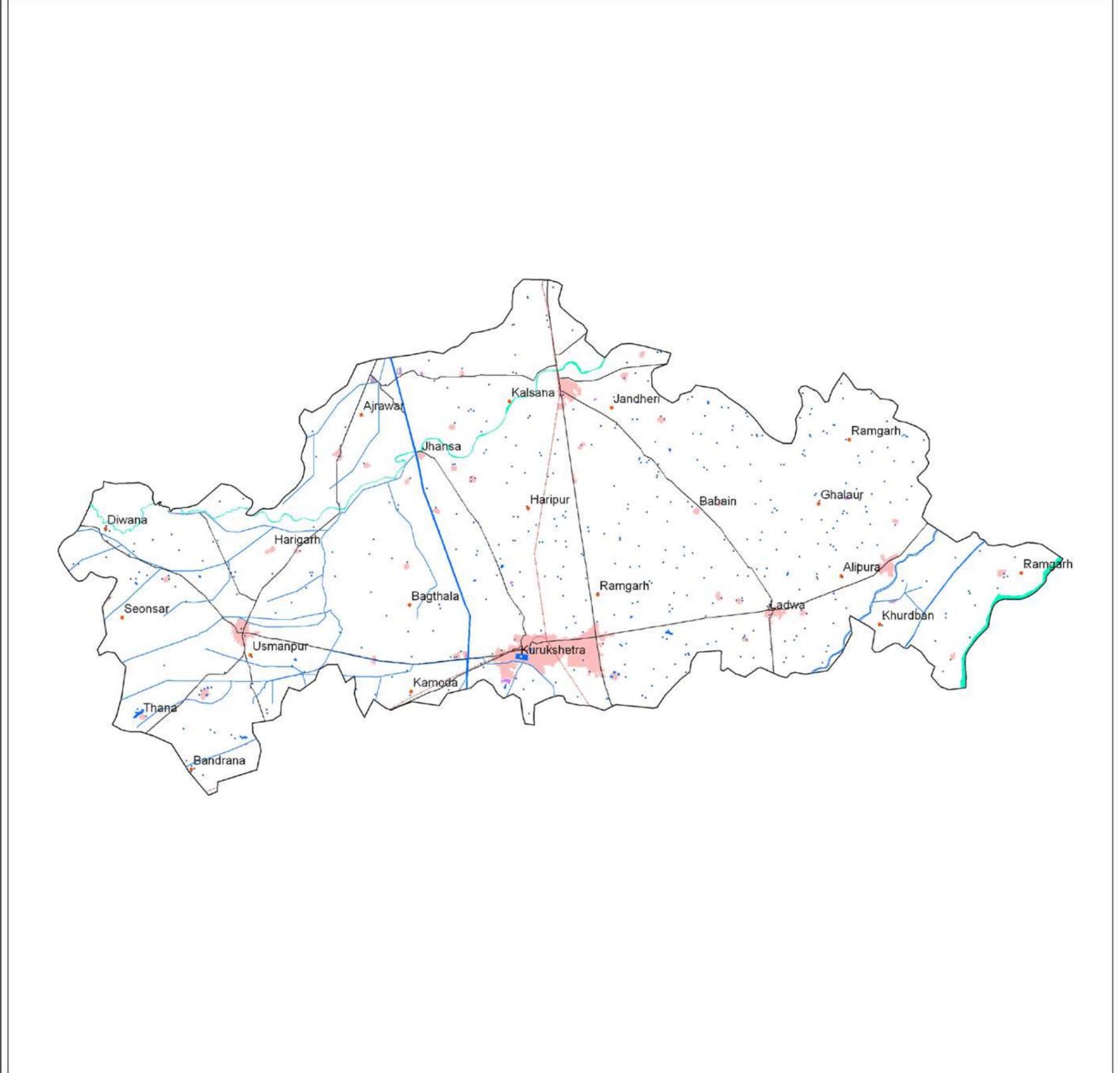
The total wetland area in the district is 1671 ha and river/streams contribute around 54 per cent. Water spread area in post-monsoon season is 340 ha and in pre-monsoon season 332 ha. It indicates that there is almost same rate of water discharge through these rivers. In all there are only 42 wetlands having an area of 1198 ha. Small wetlands, which are less than minimum mapping unit, are 473. Natural waterlogged area is 46 ha. Qualitative turbidity ranges from low to high. Most of the wetlands showed low and moderate turbidity.

Most of the tanks and waterlogged areas were infested by aquatic vegetation during both the seasons.

State : Haryana

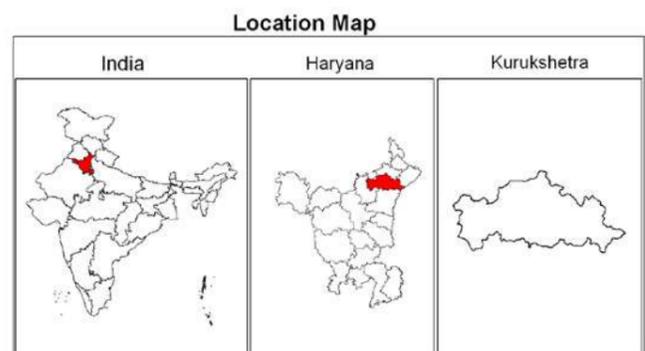
WETLAND MAP

District : Kurukshetra



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



0 2.5 5 10 15 Kilometers

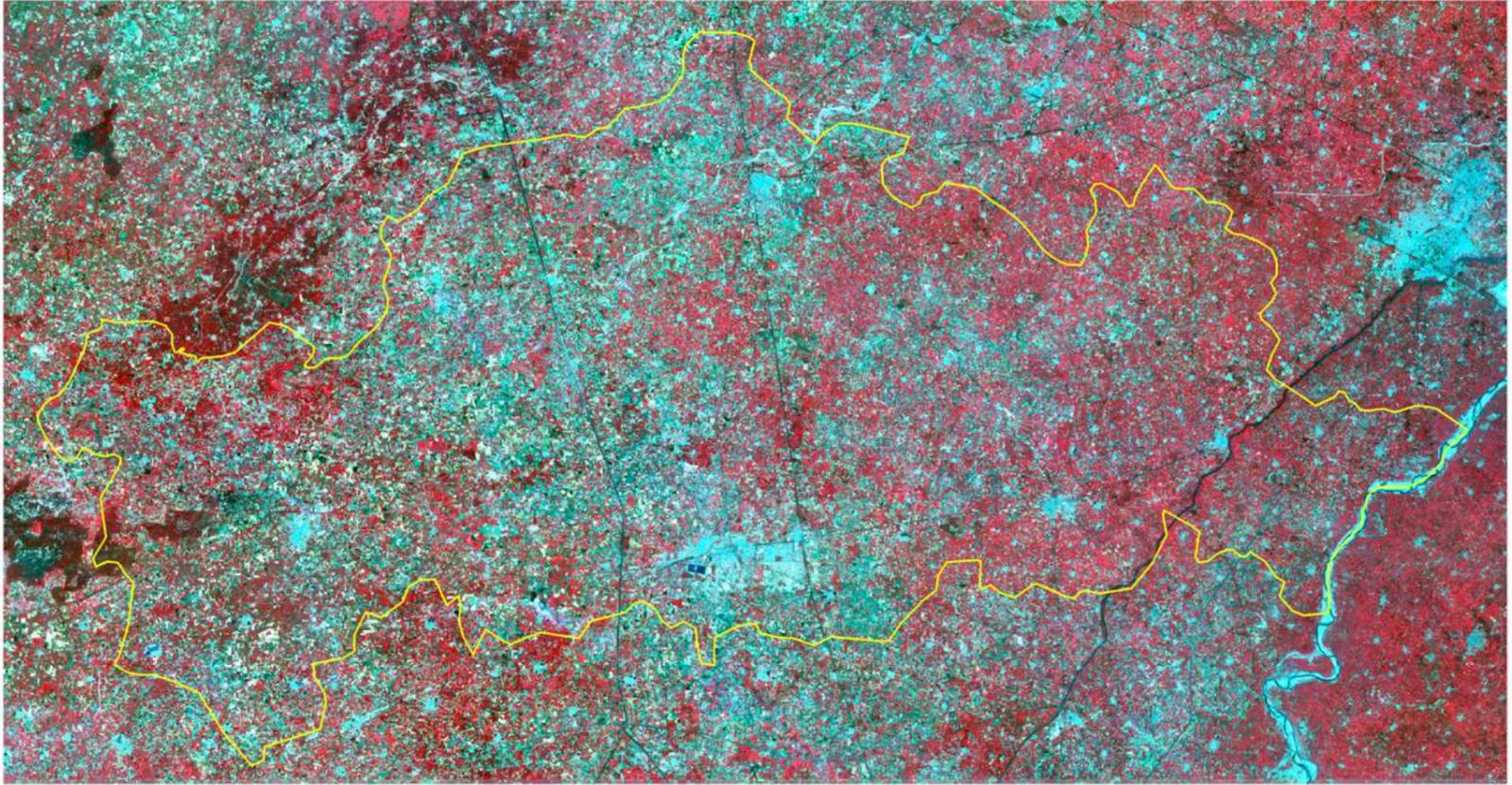
**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

**Sponsored By :**  
Ministry of Environment and Forests  
Government of India

State : Haryana

District : Kurukshetra



IRS P6 LISS-III post monsoon data (2006)

### 7.1.5 Kaithal

The Kaithal district is located between 29°32' to 30°12' N latitudes and 76°08' to 76°45' E longitudes. Total area of the district is 2317 sq. km. The Kaithal district has a sub-tropical continental monsoon climate with hot summer and cool winter. The average annual rainfall for the five years 1997-2001 in the district is 435.4 mm. about 81 percent of the annual rainfall is received during June to September. Temperature starts rising from March and continues till the end of June. May and June are the hottest months with mean daily maximum temperature at about 40°C. Temperature sometimes may rise to 45°C.

The district is a part of the alluvial plain and appears monotonous. Generally, slope of the district is from northeast to southwest. Physiographically, the district may be divided into two units the upland plain and the low-lying areas. The upland plain is spread along the northeastern boundary of the district. It is the westward extension of the upland plain of the Kurukshetra district, which is inclined towards south and southwest. It is irrigated by wells and canals and is a prosperous agricultural area. It is made up of old alluvium. The low-lying areas include the southern part of the district. The district is entirely covered by 58 per cent alluvial deposits of quaternary to recent age consisting of clay, and sand with kankar. Gravel, cemented and unconsolidated sand are also found in beds.

Table 10: Area estimates of wetlands in Kaithal

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	1	4	0.30	4	0
6	1106	River/Stream	1	373	28.00	0	321
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	85	556	41.74	393	466
9	1203	Waterlogged	3	26	1.95	16	20
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>90</b>	<b>959</b>	<b>72.00</b>	<b>413</b>	<b>807</b>
		Wetlands (<2.25 ha), mainly Tanks	373	373	28.00	-	-
		<b>Total</b>	<b>463</b>	<b>1332</b>	<b>100.00</b>	<b>413</b>	<b>807</b>

<b>Area under Aquatic Vegetation</b>	173	97
--------------------------------------	-----	----

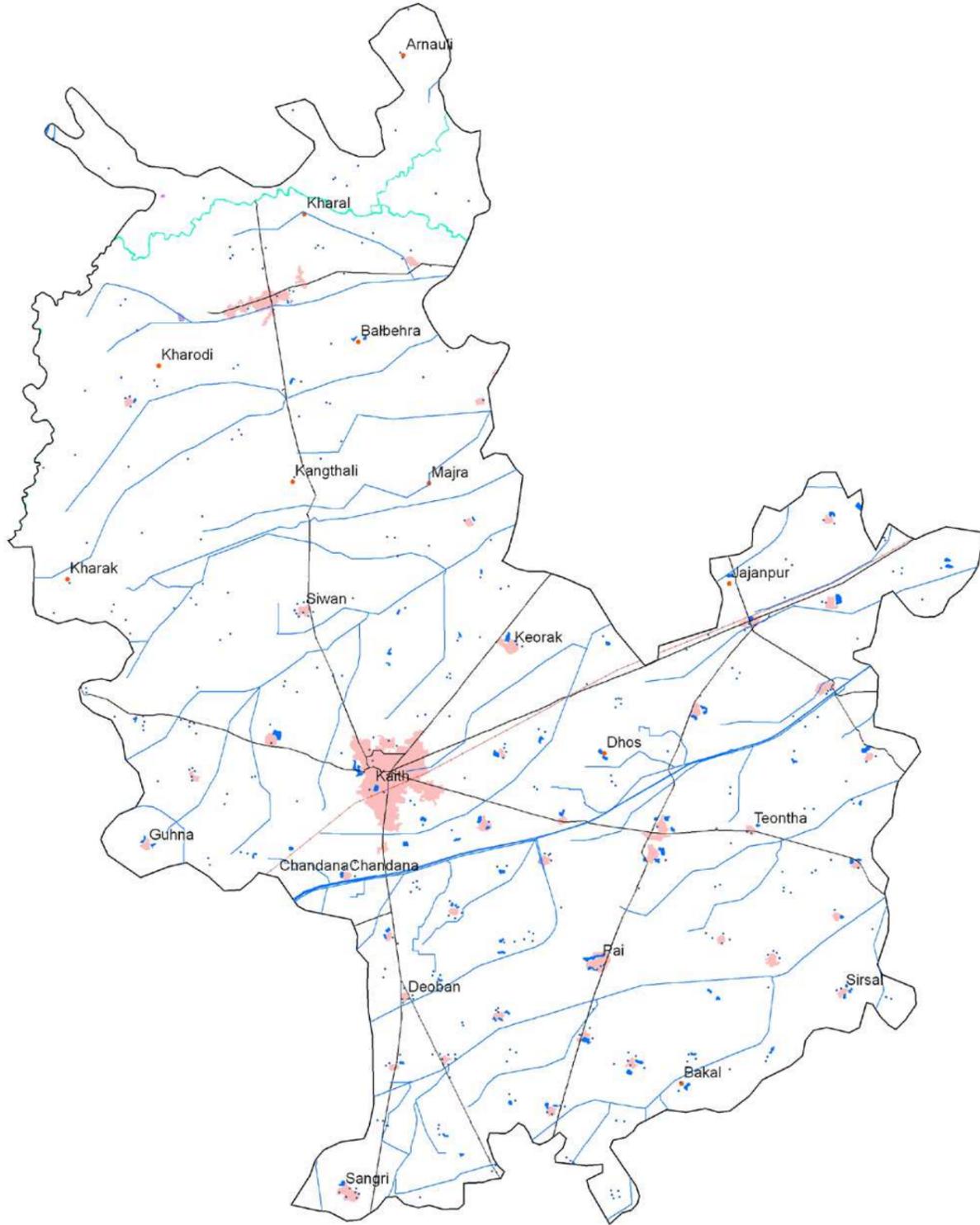
<b>Area under turbidity levels</b>		
Low	387	459
Moderate	7	328
High	19	20

The total wetland area in the district is 1332 ha and tanks (42 per cent) and river/streams (28 per cent) together contribute almost 97 per cent wetland area. Water spread area of rivers/stream is almost nil during post-monsoon season while in pre-monsoon season 321 ha. In all there are only 90 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 373. Tanks/ponds have an area of 393 ha and it is dominating wetland category during post monsoon season. Most of the wetlands showed low turbidity and tanks/ponds are infested by macrophytes.

State : Haryana

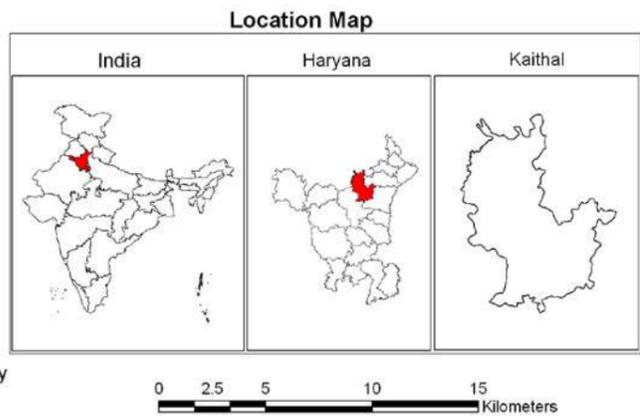
**WETLAND MAP**

District : Kaithal



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			<b>Natural</b>	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			<b>Man-made</b>	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			<b>Natural</b>	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			<b>Man-made</b>	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



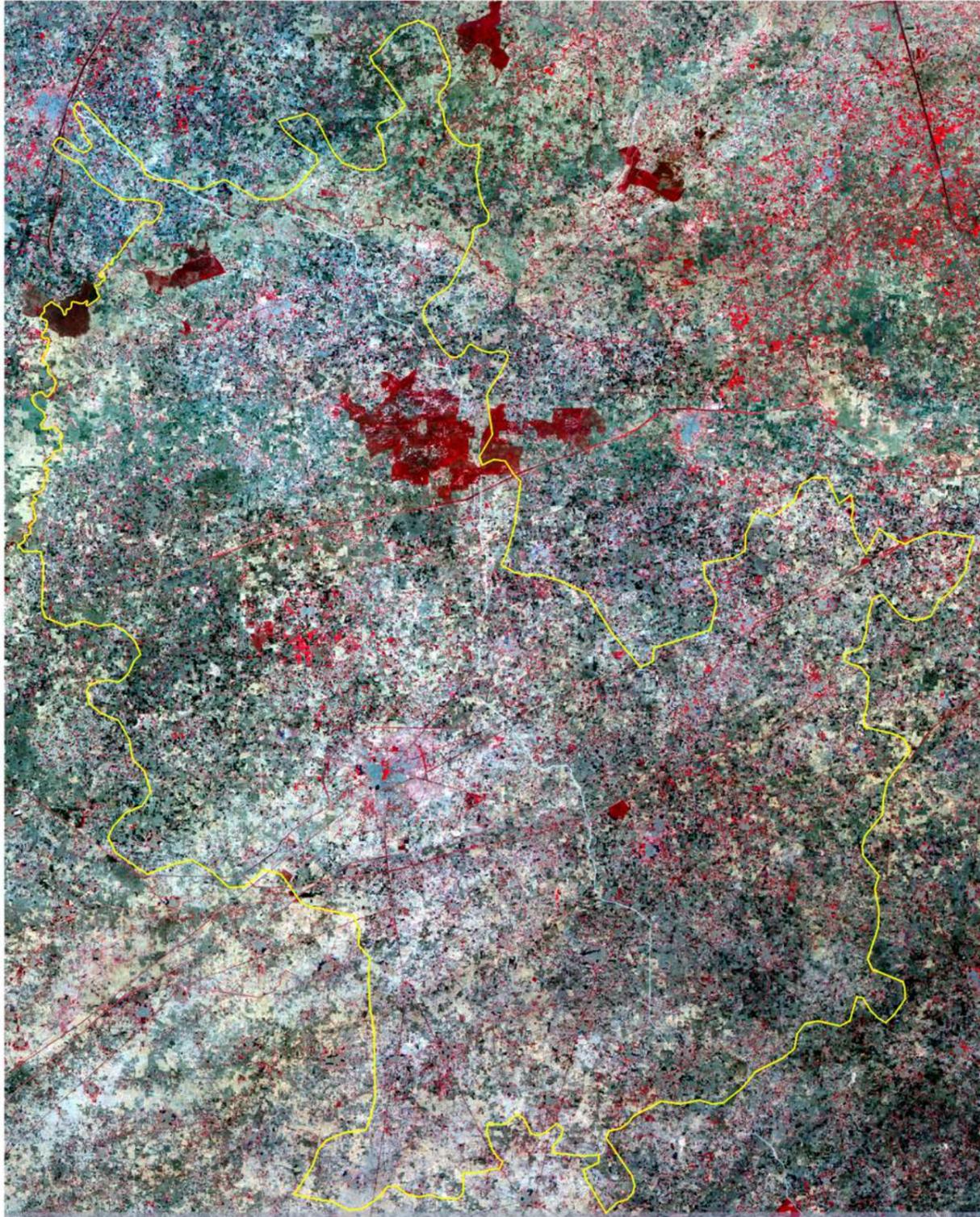
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Kaithal



IRS P6 LISS-III post monsoon data (2006)

### 7.1.6 Karnal

The district lies along the eastern border of the state between 29°10' to 29°59' North latitudes and 71°31' to 72°13' East longitudes. The district covers a total area of 2538 sq. km. Hot summer, cold winter and dry air, except during rainy season characterize the climate of the district. Temperature starts rising from March and continues till the late of the June. May and June are the hottest months with mean daily maximum temperature of about 40 0C, which may sometimes rise to 45 0C. It starts decreasing by the middle of November. January is the coldest month. The average annual rainfall in the district is 528.9 mm. The district is a part of alluvial plain of Yamuna river. It slopes from west to east and water of the area flows towards Yamuna. There are two major physiographic units in the area. The Khadar, is within one mile of the Yamuna River. It has light soils and the water table is very near to the surface. It is a flood plain of the river Yamuna is suitable for rice and sugarcane cultivation. The other unit is the upland plain spreading in the western part of the district and is inclined towards the south and southwest and covers the Karnal Bangar area. This area is eastward extension of the upland plain of Kaithal district. It is irrigated by tube wells and & canal and is a prosperous agricultural area. The district enjoys perennial river the Yamuna that forms the eastern boundary of the district. The Khadar, flood plain of this river is very fertile. A seasonal stream, the Chautang runs in the northeast of the district.

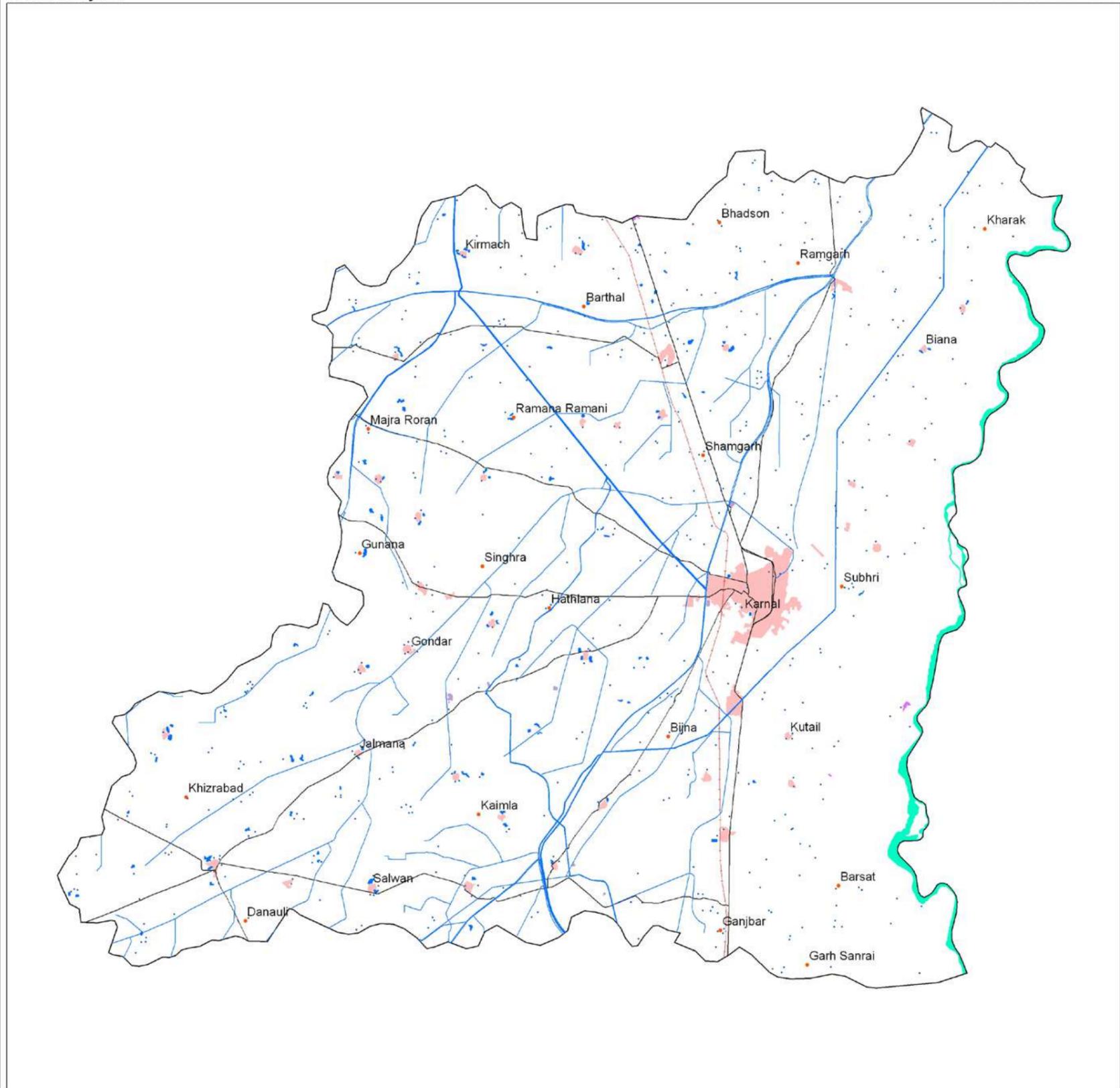
Table 11: Area estimates of wetlands in Karnal

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	3	27	0.83	27	11
6	1106	River/Stream	1	2048	63.09	528	661
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	105	555	17.10	524	493
9	1203	Waterlogged	7	61	1.88	51	33
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>116</b>	<b>2691</b>	<b>82.90</b>	<b>1130</b>	<b>1198</b>
		Wetlands (<2.25 ha), mainly Tanks	555	555	17.10	-	-
		<b>Total</b>	<b>671</b>	<b>3246</b>	<b>100.00</b>	<b>1130</b>	<b>1198</b>

<b>Area under Aquatic Vegetation</b>	34	54
--------------------------------------	----	----

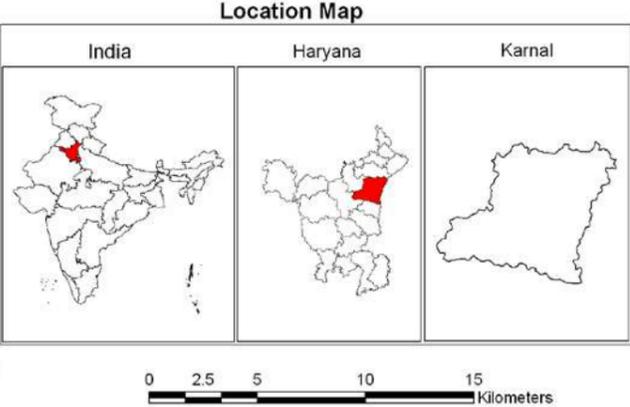
<b>Area under turbidity levels</b>		
Low	518	487
Moderate	528	661
High	84	50

The total wetland area in the district is 3246 ha and tanks/ponds (17 per cent) and river/streams (63 per cent) together contribute almost 80 per cent wetland area. Water spread area of rivers/stream is 528 ha during post-monsoon season while in pre-monsoon season 661 ha. In all there are only 116 wetlands contributing an area of 2691 ha. There are 555 small wetlands having the size less than 2.25 ha. Tanks/ponds have an area of 555 ha and it is second dominating wetland category after rivers/streams in both the seasons. Most of the wetlands showed low and moderate turbidity in both the season. Out of total wetland area (3246 ha), 54 ha wetland area is infested by aquatic vegetation during pre-monsoon season.



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			<b>Natural</b>	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			<b>Man-made</b>	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			<b>Natural</b>	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			<b>Man-made</b>	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



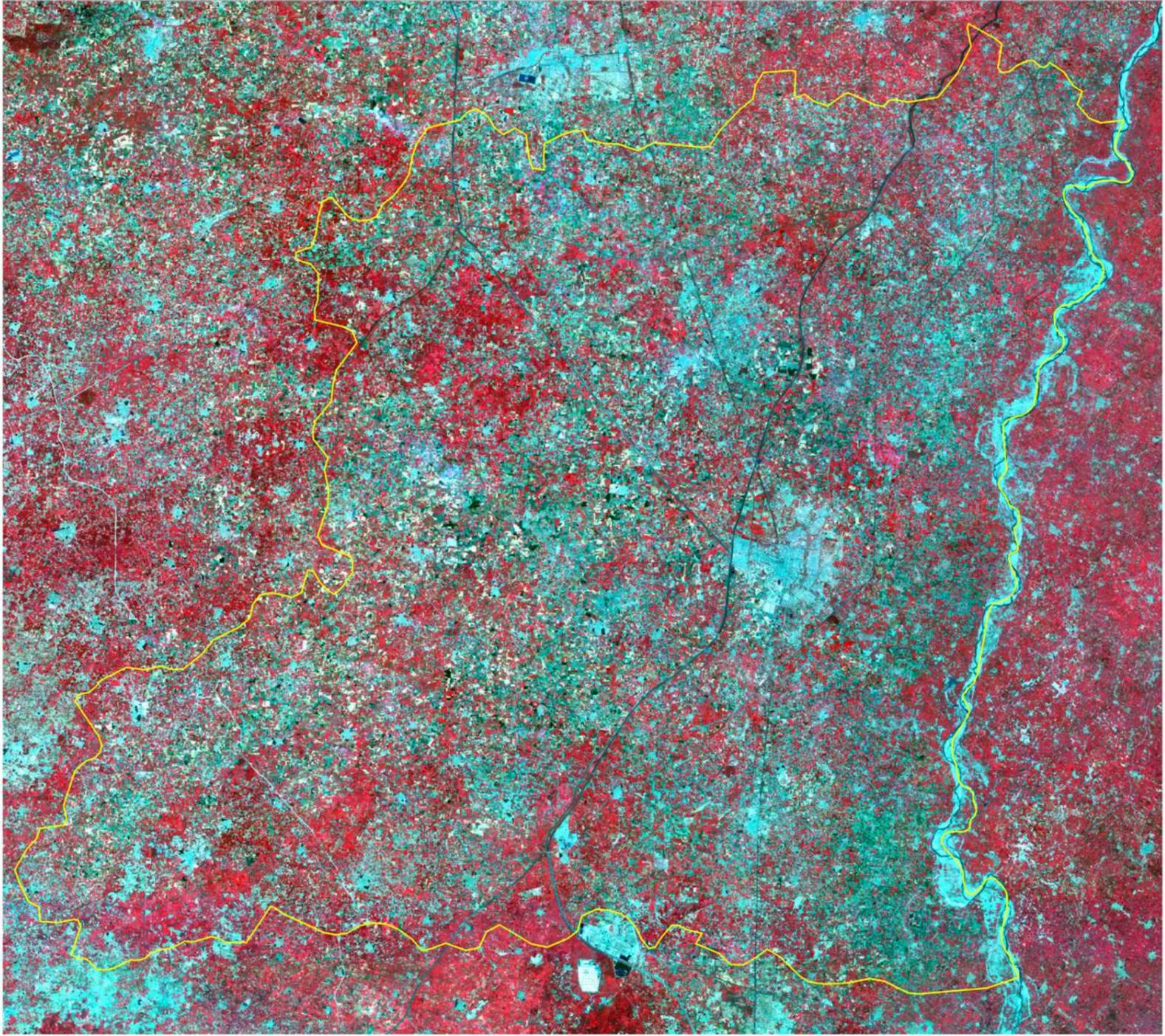
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Karnal



IRS P6 LISS-III post monsoon data (2006)

### 7.1.7 Panipath

The district lies between 29°10'0" to 29°40'0" N latitudes and 76°29'40" to 77°9'50" E longitudes. The area of the district is 1268 sq. kms. Hot summer, cold winter and dry air, except during rainy season characterize the climate of the district. Temperature starts rising from March and continues till the end of June. May and June are the hottest months with mean daily maximum temperature of about 40°C, which may sometimes rise to 45°C. It starts decreasing by the middle of November. January is the coldest month. The average annual rainfall in the district is 625.8mm. The variation in annual rainfall is very large. About 84 percent of the annual rainfall is received during the monsoon month i.e. July to September. The district is a part of alluvial plain of Yamuna river. It slopes from west to east and water of the area flows towards Yamuna. There are two major physiographic units in the area. The flood plain, which is within one mile of the Yamuna River, has light soils and the water table is very near to the surface. This flood plain of the river Yamuna is suitable for rice and sugarcane cultivation. The other unit i.e. older alluvial plain spreading in the western part of the district is inclined towards the south and southwest area. This area is irrigated by tube wells and canals and is a prosperous agricultural area. The district has a perennial river Yamuna, which forms the eastern boundary of the district.

Table 12: Area estimates of wetlands in Panipath

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	2	33	1.77	19	31
6	1106	River/Stream	1	987	53.01	274	793
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	25	325	17.45	306	303
9	1203	Waterlogged	7	111	5.96	47	87
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>35</b>	<b>1456</b>	<b>78.20</b>	<b>646</b>	<b>1214</b>
		Wetlands (<2.25 ha), mainly Tanks	406	406	21.80	-	-
		<b>Total</b>	<b>441</b>	<b>1862</b>	<b>100.00</b>	<b>646</b>	<b>1214</b>

<b>Area under Aquatic Vegetation</b>	85	36
--------------------------------------	----	----

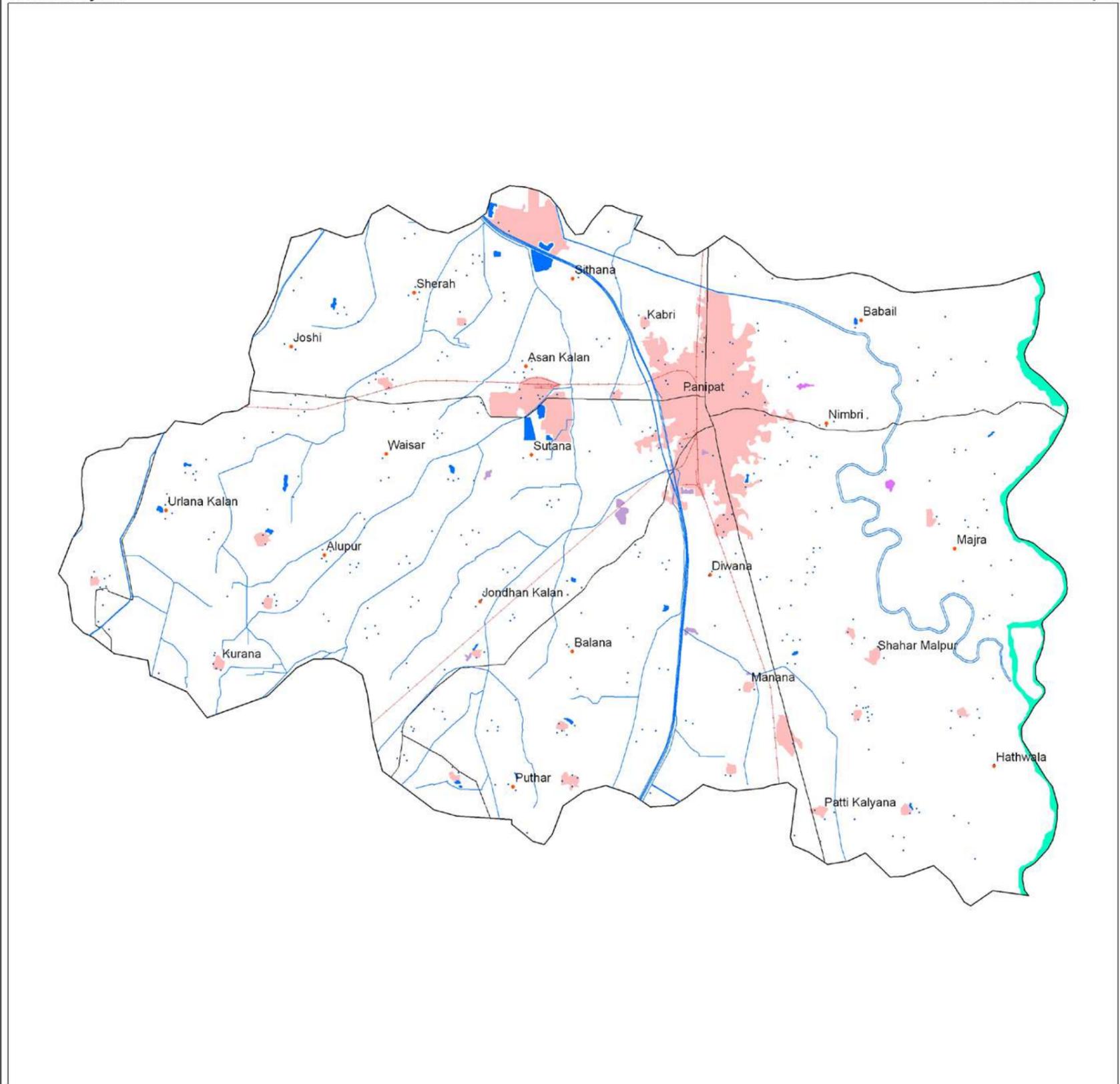
<b>Area under turbidity levels</b>		
Low	307	303
Moderate	273	794
High	66	117

The total wetland area in the district is 1862 ha and tanks/ponds (17 per cent) and river/streams (53 per cent) together contribute almost 70 per cent wetland area. Water spread area of rivers/stream is 274 ha during post-monsoon season while in pre-monsoon season 793 ha. In all there are only 35 wetlands contributing an area of 1456 ha. There are 406 small wetlands having the size less than 2.25 ha. Tanks/ponds have an area of 325 ha and it is second dominating wetland category after rivers/streams (987 ha) in both the seasons. Most of the wetlands showed moderate to low turbidity in both the season. Out of total wetland area (1862 ha), 85 ha and 36 ha wetland area is infested by aquatic vegetation during post and pre-monsoon season respectively.

State : Haryana

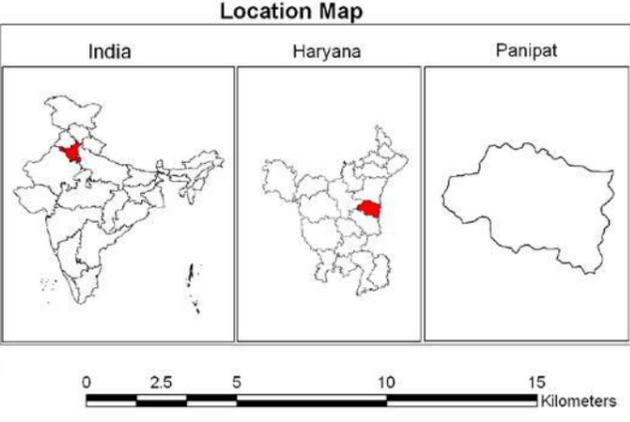
WETLAND MAP

District : Panipat



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



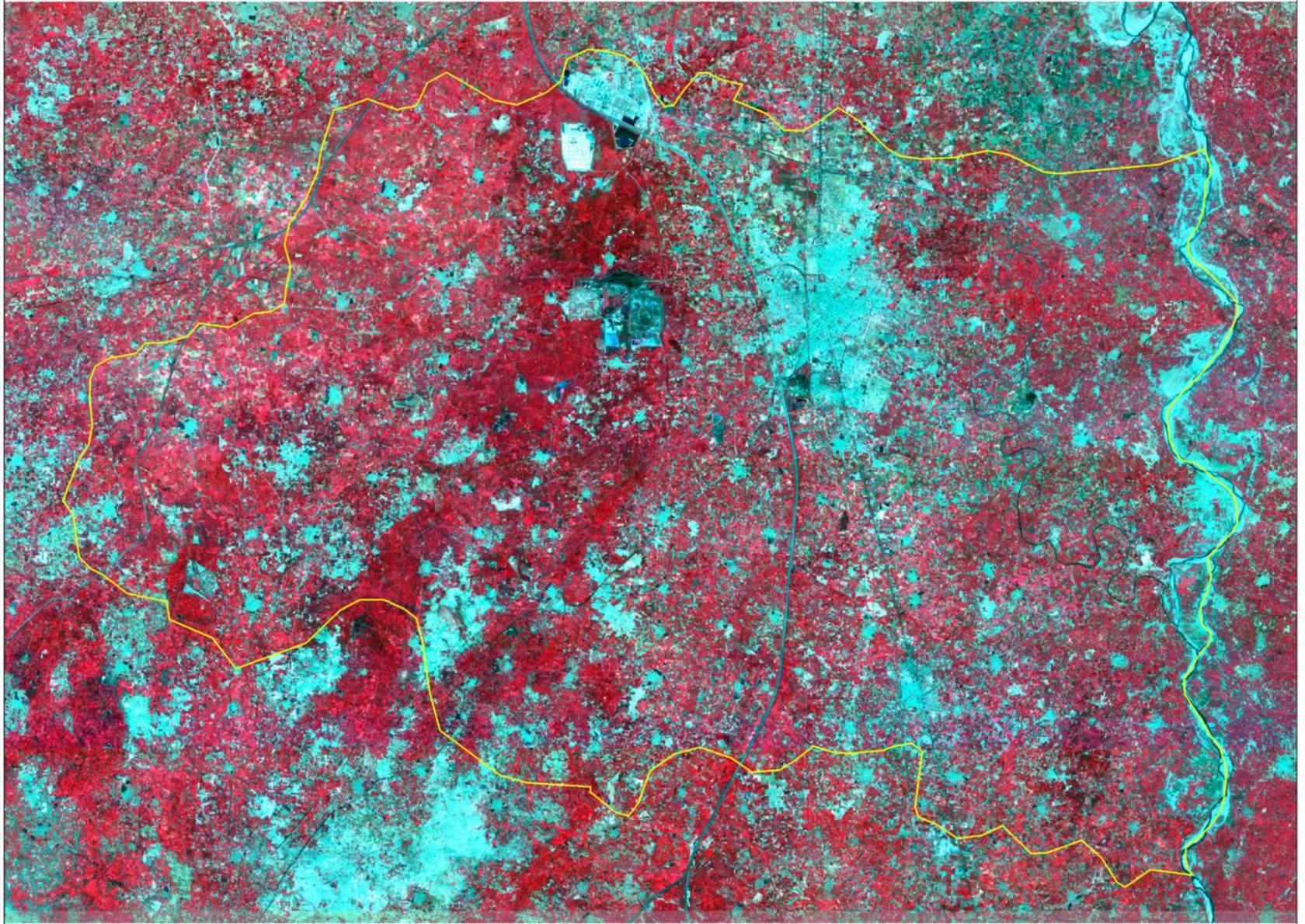
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Panipat



IRS P6 LISS-III post monsoon data (2006)

### 7.1.8 Sonipath

The Sonipat district is located in the east of Haryana State between 28°49' N to 29°19' N latitudes and 76°30' to 77°13'E longitudes. It covers a total area of 2122 sq. km. Yamuna River forms the eastern boundary of the district along Uttar Pradesh state. The climate of the district is dry with intensely hot summer and cold winter. Only during the three monsoon months of July to September, the weather becomes mild. The average annual rainfall in the district is 612.3 mm.. About 74 percent of annual rainfall is received during the monsoon season. The district experiences extreme temperatures. During winter, temperature goes down to below 4°C. In January, which is the coldest month, the mean daily maximum temperature is about 21°C and the mean daily minimum temperature is about 7°C. On the arrival of cold waves with western disturbances, temperature may go down to freezing point.

The district has almost a plain topography. Physiographically, it may roughly be divided into two units. The Khadar, which lies along the Yamuna in a narrow flood plain ranging from two miles in width, has medium to fine textured soils. The upland plain is spread in the west of the Khadar. It is about 20 to 30 feet higher than the Khadar and is 735 feet above mean sea level. It is covered with old alluvium. There is no perennial or seasonal stream in the district except the Yamuna, which borders the district on the east. The district comprises of recent flood plains, young meander plains, old meander plains and old alluvial plains. The soils are loamy sand to sandy loam on the surface and sandy loam to clay loam in the sub surface.

Table 13: Area estimates of wetlands in Sonipath

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	1	6	0.28	6	6
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	2	29	1.35	29	14
6	1106	River/Stream	1	733	34.03	348	310
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	90	549	25.49	531	475
9	1203	Waterlogged	24	185	8.59	162	141
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>118</b>	<b>1502</b>	<b>69.73</b>	<b>1076</b>	<b>946</b>
		Wetlands (<2.25 ha), mainly Tanks	652	652	30.27	-	-
		<b>Total</b>	<b>770</b>	<b>2154</b>	<b>100.00</b>	<b>1076</b>	<b>946</b>

<b>Area under Aquatic Vegetation</b>	6	11
--------------------------------------	---	----

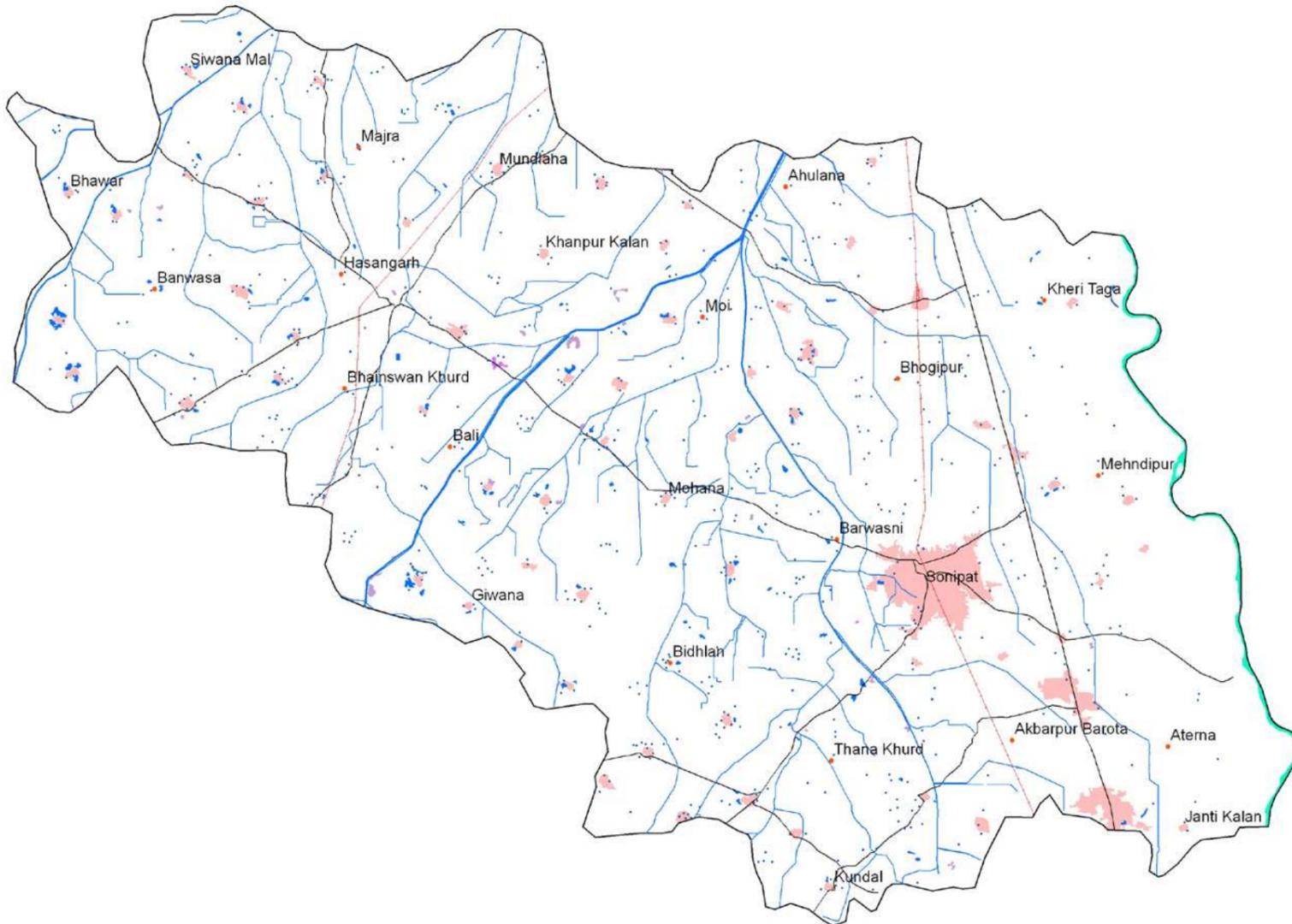
<b>Area under turbidity levels</b>		
Low	497	441
Moderate	380	342
High	199	163

The total wetland area in the district is 2154 ha and tanks/ponds (25 per cent) and river/streams (34 per cent) together contribute almost 59 per cent wetland area. Water spread area of rivers/stream is 348 ha during post-monsoon season while in pre-monsoon season 310 ha. In all there are only 118 wetlands contributing an area of 1502 ha. There are 652 small wetlands having the size less than 2.25 ha. Tanks/ponds have an area of 549 ha and it is second dominating wetland category after rivers/streams (733 ha) in both the seasons. Most of the wetlands showed low and moderate turbidity in both the season. Out of total wetland area (2154 ha), 06 ha and 11 ha wetland area is infested by aquatic vegetation during post and pre-monsoon season respectively.

State : Haryana

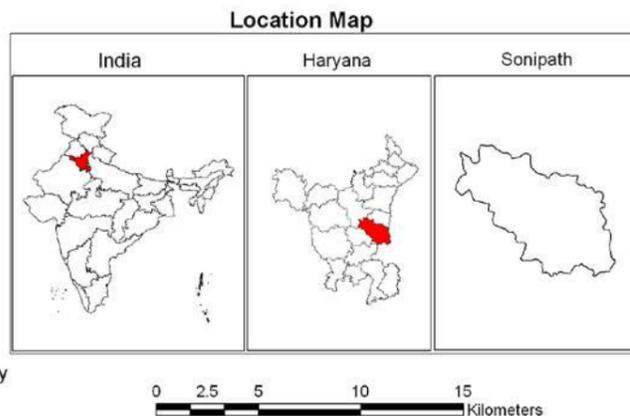
WETLAND MAP

District : Sonipath



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



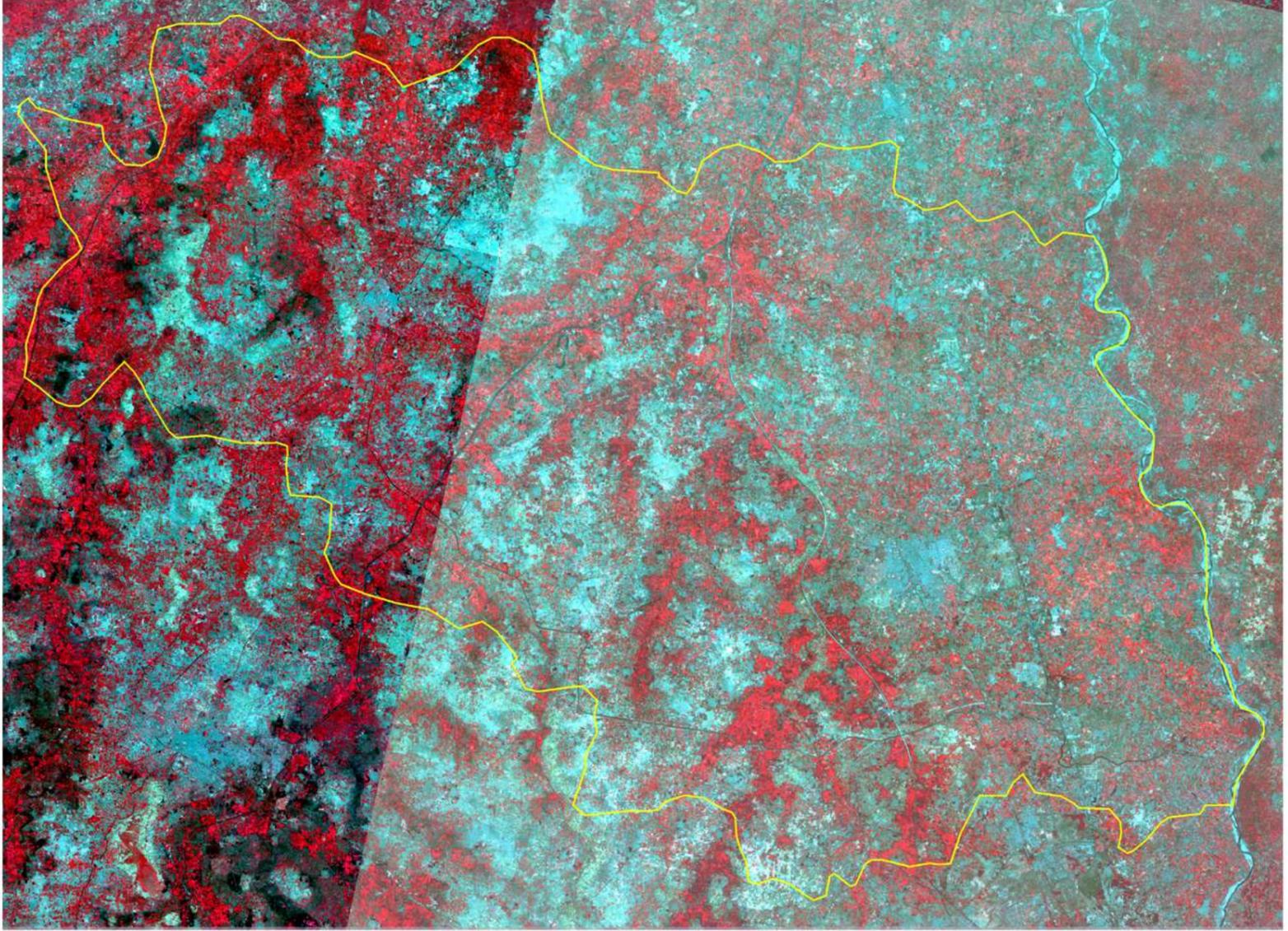
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Sonapat



IRS P6 LISS-III post monsoon data (2006)

### 7.1.9 Jind

The district lies in the north- central part of Haryana between 29°03' and 29° 51' north latitudes and 75°53' and 76°47' east longitudes. The district covers a total area of 2702 sq. km. The climate of this district is on the whole dry, hot in summer and cold in winter. The average rainfall in the district is 599 mm. Over 70% of the annual rainfall is received during the monsoon months of July to September. A little rainfall is also received during the winter months (December to February) in association with western disturbances, which pass through the district or in the vicinage from west to east, affecting the weather in this season. The temperature in the district starts increasing from the beginning of March till June, which is generally the hottest month. The mean daily maximum temperature during June is around 41°C and the mean daily minimum around 27°C. Scorching dust laden winds blow during the hot season render the weather very tiring. After October, both day and night temperature decreases rapidly. January is usually the coldest month with the mean daily maximum temperature at about 21°C. and the mean daily minimum at about 6°C.

Physiographical, it constitutes a part of the alluvial plain, which is largely flat, featureless and is formed due to Pleistocene and sub-recent alluvial deposits of the Indo-Gangetic system.

Table 14: Area estimates of wetlands in Jind

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	5	61	2.83	61	60
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	160	1033	47.98	967	929
9	1203	Waterlogged	9	106	4.92	94	81
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>174</b>	<b>1200</b>	<b>55.74</b>	<b>1122</b>	<b>1070</b>
		Wetlands (<2.25 ha), mainly Tanks	953	953	44.26	-	-
		<b>Total</b>	<b>1127</b>	<b>2153</b>	<b>100.00</b>	<b>1122</b>	<b>1070</b>

<b>Area under Aquatic Vegetation</b>	69	92
--------------------------------------	----	----

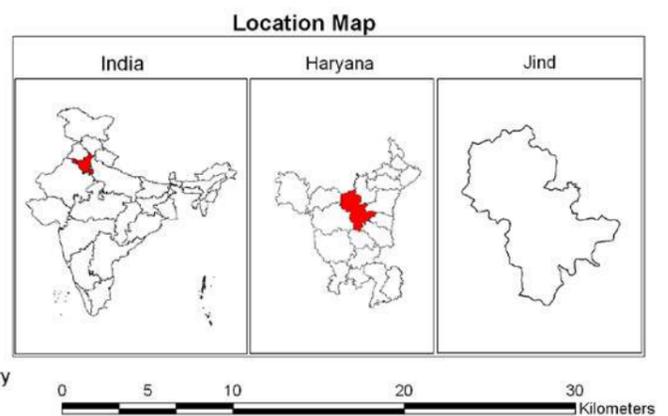
<b>Area under turbidity levels</b>		
Low	963	926
Moderate	4	4
High	155	140

The total wetland area in the district is 2153 ha and tanks/ponds contribute 48 per cent water spread area in post and pre-monsoon season. There are no major rivers in the district. In all there are only 174 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 953. Qualitative turbidity is mostly low in both the season. Out of 2153 ha 69 ha and 92 ha area is infested by aquatic vegetation in post-monsoon season whereas in pre-monsoon season respectively.



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			<b>Natural</b>	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			<b>Man-made</b>	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			<b>Natural</b>	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			<b>Man-made</b>	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



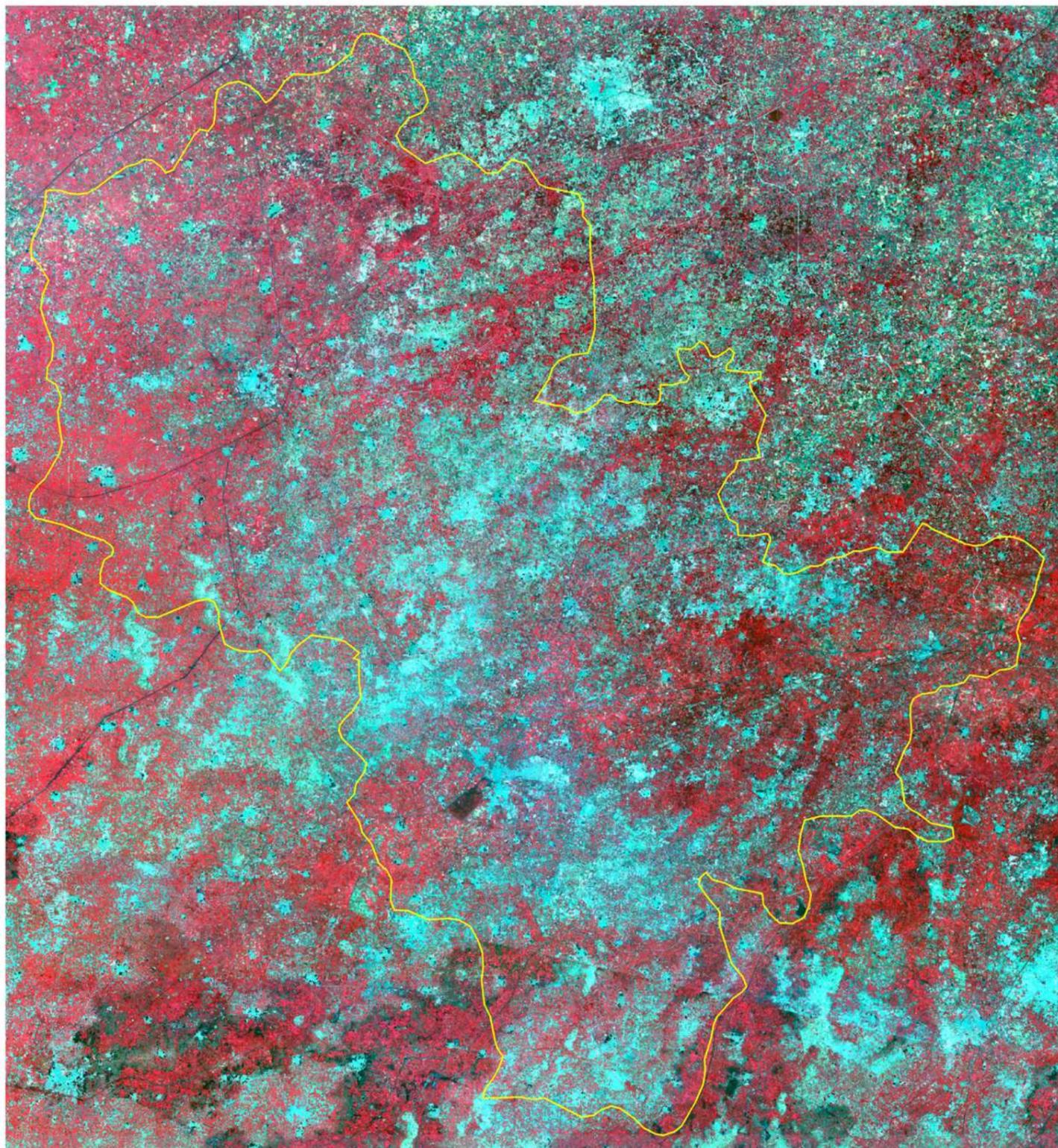
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Jind



IRS P6 LISS-III post monsoon data (2006)

### 7.1.9 Fatehabad

Fatehabad district, situated in western part of Haryana, has an area of 2520 sq. km. Geographically it falls between 29°15' to 29°49' North latitude and 75°13' to 75°58' East longitude. The climate of the Fatehabad district is characterized by its dryness and extreme temperature variations and scanty rainfall. There is a rapid increase in temperature after February. The mean daily maximum temperature is 41.6°C in June, which is the hottest month. Sometimes, during the drought period the maximum temperature of the district may rise up to 47 to 48°C in summer. The major part of the rainfall occurs during the monsoons. The latter half of September and October constitutes the post monsoon period. The average annual rainfall ranges between 323.5 to 497.5 mm. About 71 per cent of annual normal rainfall is received during the short southwestern monsoon period.

The district is the part of the Ghaggar alluvial plain and its southern and western portion mark a gradual transition to the Thar Desert. The soils of the district change generally from sand to clay.

Table 15: Area estimates of wetlands in Fatehabad

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	2	29	1.88	29	13
6	1106	River/Stream	1	602	39.12	602	461
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	47	332	21.57	200	208
9	1203	Waterlogged	9	105	6.82	17	59
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>59</b>	<b>1068</b>	<b>69.40</b>	<b>848</b>	<b>741</b>
		Wetlands (<2.25 ha), mainly Tanks	471	471	30.60	-	-
		<b>Total</b>	<b>530</b>	<b>1539</b>	<b>100.00</b>	<b>848</b>	<b>741</b>

<b>Area under Aquatic Vegetation</b>	139	106
--------------------------------------	-----	-----

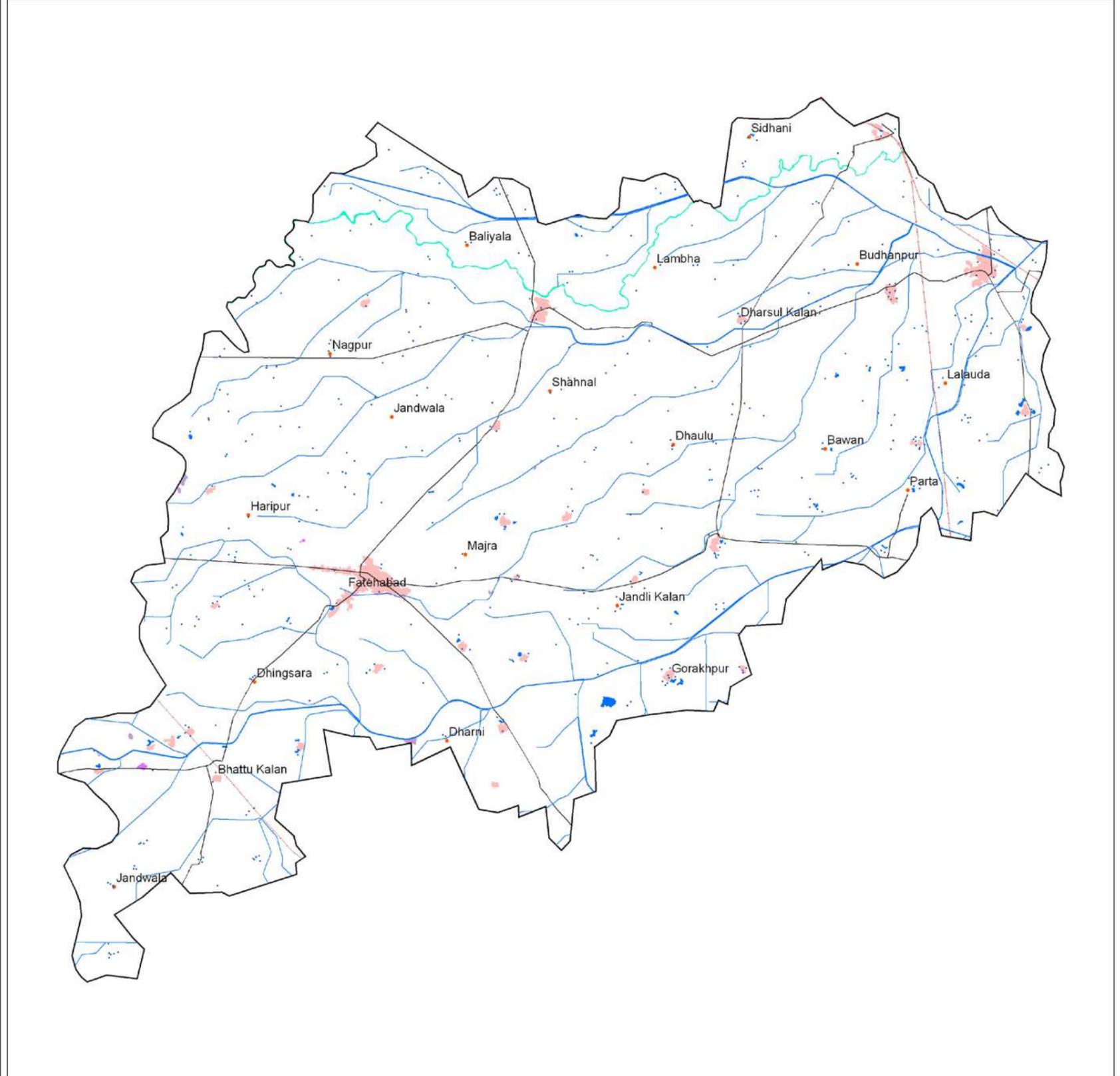
<b>Area under turbidity levels</b>		
Low	199	207
Moderate	604	462
High	45	72

The total wetland area in the district is 1539 ha and tanks/ponds and river/streams contribute 60 per cent wetland area in post-monsoon and pre-monsoon season. There is a single river, which has an area of 602 ha. In all there are only 59 wetlands having area more than 2.25 ha in the district where as less than 2.25ha wetlands are 471. Qualitative turbidity ranges from moderate to low in both the season. Out of 1539 wetland area 139 ha and 106 ha wetland is under aquatic vegetation during post-monsoon and pre-monsoon season respectively.

State : Haryana

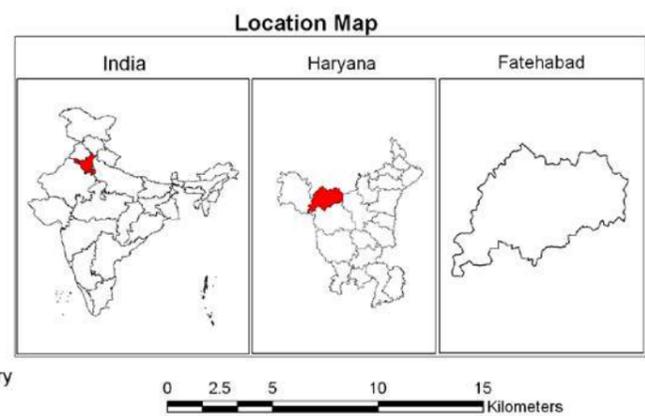
WETLAND MAP

District : Fatehabad



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
		Man-made		
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
		Man-made		
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



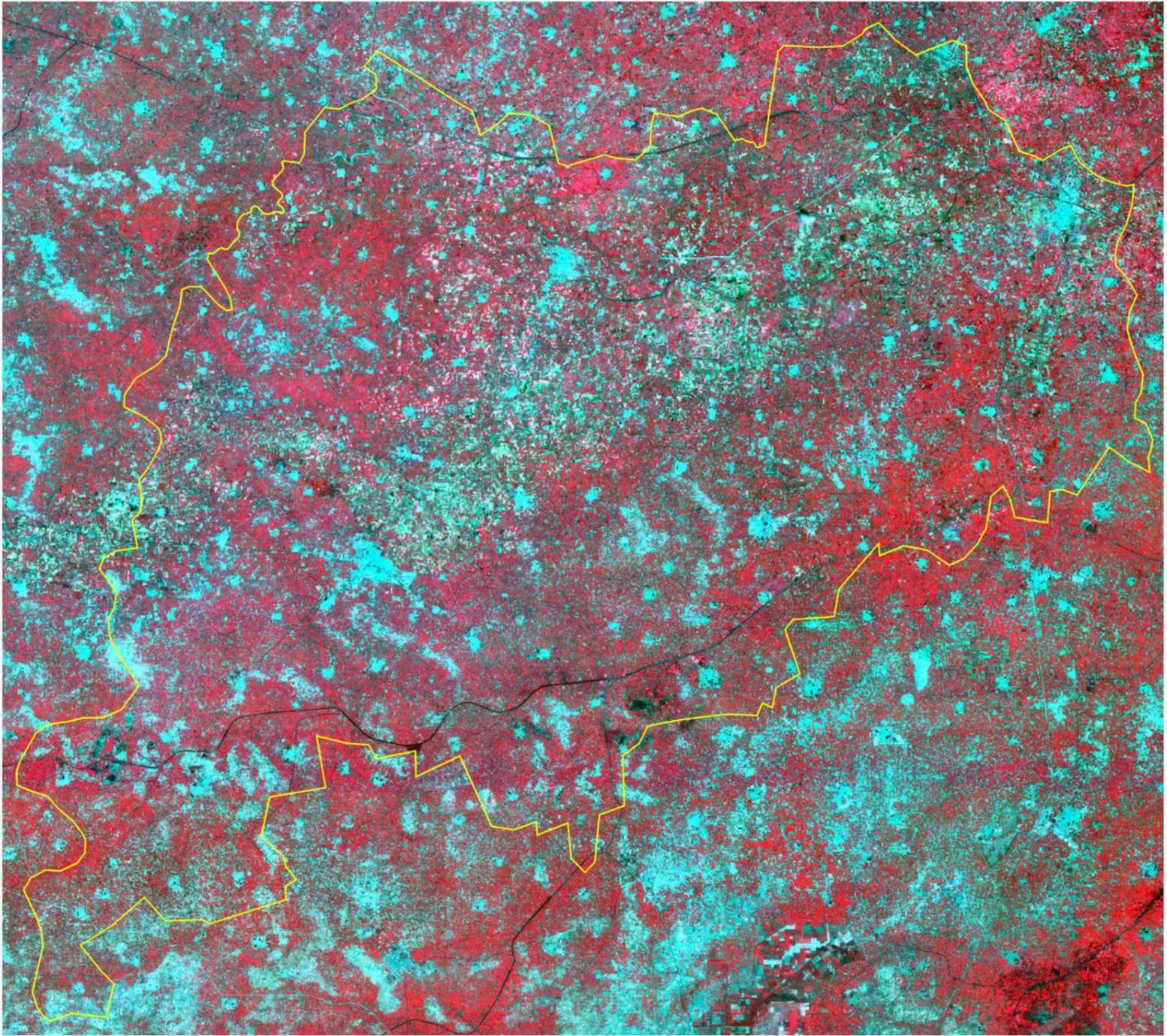
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Fatehabad



IRS P6 LISS-III post monsoon data (2006)

### 7.1.10 Sirsa

The Sirsa district lies in the extreme west corner of Haryana State. It touches the interstate boundaries on three sides and is connected with its own state only on the eastern side. The district is stretched between 29°14' to 30°N latitudes and 74°29' to 75°18'E longitudes covering an area of 4277 Sq. Kms. Its ancient name was Sairishaka and from that it seems to have been changed to Sirsa. According to a local tradition, an unknown king named Saras founded the town in 7th century A.D. and on his name the town was called Sirsa. According to another tradition, the name has its origin from the 'sacred river Saraswati which once flowed near it. During medieval period, the town was known as Sarsuti. The derivation of the name Sirsa is also attributed to the abundance of siris trees. In ancient period, Sirsa was also known as Sirsa pattan. The climate of this district is characterized by its dryness and extreme temperature and scanty rainfall. It can be defined as sub-tropical, semi-arid, continental and monsoon type. The average annual rainfall ranged between 260.3, 275.8 mm. Physiographically the Sirsa district consists of alluvial and sandy aeolian plain.

Table 16: Area estimates of wetlands in Sirsa

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	1	98	5.52	98	98
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	1	12	0.68	12	0
8	1202	Tanks/Ponds	57	305	17.17	259	237
9	1203	Waterlogged	5	319	17.96	266	110
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>64</b>	<b>734</b>	<b>41.33</b>	<b>635</b>	<b>445</b>
		Wetlands (<2.25 ha), mainly Tanks	1042	1042	58.67	-	-
		<b>Total</b>	<b>1106</b>	<b>1776</b>	<b>100.00</b>	<b>635</b>	<b>445</b>

<b>Area under Aquatic Vegetation</b>	48	147
--------------------------------------	----	-----

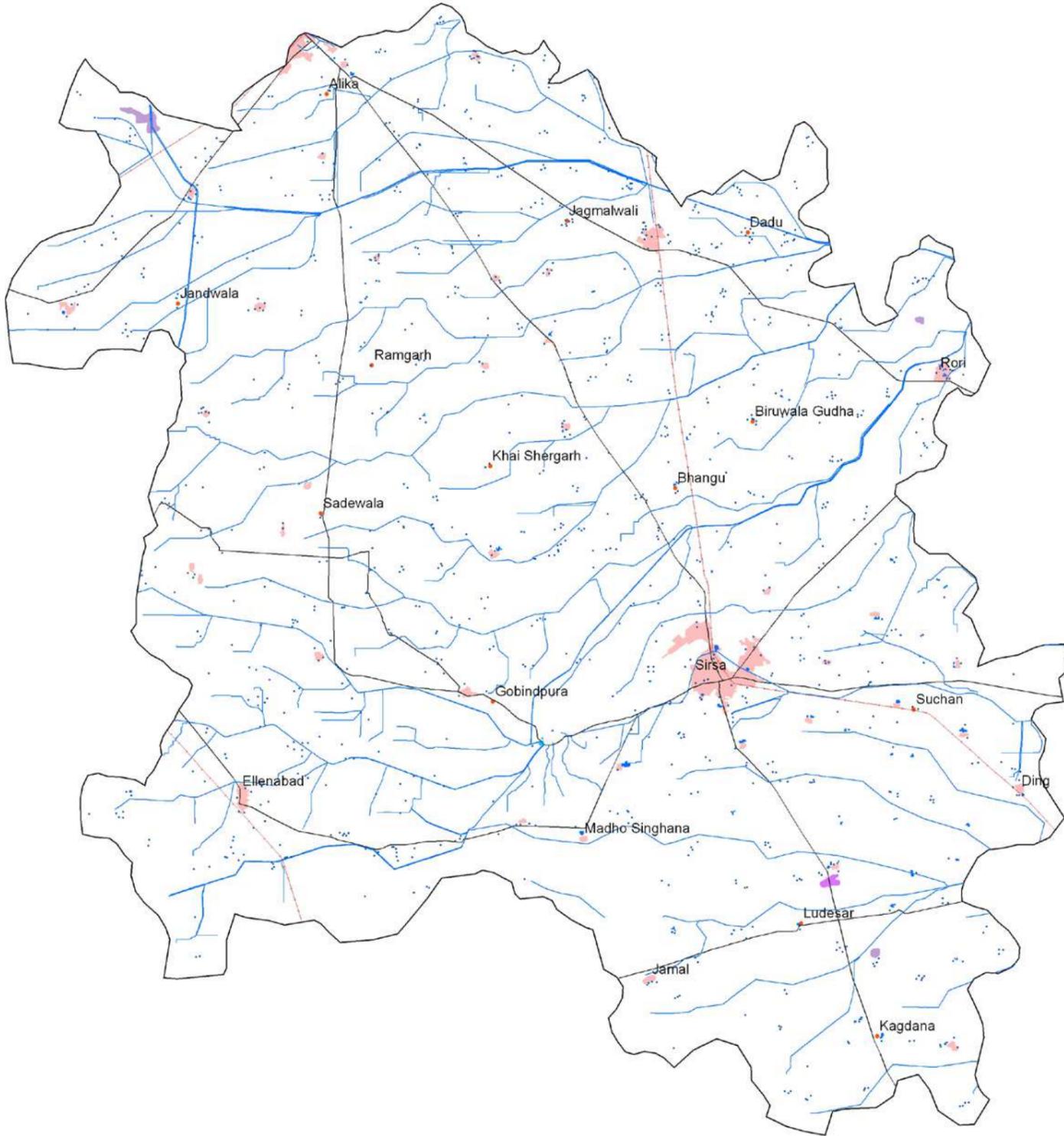
<b>Area under turbidity levels</b>		
Low	259	238
Moderate	12	0
High	364	207

The total wetland area in the district is 1776 ha and Tanks/Ponds and man-made waterlogged contribute 35 per cent of total wetland area. In all there are only 64 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 1042. Qualitative turbidity ranges from low to high. High and low turbidity is observed in both seasons. Out of 1776 ha 48 ha and 147 ha area was covered by aquatic vegetation.

State : Haryana

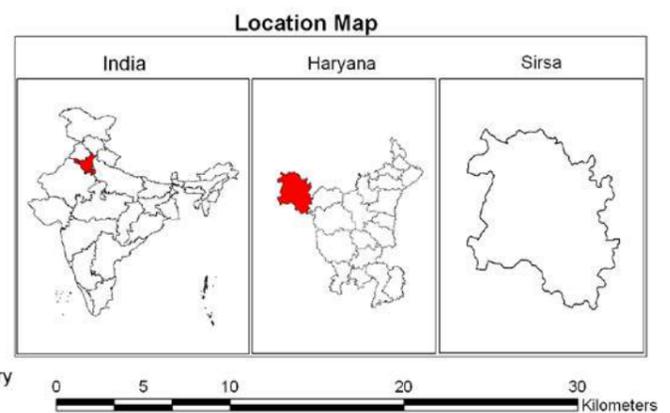
WETLAND MAP

District : Sirsa



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
		Man-made		
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
		Man-made		
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



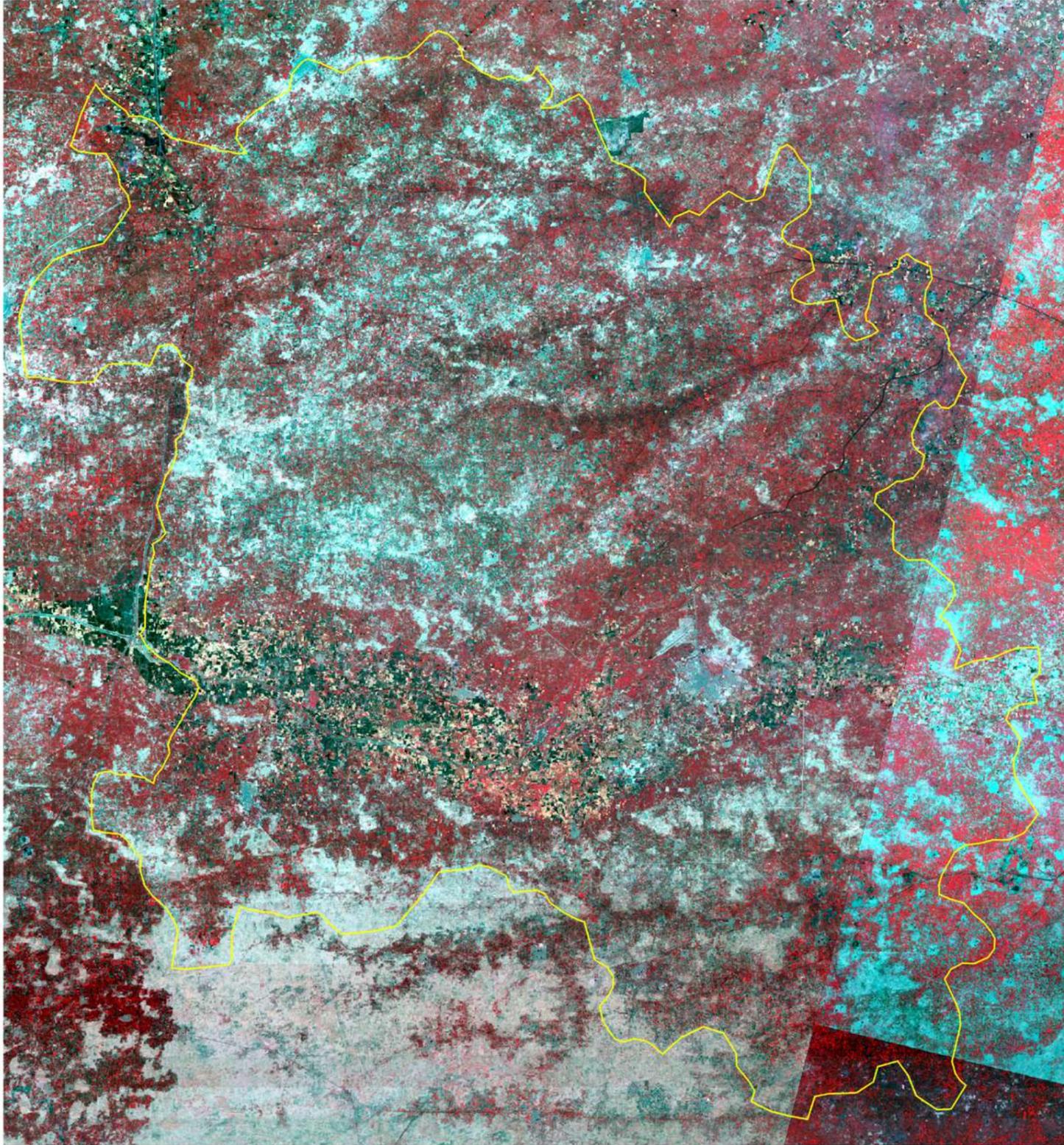
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Sirsa



IRS P6 LISS-III post monsoon data (2006)

### 7.1.11 Hisar

The Hisar district, a part of the Indo-Gangetic alluvial plain is situated between 28°53'45" to 29°49'15" N latitudes and 75°13'15" to 76°18'15" E longitudes. It has an area of 3983 sq.km. The Hisar district experiences a sub-tropical climate. The climate is influenced by westerly winds in summer months raising temperature as high as 47 °C, whereas; in winter north-westerly cold winds provide low temperature touching even -1.70 °C. The average rainfall in the district during the period of 1999 to 2004 is 361.20 mm. About 85 per cent of annual rainfall is received during the short south- western monsoon period. May and June are the hottest months. December and January are generally the coldest months. The lowest temperature -1.70 °C was recorded on January 15, 2003 and highest 47°C was recorded on May 12, 2001.

The area is nearly level, with imperceptible slopes, except for the regions in and around the sand dunes or tibbas. The general gradient of the terrain is from northeast to southwest and then west. Hisar district comprises of three major physiographic units i.e. Aeolian plain, older alluvial plain and Chautang flood plain. The soils of the districts are conventionally referred to as alluvial and aeolian .

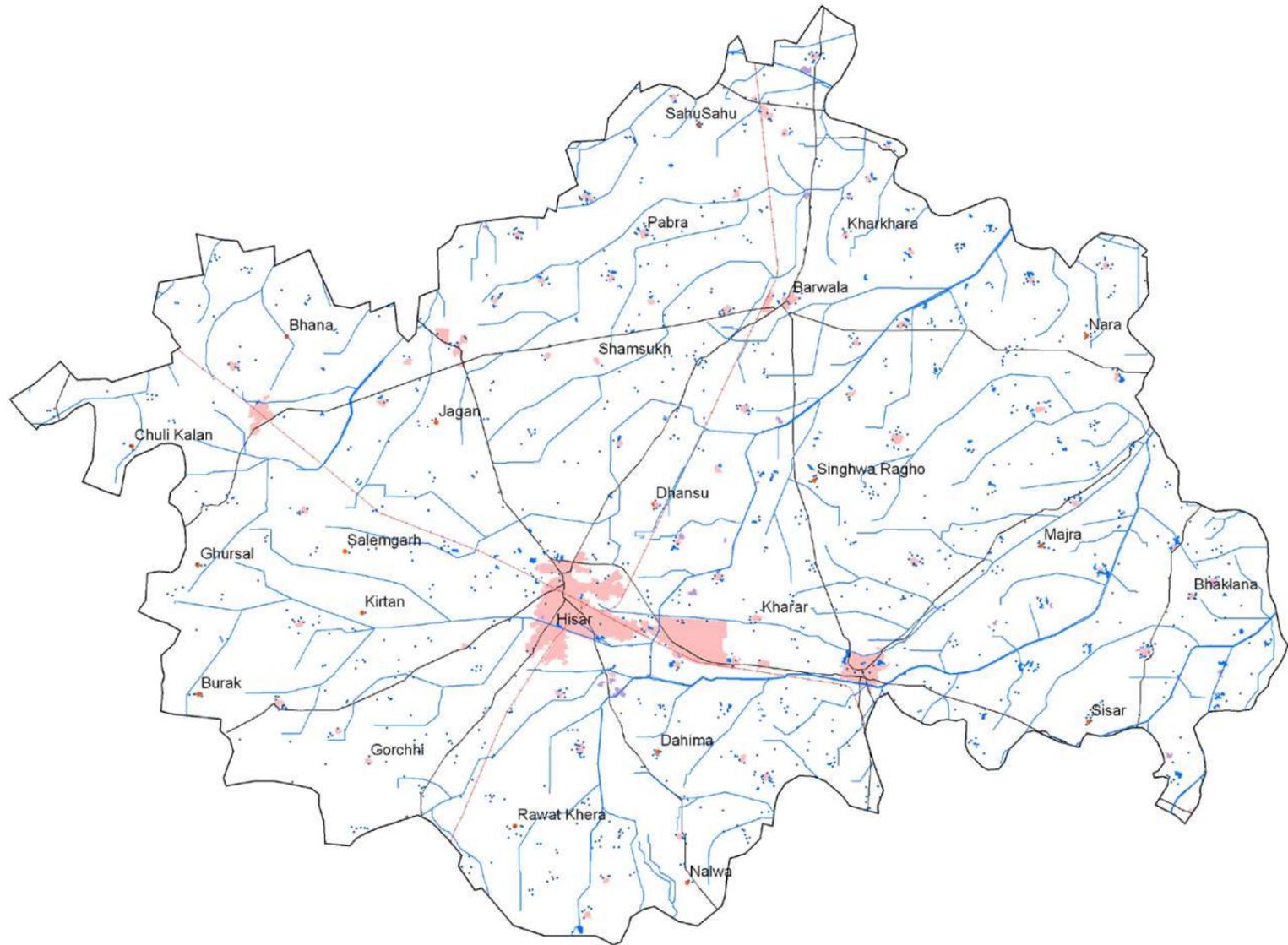
Table 17: Area estimates of wetlands in Hisar

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	3	18	0.64	18	18
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	152	1308	46.53	1161	1135
9	1203	Waterlogged	31	375	13.34	355	249
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>186</b>	<b>1701</b>	<b>60.51</b>	<b>1534</b>	<b>1402</b>
		Wetlands (<2.25 ha), mainly Tanks	1110	1110	39.49	-	-
		<b>Total</b>	<b>1296</b>	<b>2811</b>	<b>100.00</b>	<b>1534</b>	<b>1402</b>

<b>Area under Aquatic Vegetation</b>	129	106
--------------------------------------	-----	-----

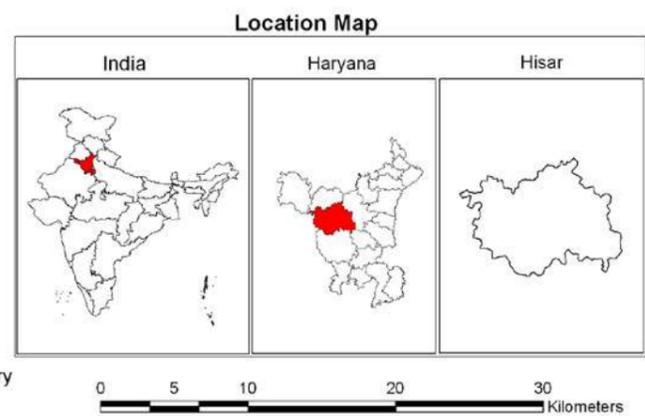
<b>Area under turbidity levels</b>		
Low	1162	1135
Moderate	0	0
High	372	267

The total wetland area in the district is 2811 ha and tanks/ponds and waterlogged contribute 59 per cent wetland area. Wetland area of tanks/ponds in both the season not showed any drastic variation in water spread. In all there are only 186 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 1110. Qualitative turbidity ranges from low to high. High and low turbidity is observed in both seasons. Out of 2811 ha wetland area 129 ha and 106 ha area was covered by aquatic vegetation during post and pre-monsoon season respectively.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
		Man-made		
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
		Man-made		
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



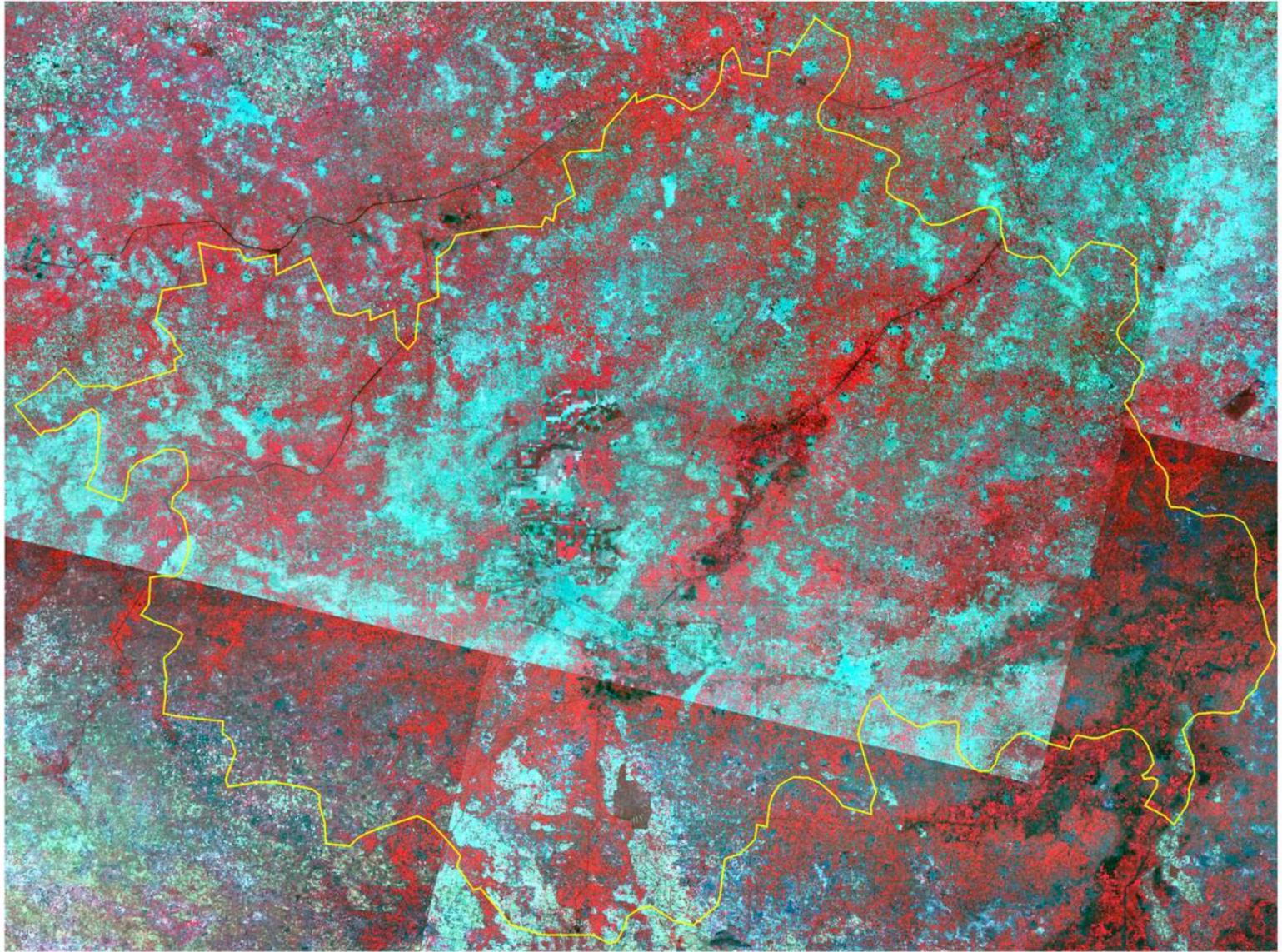
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Hisar



IRS P6 LISS-III post monsoon data (2006)

### 7.1.12 Bhiwani

The Bhiwani district occupies a traditional position between the fairly flat and featureless Punjab, Haryana plains and the Rajasthan desert and Aravali hills. It occupies an area of 4,778 sq. km and located between 28°19'N to 29°05' N latitudes and 75°28' to 76°28' E longitudes. The far inland location and bordering with Rajasthan desert in the west have profoundly influenced the climate, which is very hot in summer and cold in a fairly long winter. The average annual rainfall ranges between 315.2 to 410.2 mm (based on averages of 1995-99, 1996-2000 & 1997-01). Winter rains occur during January to march due to western disturbances but the amount is very less. About 75 percent of the annual rainfall is received during the monsoon month.

Temperature starts rising rapidly from March and reaches 41°C till with minimum temperature 28°C. Maximum temperature may occasionally touch 48°C on individual days during the period. Broadly speaking the district is a sandy, undulating plain dotted with sand dunes of varying shapes and dimensions occurring in different directional dispositions.

Table 18: Area estimates of wetlands in Bhiwani

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	7	94	5.38	92	59
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	72	562	32.15	498	458
9	1203	Waterlogged	13	210	12.01	179	136
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>92</b>	<b>866</b>	<b>49.54</b>	<b>769</b>	<b>653</b>
		Wetlands (<2.25 ha), mainly Tanks	882	882	50.46	-	-
		<b>Total</b>	<b>974</b>	<b>1748</b>	<b>100.00</b>	<b>769</b>	<b>653</b>

<b>Area under Aquatic Vegetation</b>	72	14
--------------------------------------	----	----

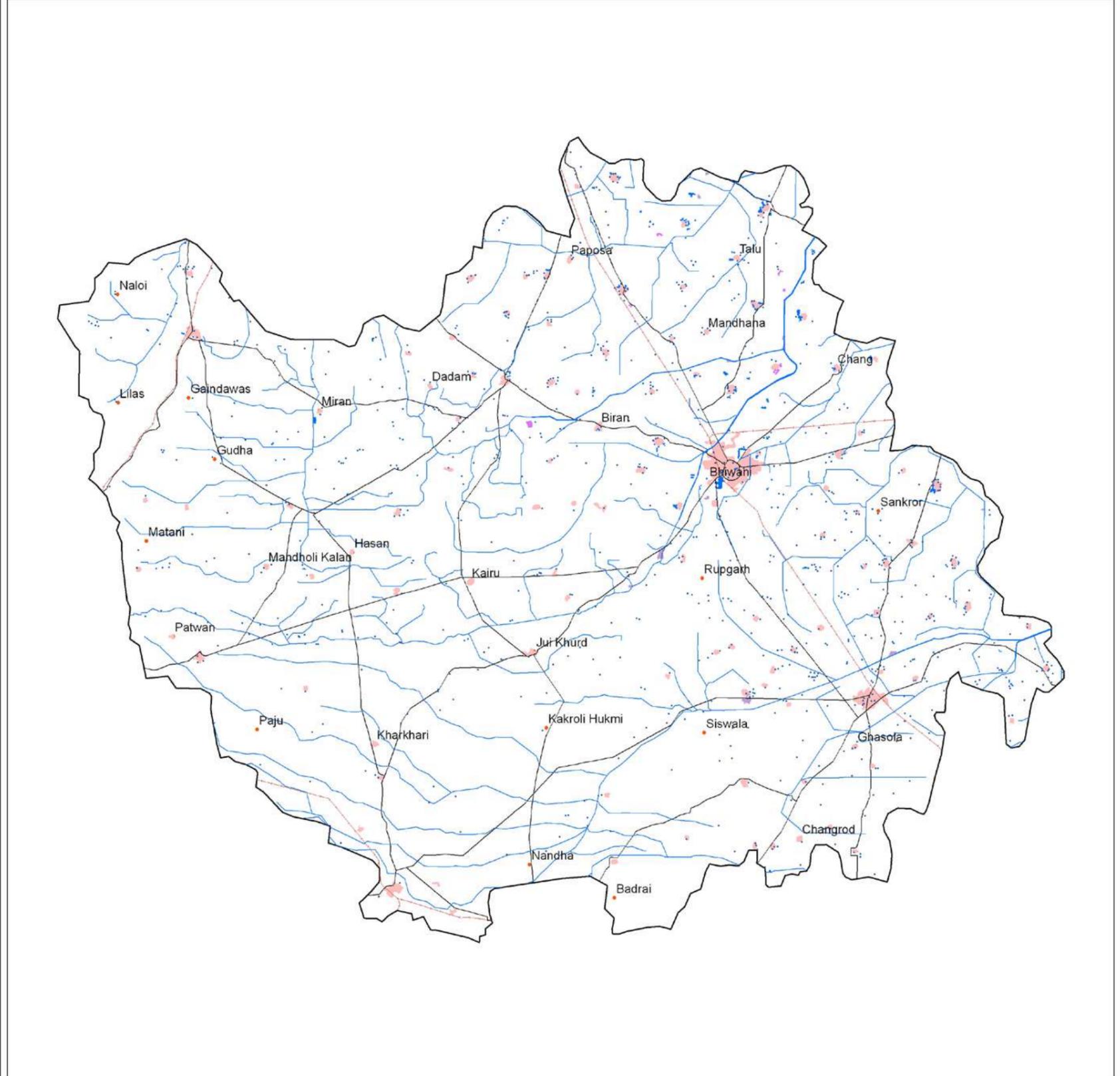
<b>Area under turbidity levels</b>		
Low	498	458
Moderate	0	0
High	271	195

The total wetland area in the district is 1748 ha and tanks/ponds and waterlogged contribute 44 per cent wetland area. Wetland area of tanks/ponds in both the season not showed any drastic variation in water spread. Natural waterlogged wetlands were observed low-lying areas and contribute around 5 per cent in total wetlands of the district. In all there are only 92 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 882. Qualitative turbidity ranges from low to high and moderate turbidity is observed. High and low turbidity is observed in both seasons. Out of 1748 ha wetland area 72 ha and 14 ha area was covered by aquatic vegetation during post and pre-monsoon season respectively.

State : Haryana

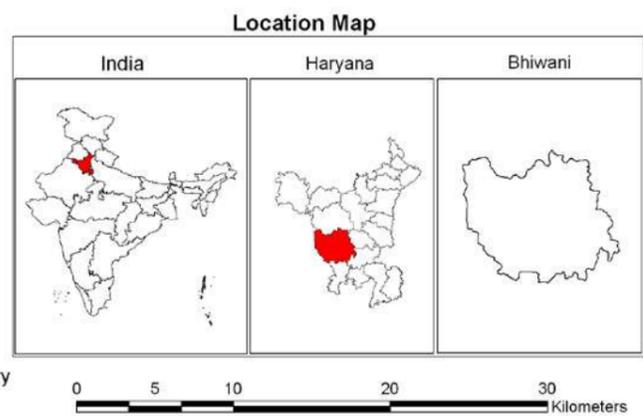
WETLAND MAP

District : Bhiwani



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
		Man-made		
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
		Man-made		
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



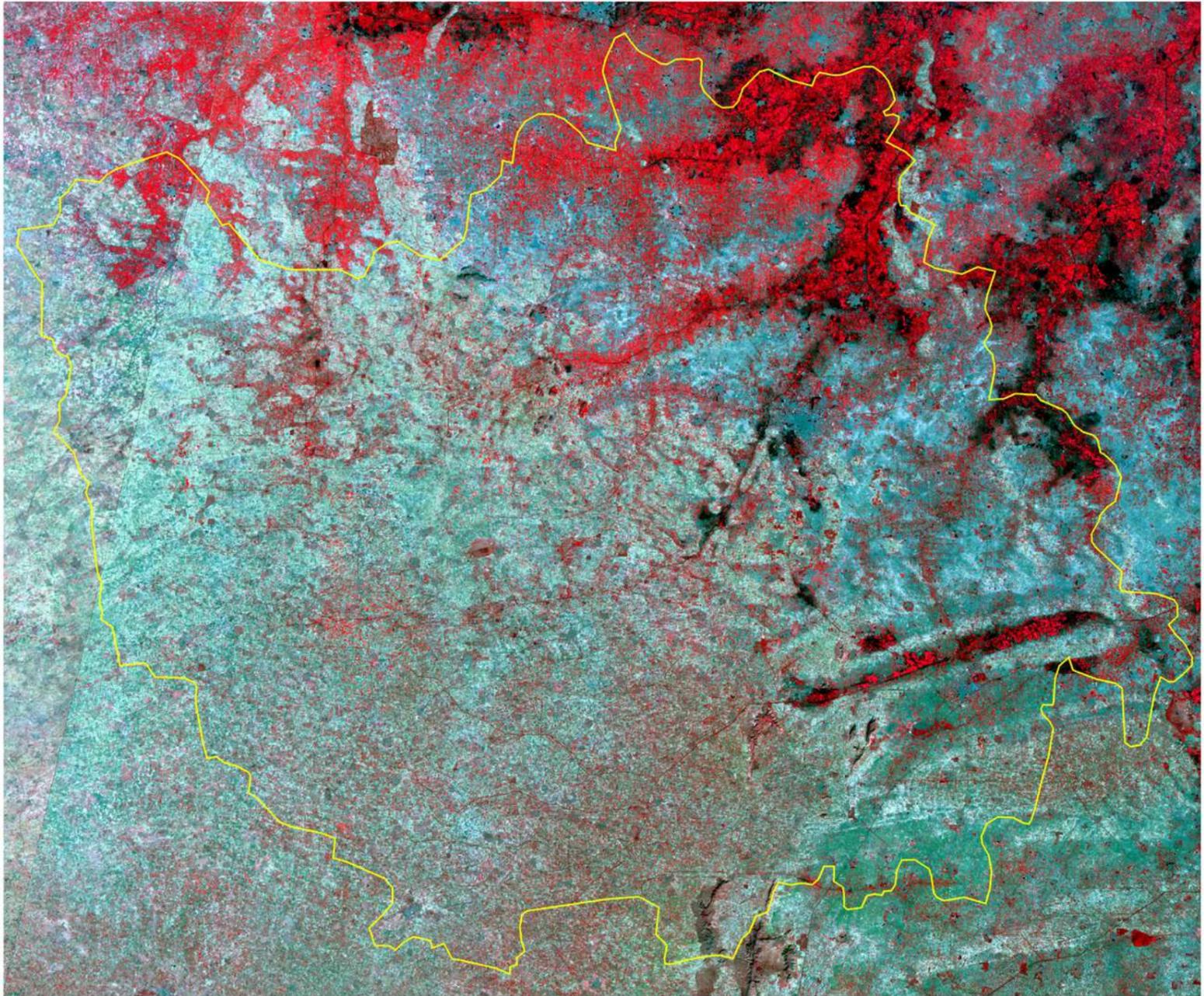
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Bhiwani



IRS P6 LISS-III post monsoon data (2006)

### 7.1.13 Rohtak

The Rohtak district is located between 28°23' to 29°06' N latitudes and 76°13' to 76°58' E longitudes. It covers a total area of 1745 sq. km. The climate of the district is dry with intensely hot summer, and cold winter. The average annual rainfall of the district is 577.0 mm. It generally increases towards northeast. About 74 per cent of annual rainfall is received during the monsoon season. The district experiences extreme temperatures. During January the temperature goes down to below 1°C. May and June are the hottest months with mean daily maximum temperature at about 40°C. Temperature sometimes may rise to 45°C.

The district is comprised of the vast Indo-Gangetic alluvial plains called older alluvial plain. This older alluvial plain is further divided into sand dunes, plain and depressions. The sediment derived in the old alluvial plain are mostly from the Himalayan rivers having a heterogeneous composition. This landform is formed predominantly by medium to fine textured soils. Since the soils are fertile with good irrigation facilities (canal and tube wells), these have been put into maximum use over a long time. This landform has been further divided into the following subunits:

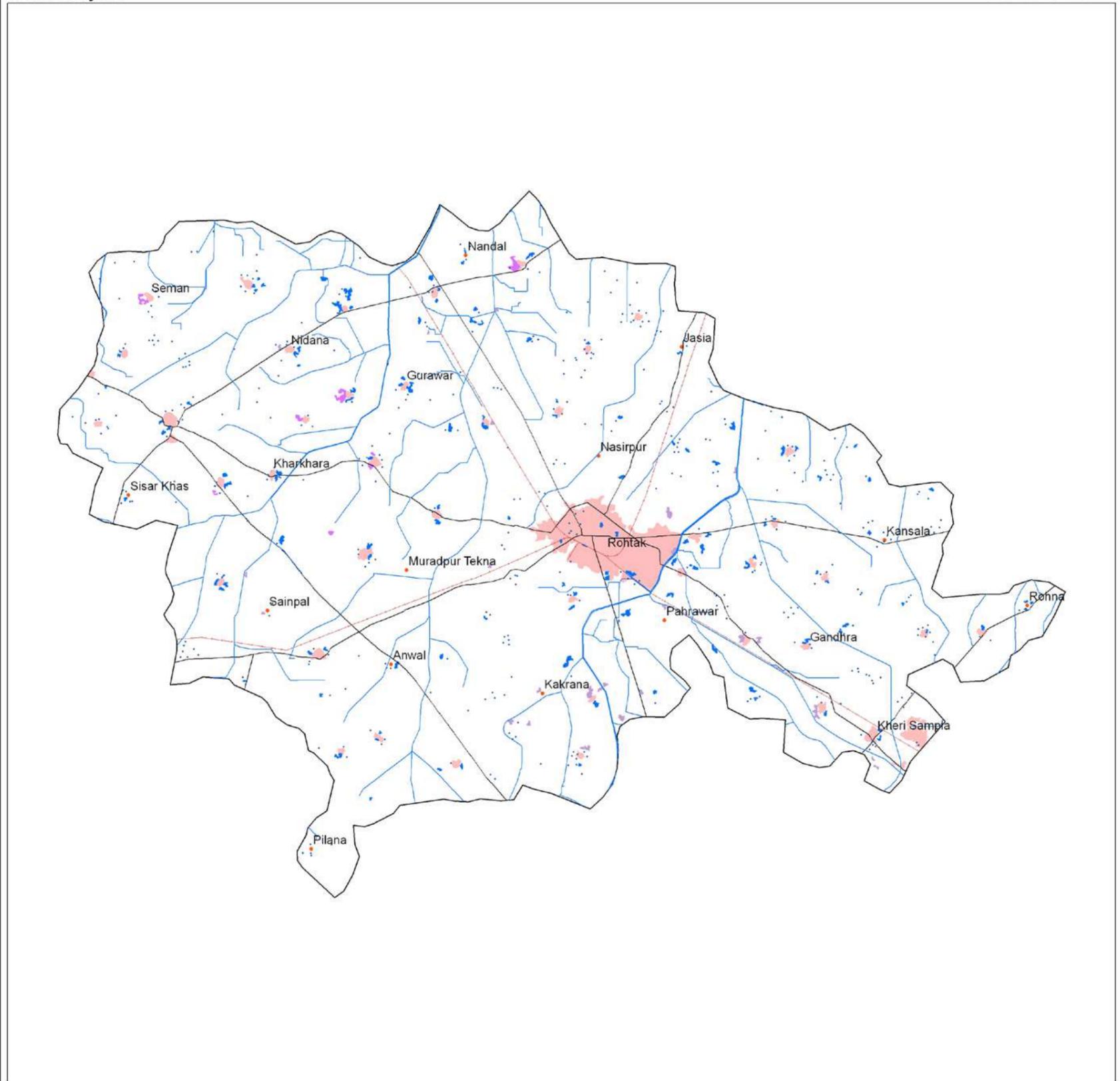
Table 19: Area estimates of wetlands in Rohtak

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	8	150	8.91	148	108
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	126	888	52.76	874	696
9	1203	Waterlogged	25	232	13.78	229	170
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>159</b>	<b>1270</b>	<b>75.46</b>	<b>1251</b>	<b>974</b>
		Wetlands (<2.25 ha), mainly Tanks	413	413	24.54	-	-
		<b>Total</b>	<b>572</b>	<b>1683</b>	<b>100.00</b>	<b>1251</b>	<b>974</b>

<b>Area under Aquatic Vegetation</b>	13	0
--------------------------------------	----	---

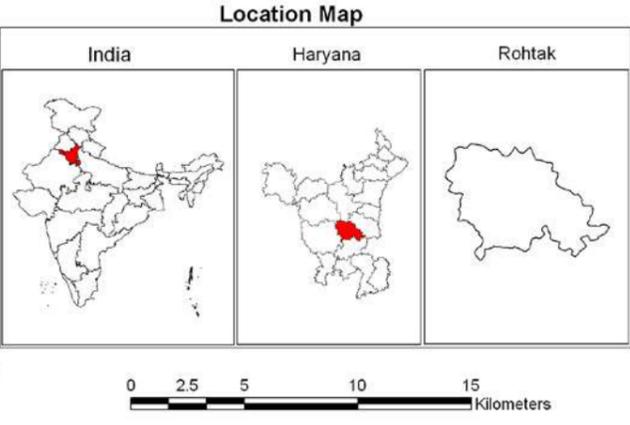
<b>Area under turbidity levels</b>		
Low	875	696
Moderate	0	0
High	376	278

The total wetland area in the district is 1983 ha and tanks/ponds and waterlogged contribute around 67 per cent wetland area. There are 126 tanks/ ponds and their wetland area in both the season not shown any drastic fluctuations in water spread. Natural waterlogged wetlands were observed low-lying areas and contribute around 9 per cent in total wetlands of the district. In addition there are 413 wetlands having less than 2.25 ha area. Qualitative turbidity ranges from low to high and is observed in both seasons. Out of 1683 ha wetland area 13 ha area was covered by aquatic vegetation during post monsoon season.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



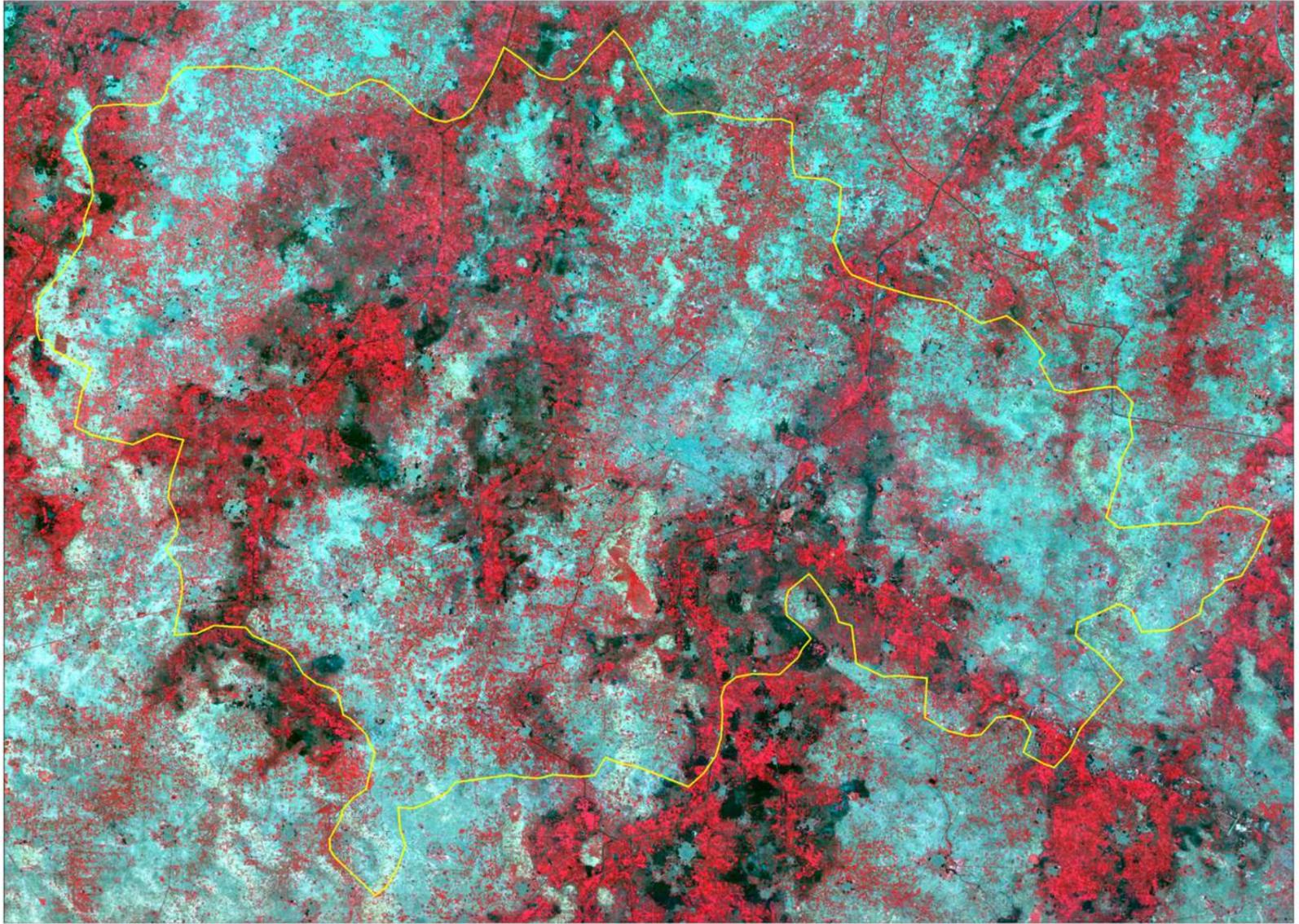
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Rohtak



IRS P6 LISS-III post monsoon data (2006)

### 7.1.14 Jhajjar

The Jhajjar district is located between 29°21'30" to 29°51'30" N latitudes and 76°16'30" to 76°58'45" E longitudes. It covers a total area of 1834 sq. km. The climate of the district is dry with intense hot summer, and cold winter. The average annual rainfall of the district is 577.0 mm. The maximum rainfall received during the months of July and August. About 74% of annual rainfall is received during the monsoon season. Temperature starts rising from March and continues till the end of June. May and June are the hottest months with mean daily maximum temperature is about 40°C. During winter the temperature starts decreasing by the middle of November, January is the coldest month.

The main physiographic units of the district are as under: The upland plain spreads in the north- eastern part of the district. It slopes towards south. This plain is covered with old alluvium of high productivity. The sandy region is spread in the southern and south- western parts of the district. It comprises of permanent sand dunes, most of them now have been leveled. Sahibi is the only seasonal stream, which enters the district from the southeastern part and flows from the south.

Table 20: Area estimates of wetlands in Jhajjar

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	2	563	25.66	203	0
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	6	76	3.46	76	76
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	72	499	22.74	480	369
9	1203	Waterlogged	27	227	10.35	219	247
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>107</b>	<b>1365</b>	<b>62.22</b>	<b>978</b>	<b>692</b>
		Wetlands (<2.25 ha), mainly Tanks	829	829	37.78	-	-
		<b>Total</b>	<b>936</b>	<b>2194</b>	<b>100.00</b>	<b>978</b>	<b>692</b>

<b>Area under Aquatic Vegetation</b>	378	49
--------------------------------------	-----	----

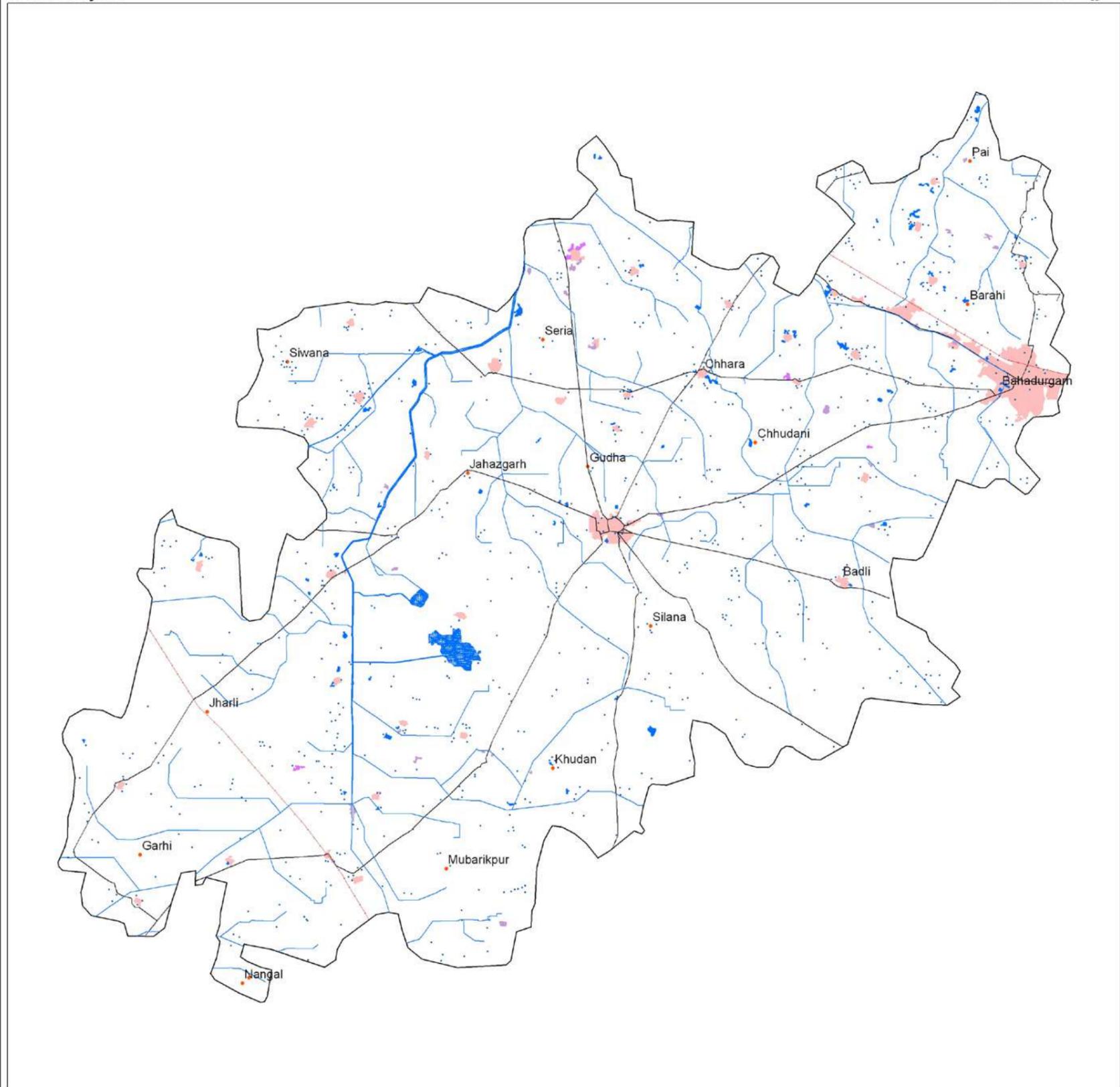
<b>Area under turbidity levels</b>		
Low	683	369
Moderate	0	0
High	295	323

The total wetland area in the district is 2194 ha and lakes/ ponds and tanks/ponds contribute around 49 per cent wetland area. There are 72 tanks/ ponds and their wetland area in both the season not shown any drastic fluctuations in water spread. There are only two lakes and the wetland area in post-monsoon season 203 ha but during summer these wetlands dried. There are 107 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 829. Qualitative turbidity ranges from low to high and is observed in both seasons. Out of 2194 ha wetland area 378 ha area was covered by aquatic vegetation during post monsoon season while in pre-monsoon season it is only 49 ha. .

State : Haryana

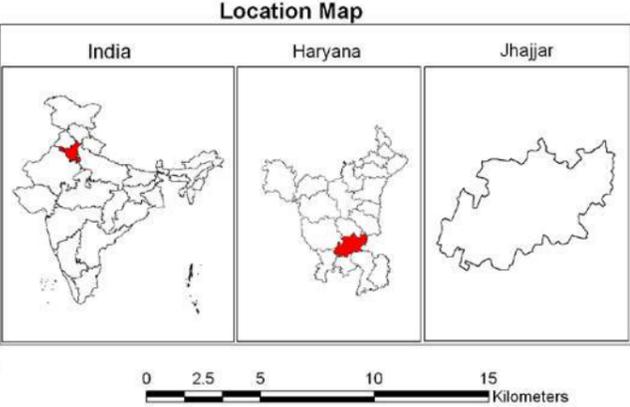
WETLAND MAP

District : Jhajjar



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
		Man-made		
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
		Man-made		
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



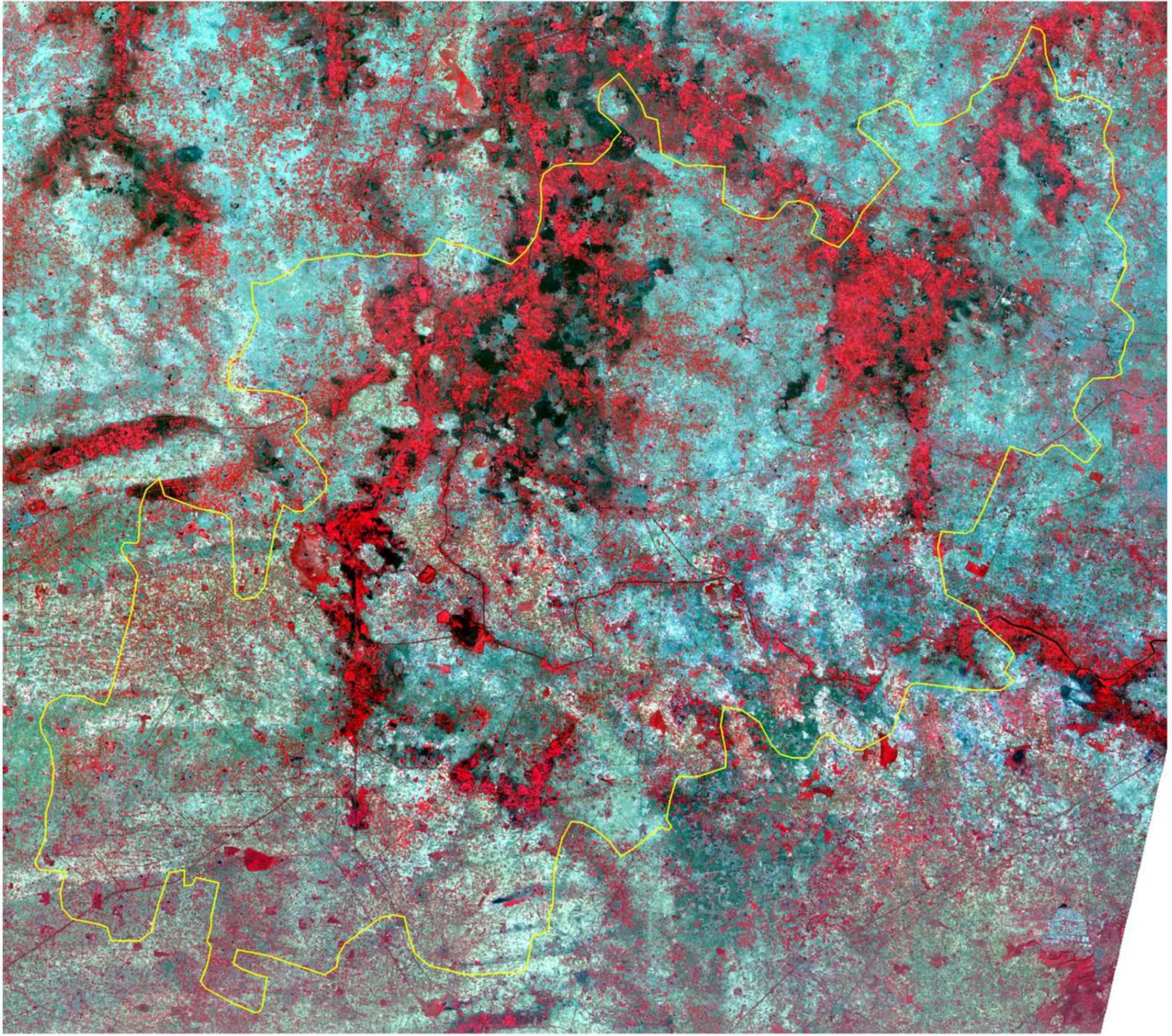
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Jhajjar



IRS P6 LISS-III post monsoon data (2006)

### 7.1.15 Mahendragarh

Mahendragarh district, situated in south- western part of Haryana, has an area of 1859 sq. km. Geographically, it stretches in between 27°48' N to 28°28' N latitudes and 75°54' E to 76°22' E longitudes. The climatic conditions in the district vary from arid to semi arid. The summer months are very hot whereas, winter season is fairly cool and dry, but there is sometimes freezing temperature during the months of December and January. Occasionally, frost also occurs in winter. The annual rainfall in the district increases from west to east. About 75% of annual rainfall is received during the southwest monsoon months i.e. July to September. During winter months light rainfall occurs due to western cyclonic disturbance of Mediterranean sea. Temperature begins to rise from March to June. June is the hottest month. The mean daily maximum temperature varies from 41°C to 45°C and mean daily temperature is about 27°C. Maximum temperature may go up to 48°C.

The district is dominated by dry lands with presence of inland streams, sandy plains, shifting sand dunes, stabilized sand dunes, dissected upland tracts and often barren, denuded, rocky hill ranges and their outcrops.

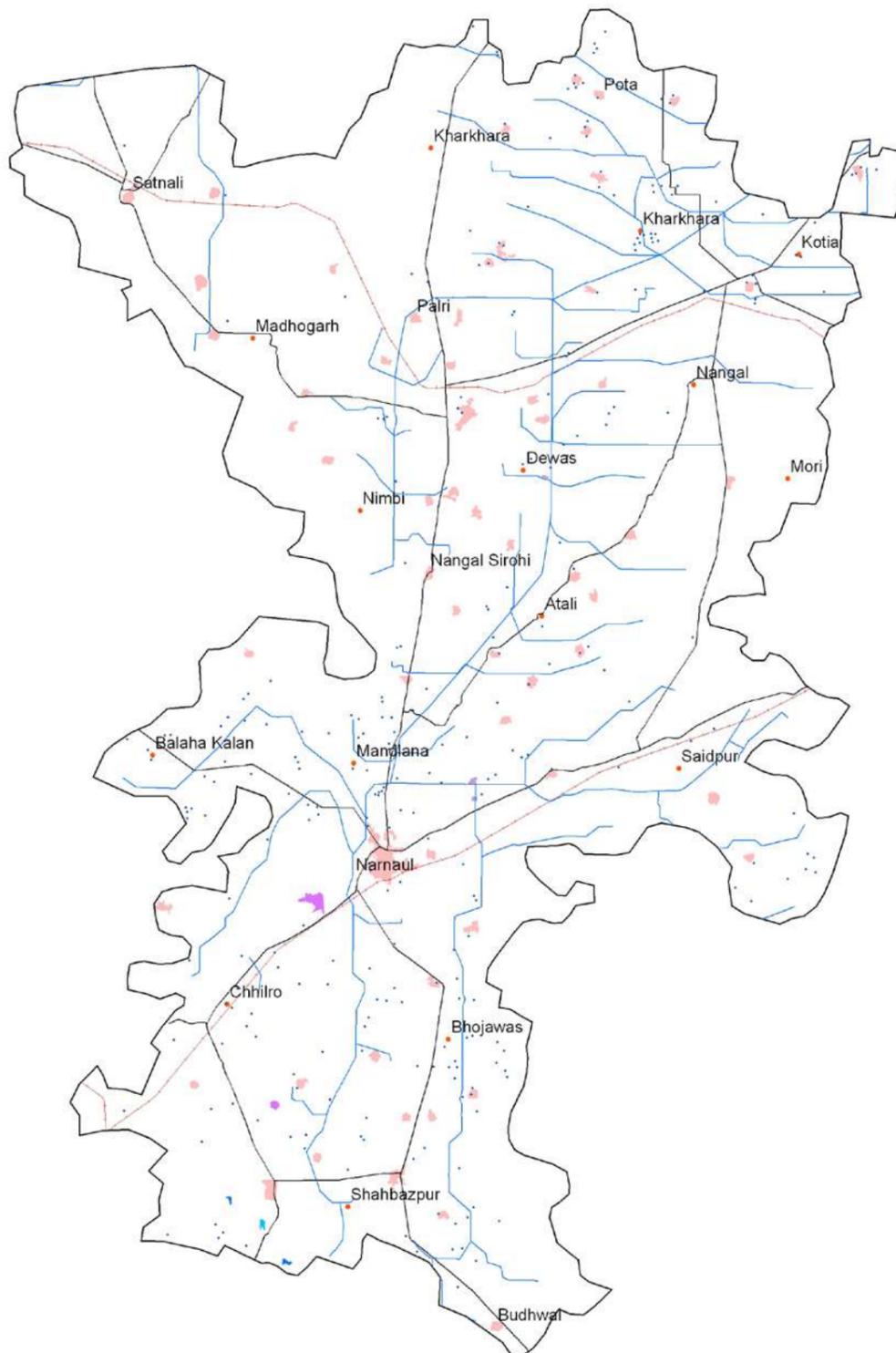
Table 21: Area estimates of wetlands in Mahendranagar

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	2	97	21.95	97	12
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	1	13	2.94	13	3
8	1202	Tanks/Ponds	2	17	3.85	17	4
9	1203	Waterlogged	3	26	5.88	26	5
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>8</b>	<b>153</b>	<b>34.62</b>	<b>153</b>	<b>24</b>
		Wetlands (<2.25 ha), mainly Tanks	289	289	65.38	-	-
		<b>Total</b>	<b>297</b>	<b>442</b>	<b>100.00</b>	<b>153</b>	<b>24</b>

<b>Area under Aquatic Vegetation</b>	0	0
--------------------------------------	---	---

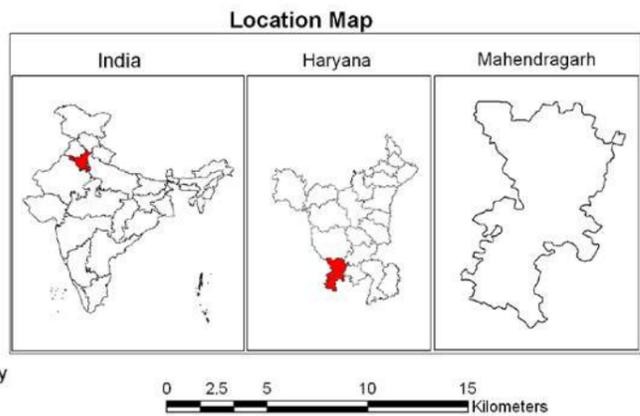
<b>Area under turbidity levels</b>		
Low	16	3
Moderate	13	2
High	124	19

The total wetland area in the district is 442 ha and waterlogged area contributes around 28 per cent wetland area. There are 18 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 289. Qualitative turbidity ranges from low to high and is observed in both seasons. Almost all wetlands are devoid of aquatic vegetation. Many wetlands are dried during pre-monsoon season.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



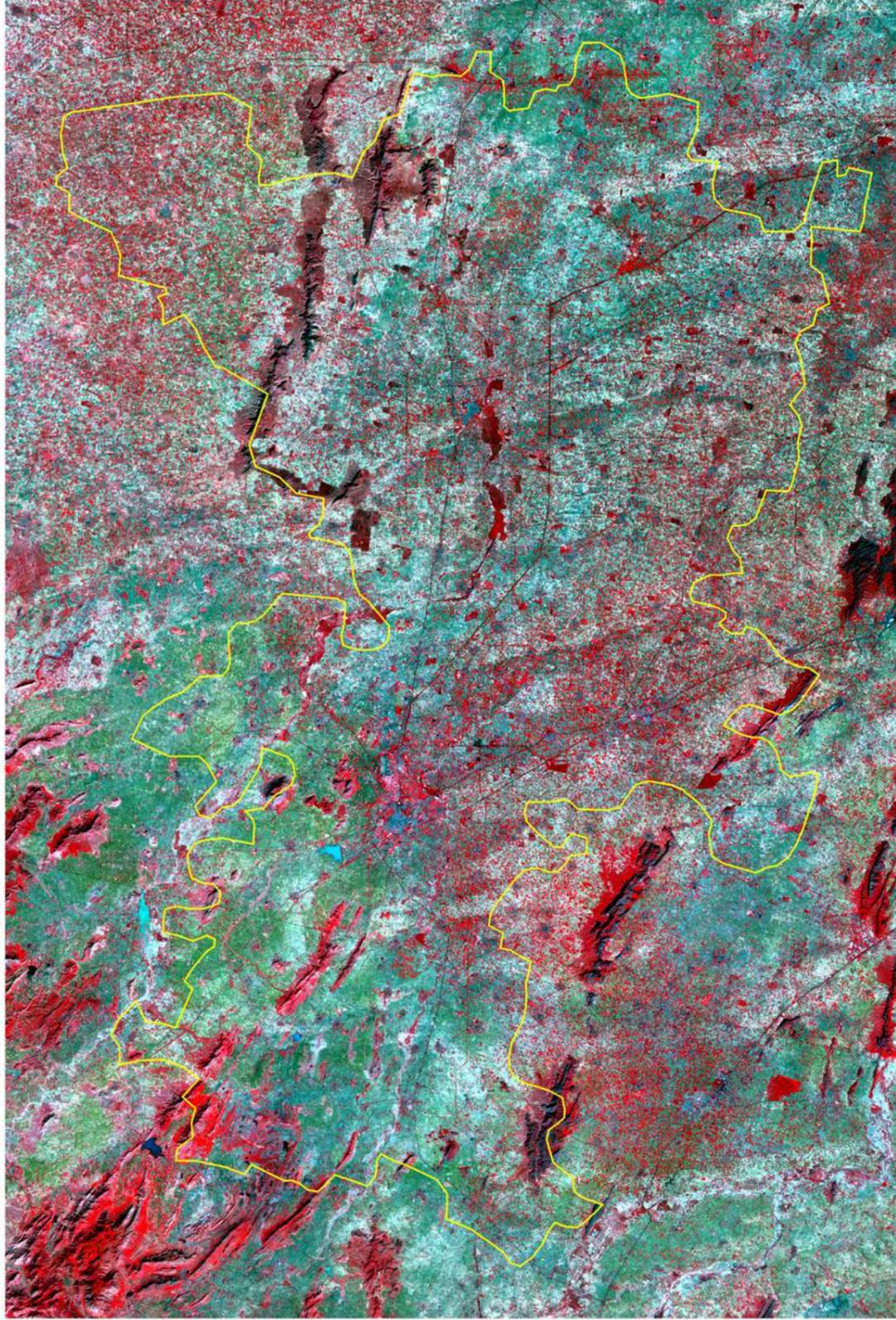
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Mahendragarh



IRS P6 LISS-III post monsoon data (2006)

### 7.1.16 Rewari

Rewari district lies in southwestern part of Haryana, which extends from 27°57' north to 28°17' north latitudes and from 76°17' east to 76°51' east longitudes encompassing an area of 1582 sq. km. The climate in the district varies from arid to semi arid. The incidence of thunderstorm also occurs during August and September. These are sometimes accompanied by heavy shower and occasional hail. The district has an average annual rainfall of about 686.6 mm. The major part of it (70 to 80%) is received during summer monsoon i.e. July to September. Due to western cyclonic disturbances coming through Afghanistan and Pakistan, the district receives about 10 to 15 percent of total rainfall during winter season. Eastern part of the district gets more rainfall and it starts decreasing towards west and southwest. The summer months are very hot with maximum temperature ranging from 41°C to 46°C in May and June. June is the period of highest incidence of dust storm. Sometimes, the temperature touches 48°C.

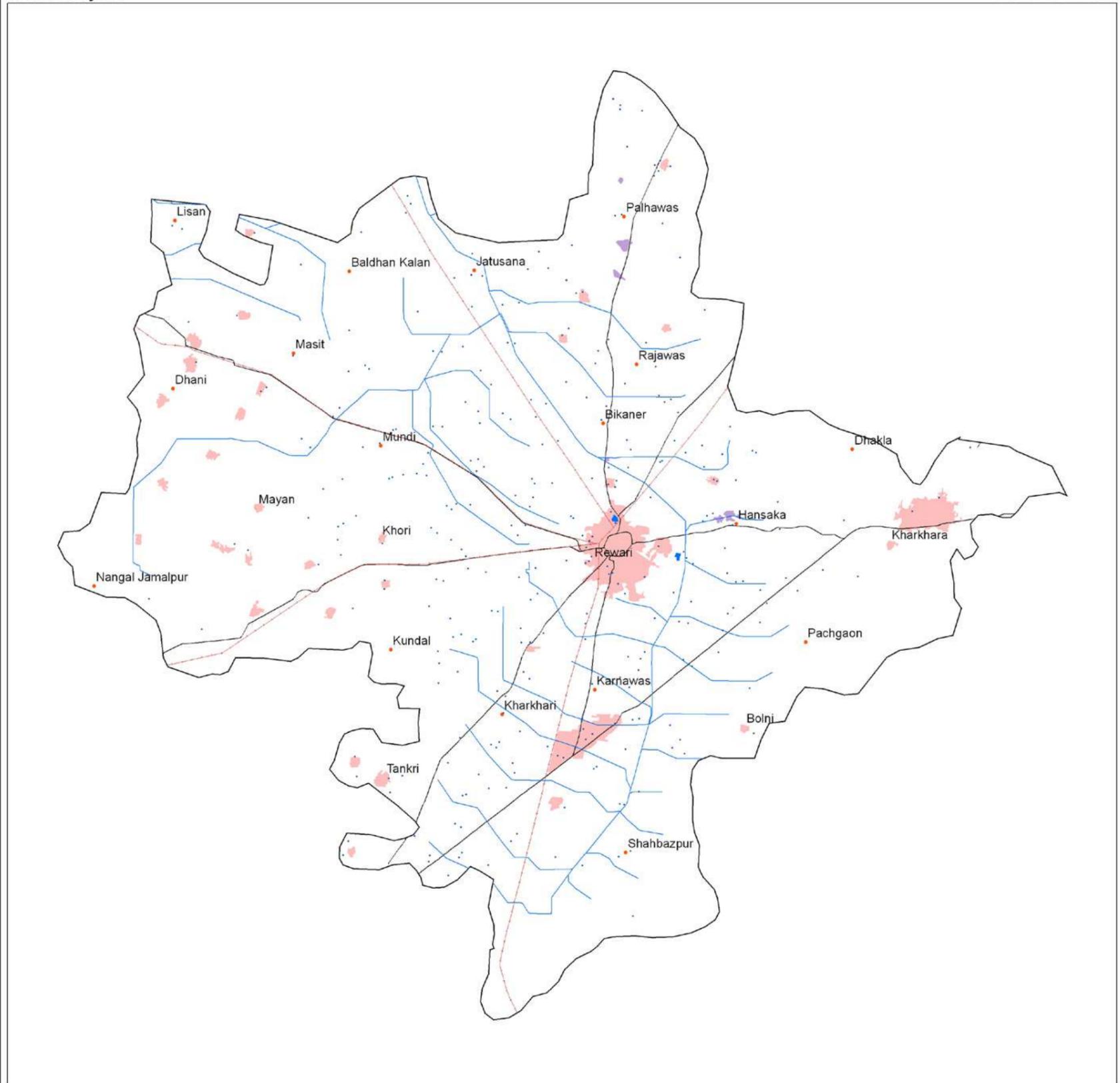
Table 22: Area estimates of wetlands in Rewari

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	-	-	-	-	-
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	-	-	-	-	-
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	2	20	4.52	20	20
9	1203	Waterlogged	7	106	23.98	106	4
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>9</b>	<b>126</b>	<b>28.51</b>	<b>126</b>	<b>24</b>
		Wetlands (<2.25 ha), mainly Tanks	316	316	71.49	-	-
		<b>Total</b>	<b>325</b>	<b>442</b>	<b>100.00</b>	<b>126</b>	<b>24</b>

<b>Area under Aquatic Vegetation</b>	0	0
--------------------------------------	---	---

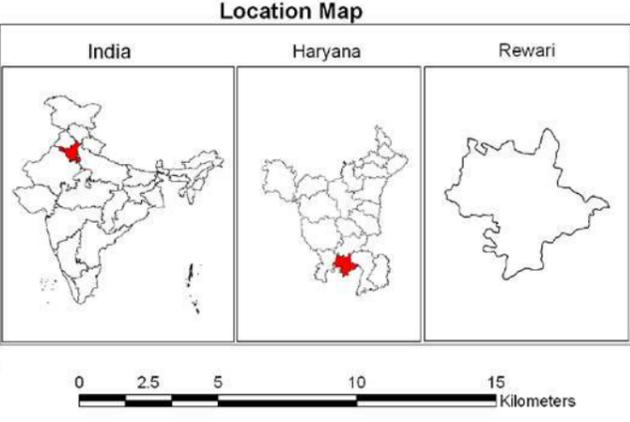
<b>Area under turbidity levels</b>		
Low	20	20
Moderate	0	0
High	106	4

The total wetland area in the district is 442 ha and man made waterlogged area contribute around 24 per cent wetland area. There are no natural wetlands in the district. There are only two tanks and water level fluctuations are very high. There are 9 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 316. Two classes of turbidity were observed. Area of high turbidity is 106 ha and low turbidity is restricted to 20 ha. Almost all wetlands are devoid of aquatic vegetation. Many wetlands mainly waterlogged are dried during pre-monsoon season.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



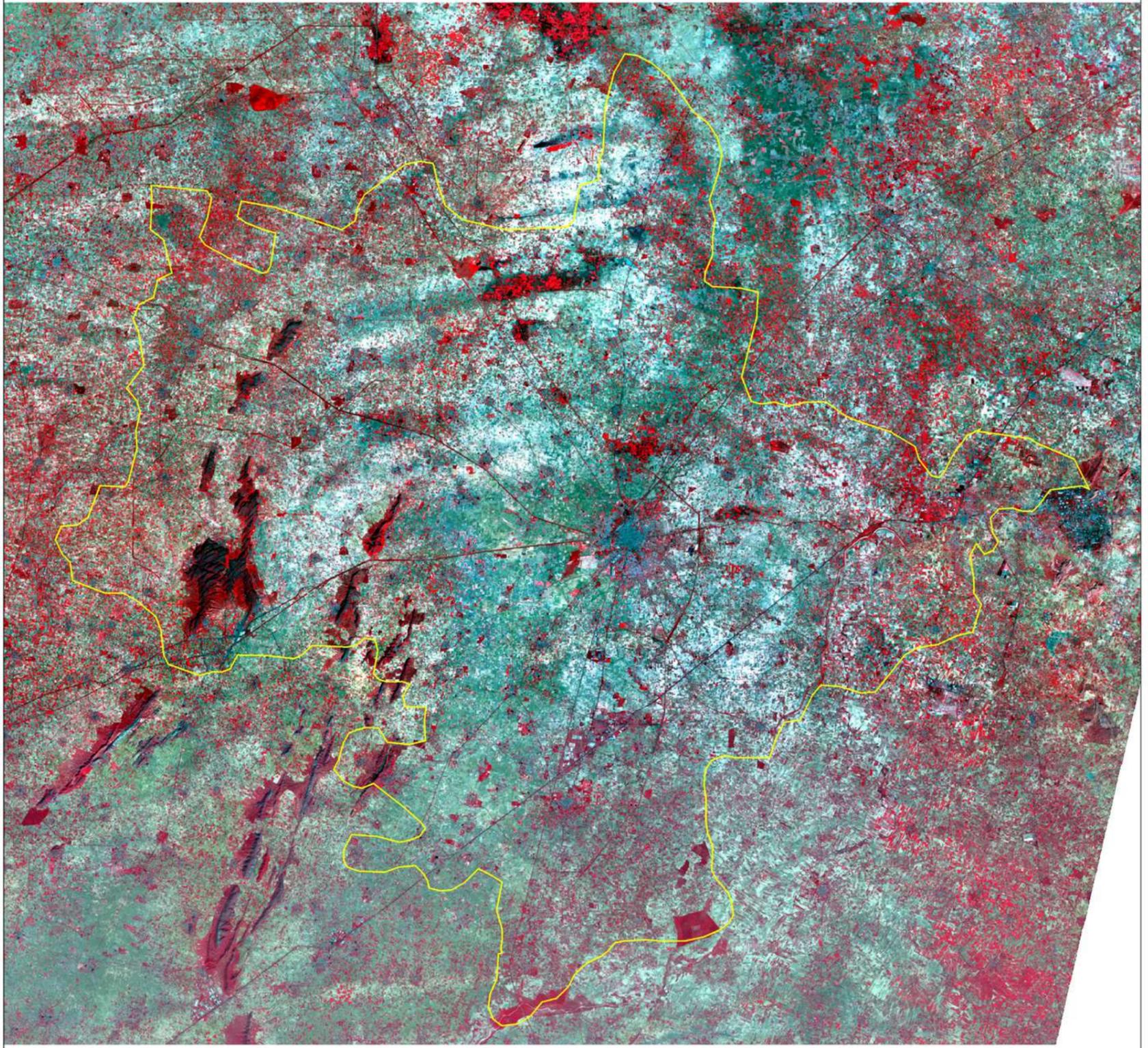
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Rewari



IRS P6 LISS-III post monsoon data (2006)

### 7.1.18 Gurgaon

The Gurgaon district is one of the southern districts of Haryana state and named after its headquarter town Gurgaon. The district lies between 27°39' N and 28°32'N latitudes and 76°39' and 77°20'E longitudes. It stretches towards the outlying hills of the Rajasthan in the south. It is bounded on the northwest by the Jhajjar district and on the north-east by the Union Territory of Delhi. On the east Faridabad district forms its boundary. On the south the Alwar district of Rajasthan and on the west Rewari district marks the district boundary. Total area of the district is 1254 sq.km.

The district experiences dry air except during the monsoon, hot summer and cold winter. The monthly average annual rainfall of the district is 442.4mm. Maximum rainfall is received during the months of July, September, August about 76%. Some rainfall is also received during the winter season from December to February but the amount is very low (6%).

Temperature begins to rise from March to June. June is the hottest month. Maximum temperature may go up to 48°C. With the onset of monsoon, temperature starts falling and during monsoon period weather remains uncomfortable due to increased humidity and warm night. After October, there is decrease temperature, the decrease being steeper after middle of November. January is the coldest month. Occasionally during winter season, cold in association with western disturbances brings temperature down to freezing point.

The drainage of the district is typical of the arid and semi-arid areas. It comprises of large depressions and seasonal streams. Important depressions of the district are: Khalilpur lake, Chandaini lake, Sangel-Ujina lake, Kotla Dahar lake and Najafgarh lake. Sahibi and Indari are two important seasonal streams of the district. They originate from Aravalli hills. Both these streams cause heavy damage to crops during heavy rainfall.

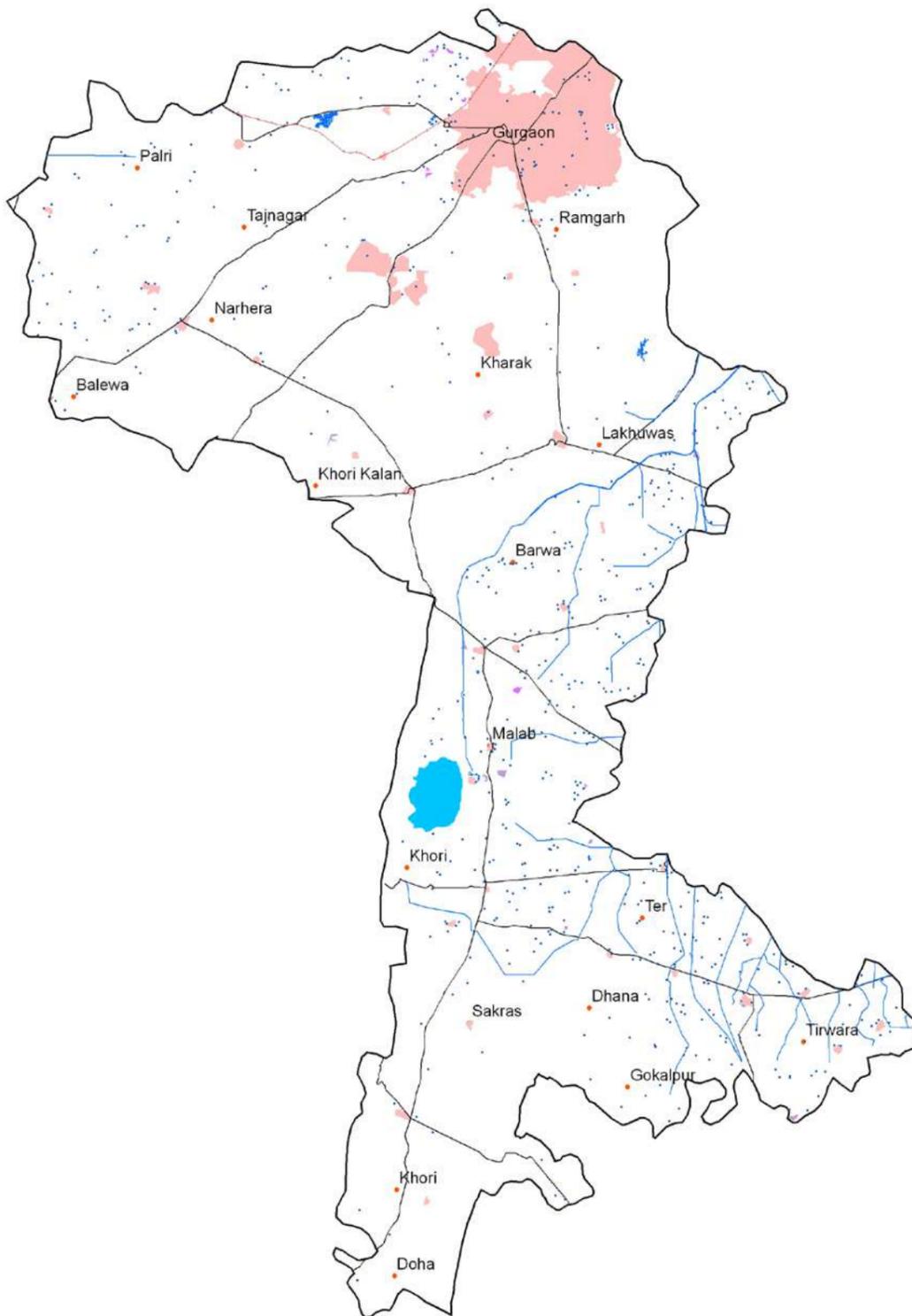
Table 23: Area estimates of wetlands in Gurgaon

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	2	158	5.72	70	20
2	1102	Ox-bow lakes/ Cut-off meanders	-	-	-	-	-
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	9	79	2.86	51	61
6	1106	River/Stream	-	-	-	-	-
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	1	1713	61.98	0	153
8	1202	Tanks/Ponds	14	63	2.28	54	59
9	1203	Waterlogged	18	155	5.61	114	128
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>44</b>	<b>2168</b>	<b>78.44</b>	<b>289</b>	<b>421</b>
		Wetlands (<2.25 ha), mainly Tanks	596	596	21.56	-	-
		<b>Total</b>	<b>640</b>	<b>2764</b>	<b>100.00</b>	<b>289</b>	<b>421</b>

<b>Area under Aquatic Vegetation</b>	599	312
--------------------------------------	-----	-----

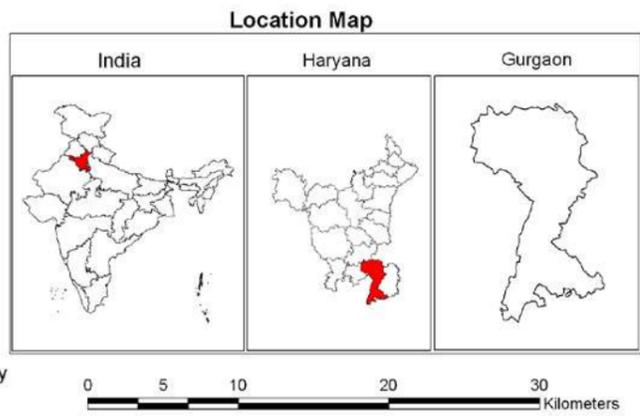
<b>Area under turbidity levels</b>		
Low	75	212
Moderate	48	20
High	166	189

The total wetland area in the district is 2764 ha and man made reservoirs/barrages contribute around 62 per cent wetland area. The contribution of natural wetlands to total wetlands of the district is around 3 per cent. There are 44 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 596. Three classes of turbidity were observed in both the season. Area of high turbidity is 166 ha and 189 ha in post and pre-monsoon season respectively. Out of 2764 wetland area 599 ha area was covered by aquatic vegetation while pre-monsoon season it was 312 ha.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Gurgaon



IRS P6 LISS-III post monsoon data (2006)

### 7.1.19 Faridabad

The Faridabad district is located in the southern part of Haryana state. The district lies between 28°23'1.141" and 28°22'39.975" north latitudes and 77°20'44.617" and 77°32'36.575" east longitudes. The total geographical area of this district as per Census is 764 sq.kms. The district is named after the town Faridabad, which is said to have been founded in 1607 by Shaikh Farud, treasurer of Jahangir, with the object of protecting the highway, which passed through the town in those days.

The climate condition of the district slightly differs from other southern districts of Haryana state. The climate characteristics of the district are dry air, except during monsoon, hot summer and cold winters. The normal annual rainfall is 521.1 mm. It increases towards east. About 77 percent of annual rainfall in the district is received during the monsoon months i.e. July to September. On an average there are 28 rainy days in a year in the district. Temperature begins to rise from March to June. June is the hottest month. Maximum temperature may go up to 48°C. With the onset of monsoon, temperature starts falling and during monsoon period weather remains uncomfortable due to increased humidity and warm night. January is the coldest month. Occasionally during winter season, cold in association with western disturbances brings temperature down to freezing point.

The district has monotonous physiography and has alluvium deposits. The district is enjoying with very good network of canals, wells and tube- wells alongwith the river Yamuna as its natural water source. The district is also having a good potential for ground water in most of the places.

The western part the district is the extension of Rajasthan desert. The natural vegetation of the district is dominated by Kikar (Acacia).

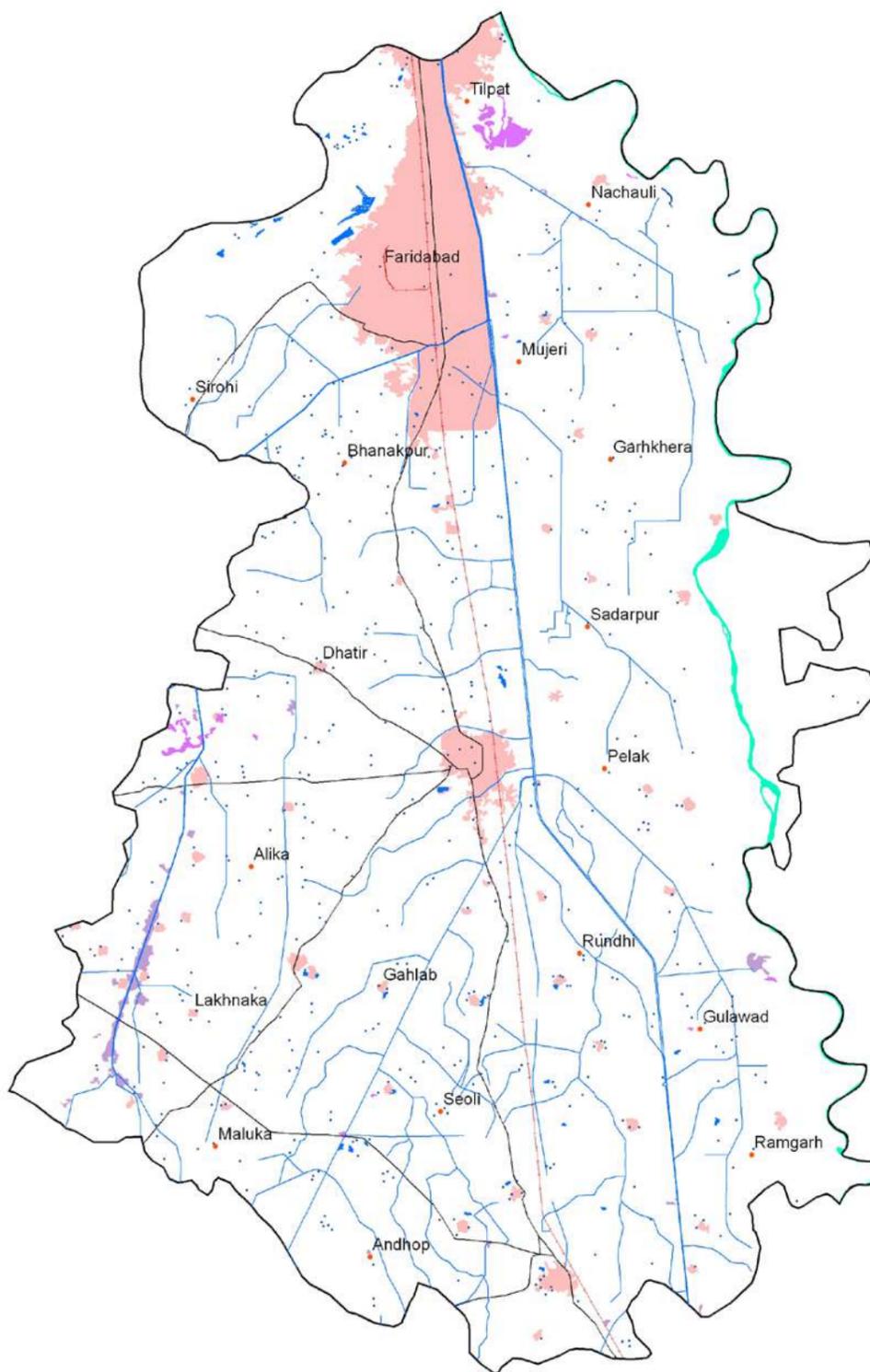
Table 24: Area estimates of wetlands in Faridabad

Sr. No.	Wettcode	Wetland Category	Number of Wetlands	Total Wetland Area	% of wetland area	Area in ha	
						Open Water	
						Post-monsoon Area	Pre-monsoon Area
	<b>1100</b>	<b>Inland Wetlands - Natural</b>					
1	1101	Lakes/Ponds	1	80	2.25	11	0
2	1102	Ox-bow lakes/ Cut-off meanders	2	17	0.51	11	11
3	1103	High altitude wetlands	-	-	-	-	-
4	1104	Riverine wetlands	-	-	-	-	-
5	1105	Waterlogged	12	511	14.36	287	164
6	1106	River/Stream	1	1409	39.59	830	1116
	<b>1200</b>	<b>Inland Wetlands -Man-made</b>					
7	1201	Reservoirs/Barrages	-	-	-	-	-
8	1202	Tanks/Ponds	37	254	7.14	236	216
9	1203	Waterlogged	29	761	21.38	628	612
10	1204	Salt pans	-	-	-	-	-
		<b>Sub-Total</b>	<b>82</b>	<b>3033</b>	<b>85.22</b>	<b>2003</b>	<b>2119</b>
		Wetlands (<2.25 ha), mainly Tanks	526	526	14.78	-	-
		<b>Total</b>	<b>608</b>	<b>3559</b>	<b>100.00</b>	<b>2003</b>	<b>2119</b>

<b>Area under Aquatic Vegetation</b>	424	389
--------------------------------------	-----	-----

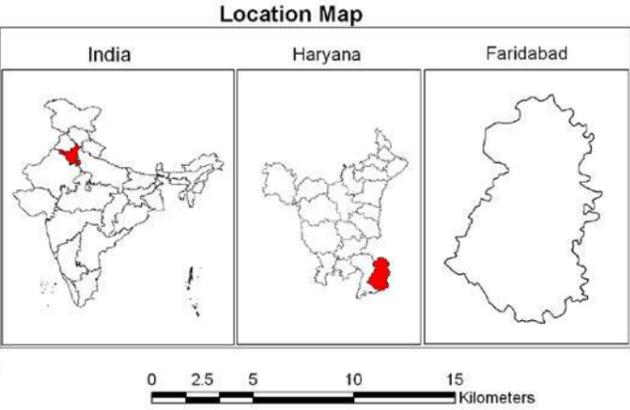
<b>Area under turbidity levels</b>		
Low	200	173
Moderate	887	1170
High	916	776

The total wetland area in the district is 3559 ha and rivers/streams contribute around 40 per cent wetland area and natural and manmade waterlogged area contributes almost equally to the total wetland area of the district. There are 82 wetlands having area more than 2.25 ha in the district where as less than 2.25 ha wetlands are 526. Three classes of turbidity were observed in both the season. Area of high turbidity is 916 ha and 776 ha in post and pre-monsoon season respectively. Out of 3559 wetland area 424 ha area was covered by aquatic vegetation while pre-monsoon season it was 389 ha.



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25ha)
  - Settlements
  - Drainage (line)
  - Major Roads
  - Railway
  - Town/Settlements
  - District Boundary
  - State Boundary
  - International Boundary



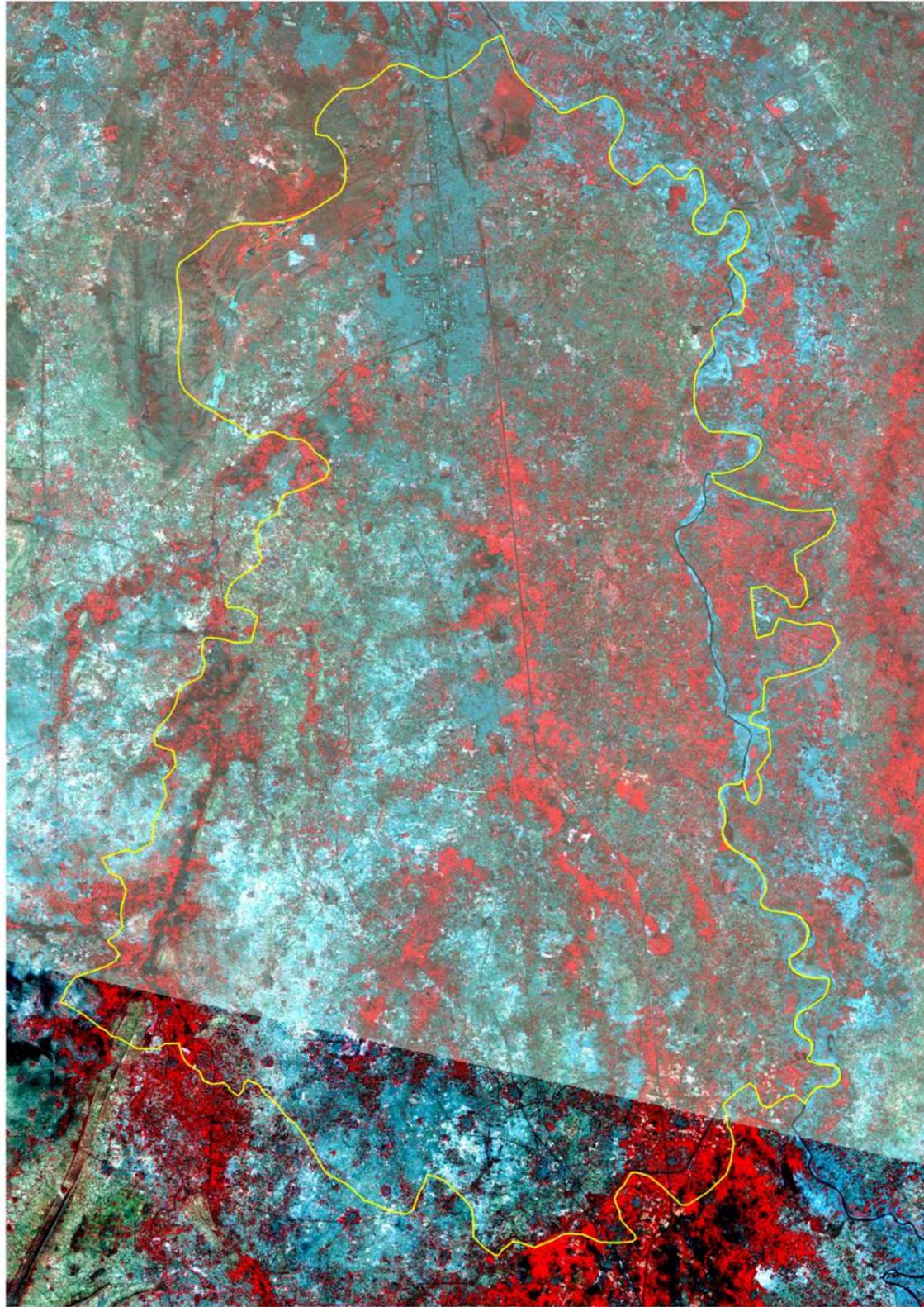
**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

District : Faridabad



IRS P6 LISS-III post monsoon data (2006)

## **MAJOR WETLAND TYPES**

8.0 MAJOR WETLAND TYPES OF HARYANA

Major wetland types observed in the state are Rivers, Waterlogged areas and Tanks/Ponds. Details are given in Plate-1. Ground truth data was collected for selected wetland sites. The standard proforma was used to record the field data. Field photographs are also taken to record the water quality (subjective), status of aquatic vegetation and water spread. The location of the features was recorded using GPS. Field photographs of different wetland types are shown in Plates 2a, and 2b.

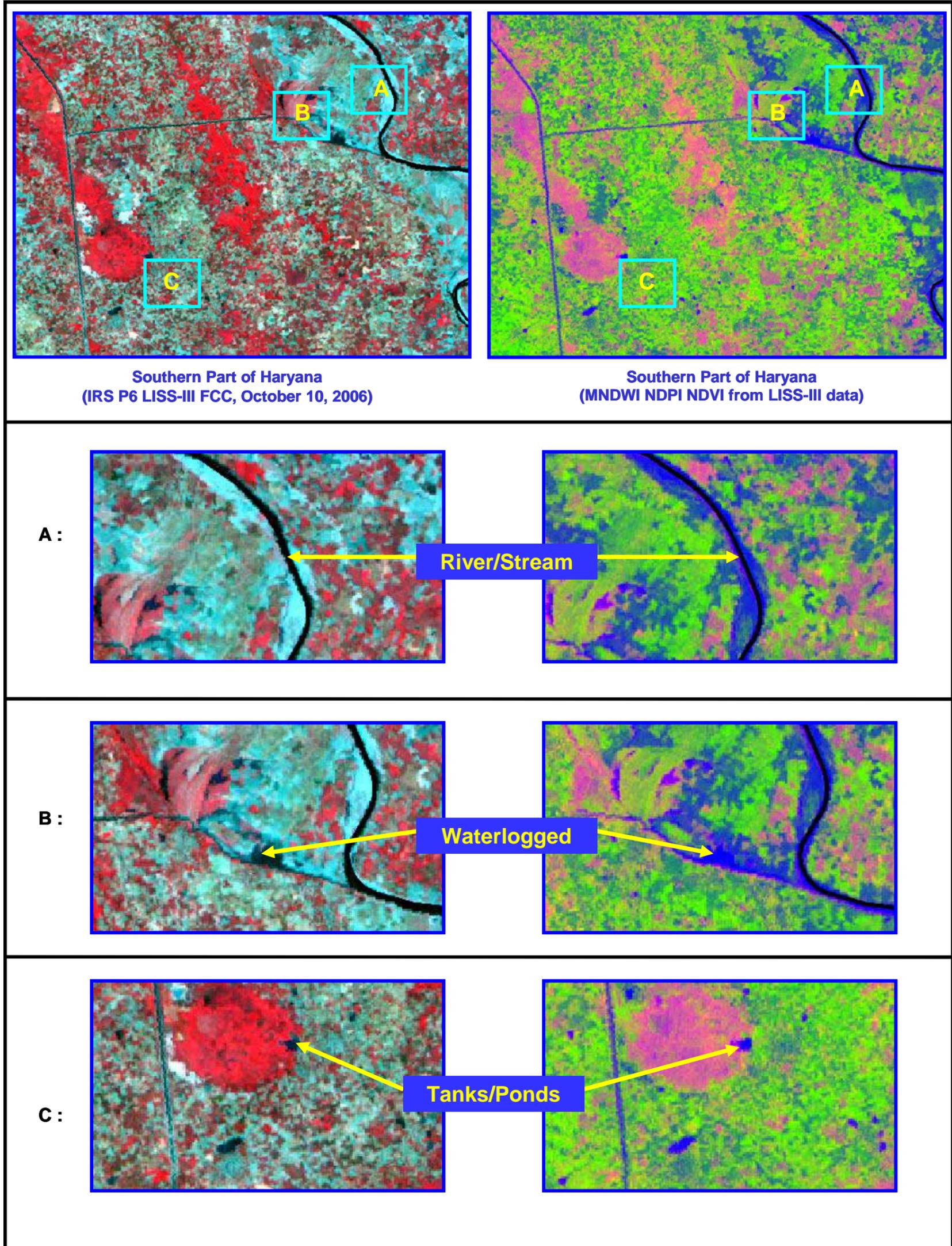


Plate - 1: Major wetland types of Haryana

Sr. No.	Description	Field photograph
1	<p><b>Wetland Type:</b> Waterlogged Area (Natural)</p> <p><b>Location:</b> Longitude: 76° 37' 33" E Latitude : 28° 45' 55" N</p> <p><b>Turbidity:</b> High</p> <p><b>Aquatic vegetation:</b> Present</p>	
2	<p><b>Wetland Type:</b> Tanks/Ponds</p> <p><b>Location:</b> Longitude: 76° 18' 05" E Latitude : 28° 57' 18" N</p> <p><b>Turbidity:</b> Low</p> <p><b>Aquatic vegetation:</b> Present</p>	
3	<p><b>Wetland Type:</b> River/Stream</p> <p><b>Location:</b> Longitude : 77° 15' 55" E Latitude : 28° 24' 14" N</p> <p><b>Turbidity:</b> Moderate</p> <p><b>Aquatic vegetation:</b> Present</p>	
4	<p><b>Wetland Type:</b> Waterlogged Area (Natural)</p> <p><b>Location:</b> Longitude: 77° 21' 12" E Latitude : 28° 26' 30" N</p> <p><b>Turbidity:</b> High</p> <p><b>Aquatic vegetation:</b> Present</p>	

Plate 2a: Field photographs and ground truth data of different wetland types in Haryana

Sr. No	Description	Field Photograph
5	<p><b>Wetland Type:</b> Tanks/Ponds</p> <p><b>Location:</b>  Longitude: 76<sup>0</sup> 49' 38" E  Latitude : 29<sup>0</sup> 57' 40" N</p> <p><b>Turbidity:</b> Low</p> <p><b>Aquatic vegetation:</b> Nil</p>	
6	<p><b>Wetland Type:</b> Tanks/Ponds</p> <p><b>Location:</b>  Longitude: 77<sup>0</sup> 15' 54" E  Latitude : 28<sup>0</sup> 24' 13" N</p> <p><b>Turbidity:</b> High</p> <p><b>Aquatic vegetation:</b> Present  (Algal-bloom)</p>	
7	<p><b>Wetland Type:</b> Lake  (Sultanpur Bird Sanctuary)</p> <p><b>Location:</b>  Latitude : 28<sup>0</sup> 27' 49" N  Longitude : 76<sup>0</sup> 53' 30" E</p> <p><b>Aquatic vegetation:</b> Present  (Floating / Submerged / Emergent)</p> <p><b>Turbidity:</b> Low</p>	
8	<p><b>Wetland Type:</b> Waterlogged Area  (Man-made: Bhindawas Bird Sanctuary)</p> <p><b>Location:</b>  Latitude : 28<sup>0</sup> 32' 2" N  Longitude : 76<sup>0</sup> 33' 3" E</p> <p><b>Aquatic vegetation:</b> Present  (Floating / Submerged)</p> <p><b>Turbidity:</b> Moderate</p>	

Plate 2b: Field photographs and ground truth data of different wetland types in Haryana

## **IMPORTANT WETLANDS OF HARYANA**

## 9.0 IMPORTANT WETLANDS OF HARYANA

The wetlands of the state mainly comprise of small lakes/ tanks and waterlogged areas mainly associated with canals. Most of the waterlogged areas are infested by phragmatis grass. Some of the village tanks have been restored and well managed to meet the local needs. There are three wetlands which attract migratory birds and two are named as bird sanctuaries - sultanpur Bird sanctuary and Bhindawas Bird Sanctuary located in Gurgaon district and Jhajjar district respectively. These wetlands are located near to national capital and attract large number of tourists during winter season. Shallow wetlands are being used for agriculture and fodder production and it is a regular practice observed in and around Mewat district. Othe than two bird sanctuaries, Damdama lake and Brahm Sarovar are important wetland sites of Haryana.

Extensive field work was carried out for important wetland sites. Wetland maps have been prepared for 5 km buffer area of each wetland sites. Details of each wetland and wetland map of 5 km buffer area are shown in plates 3 to 17.

## 9.1 Sultanpur Bird Sanctuary

### Name: Sultanpur Bird Sanctuary

#### Location:

Latitude : 28° 28 ' 15" N and 28° 27' 14" N  
 Longitudes: 76° 52' 50" E and 76° 54' 2" E

**Area:** 145 ha

**Altitude:** 220 – 230 m

#### Average Annual Rainfall:

Average annual rainfall: 300 mm

Mean Temperature: 24 to 28° C.

#### Morphometric features :

Maximum depth 1- 2m

Average depth 30 cm

Sultanpur bird sanctuary is one of the early notified bird sanctuaries by the state of Haryana. It is situated on National High way no. 8 in Gurgaon district. It is a heaven for bird lovers in the state. This is one of the famous lakes in the country, so far as the variety of the migrant birds from Europe and Siberia. These birds come here with the onset of winter and returns back at the onset of summer. One can see the abundance of birds, more than a 100 species in a day, in a most natural surrounding at really close quarters.

#### Vegetation:

There are some areas dominated by Typha sps. and phragmites ( Grasses). Shoreline is dominated by emergent vegetation and floating vegetation mainly limna and water hyacinth. Most of the area around the core area is under cultivation.

#### Fauna:

The wildlife in the park includes ungulates, a verity of waterfowl, notably pelicans, ducks, geese, and cranes. Many species of raptors occur in the area, including the Imperial eagle, greater spotted eagle, and tawny eagle and marsh harrier.

Overall turbidity of lake water is moderate.

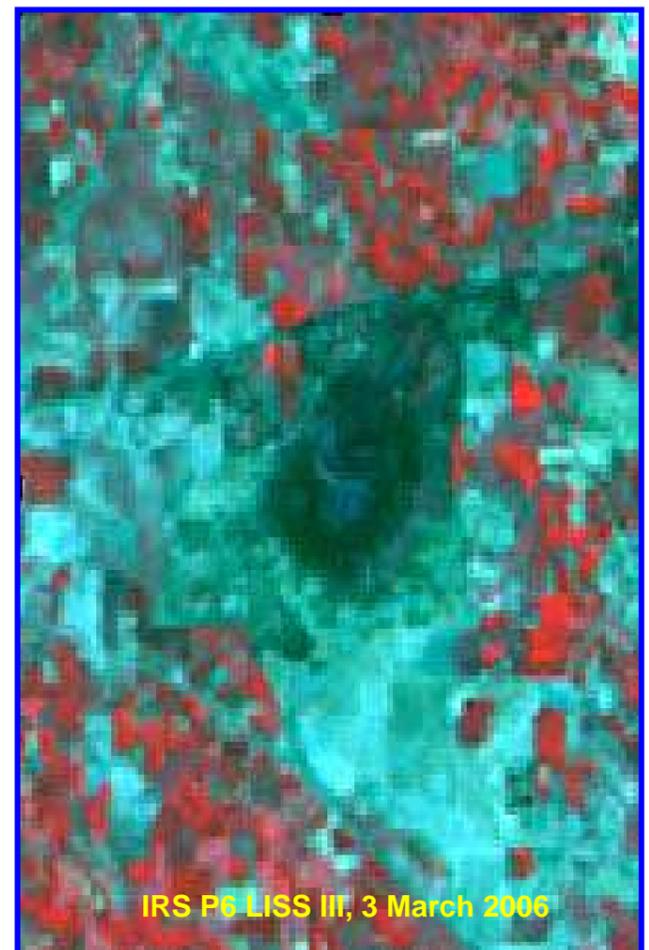


Plate 3: Sultanpur Bird Sanctuary

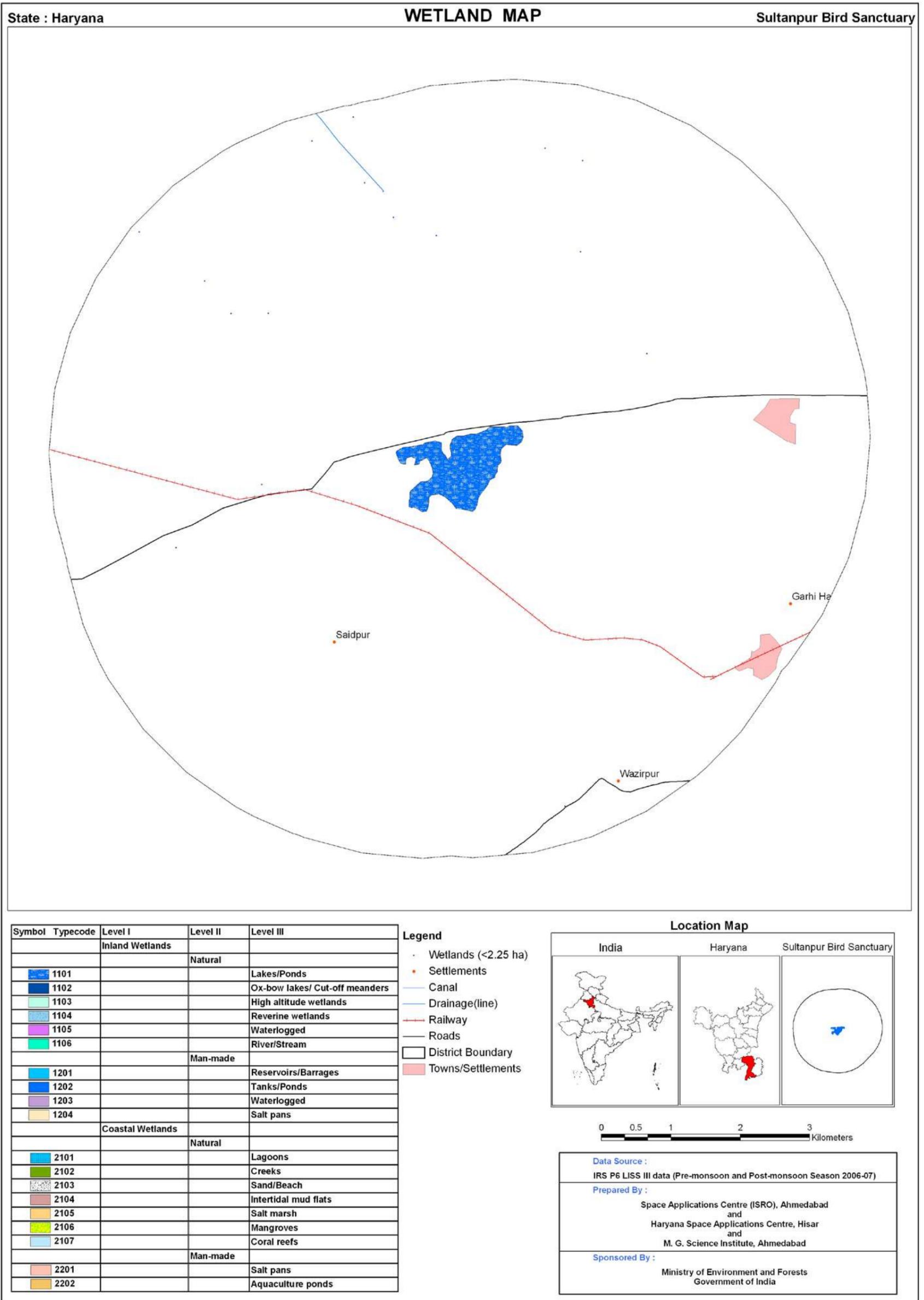
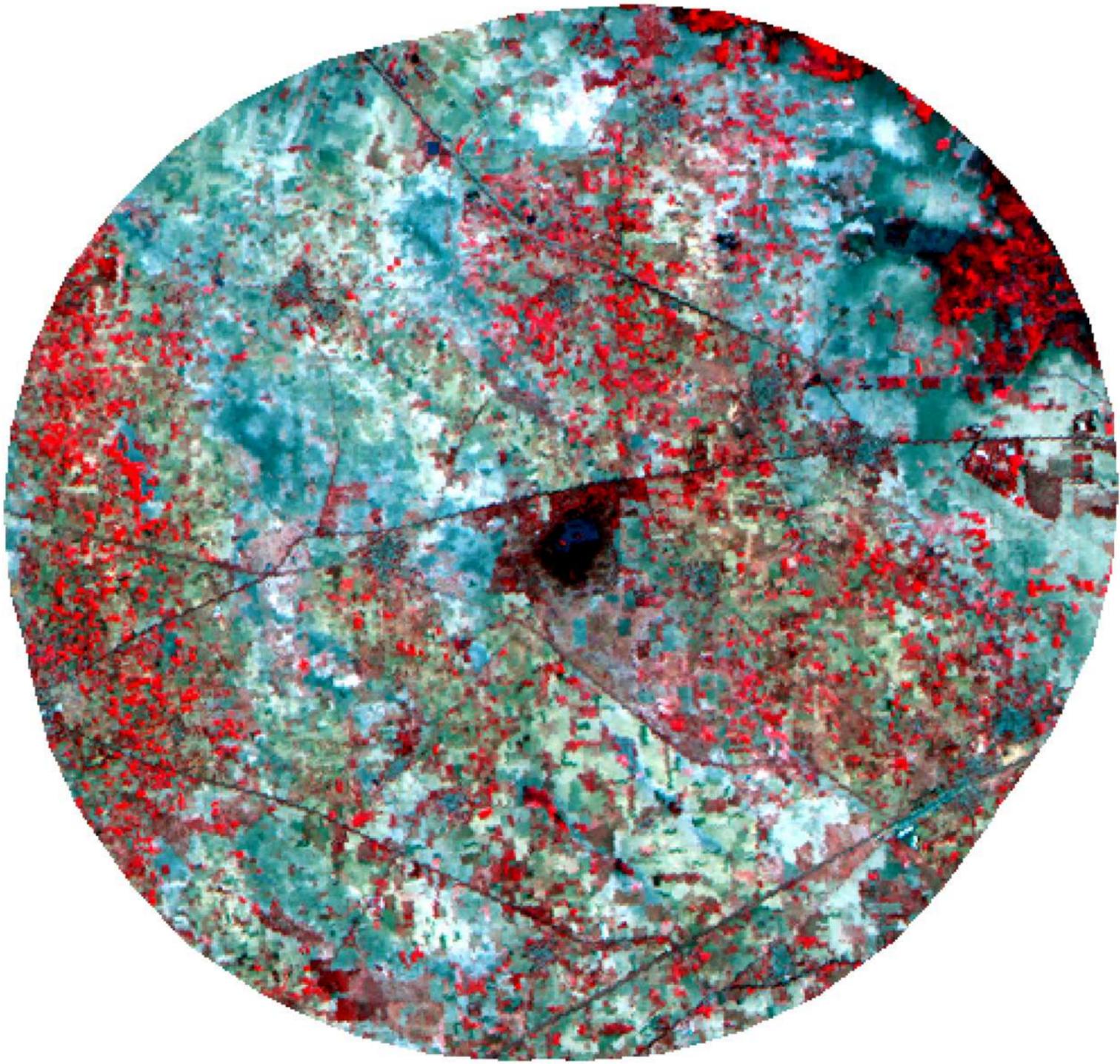


Plate 4: Wetland map - 5 km buffer area of Sultanpur Bird Sanctuary



IRS P6 LISS-III post monsoon data (2006)

Plate 5: IRS LISS-III FCC - 5 km buffer area of Sultanpur Bird Sanctuary

## 9.2 Bhindawas Bird Sanctuary

### Name: Bhindawas Bird Sanctuary

The peripheral embankment is man made and basically constructed to store the escaped water of Jawaharlal Nehru canal through an escape channel

### Location:

Latitude : 28° 32 ' 47" N and 28° 31' 57" N  
 Longitude : 76° 31' 54" E and 76° 34' 10" E

**Area:** 435 ha

**Altitude:** 200 – 230 m

### Average Annual Rainfall:

Average annual rainfall: 300 mm

Mean Temperature: 24 to 28° C.

### Morphometric features :

Maximum depth 1- 2m

Average depth 30 cm

### Vegetation:

Mainly acacias and eucalyptus species plantations are found. The 412 ha low lying storage area has twelve kilometers of motorable embankments running round the perimeter which is planted with acacias and eucalyptus species.

### Fauna:

Blue Peafowl, White-throated Kingfisher, Rose-ringed, Great Egret, Eurasian Collared Dove, Mallard, Crested Lark, Jungle Babbler, Ashy Prinia etc are some of the more common birds found in the sanctuary. In addition to the above birds, the antelope Neelgain (Blue Bull) and Jungle Cat can also be seen in the sanctuary.

Overall turbidity of lake water is low.

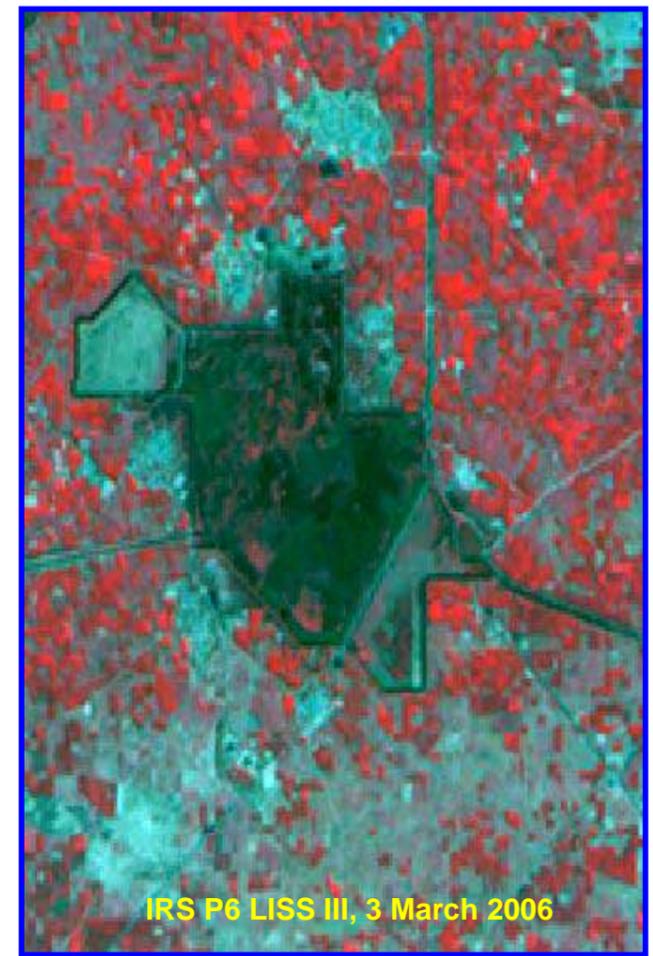
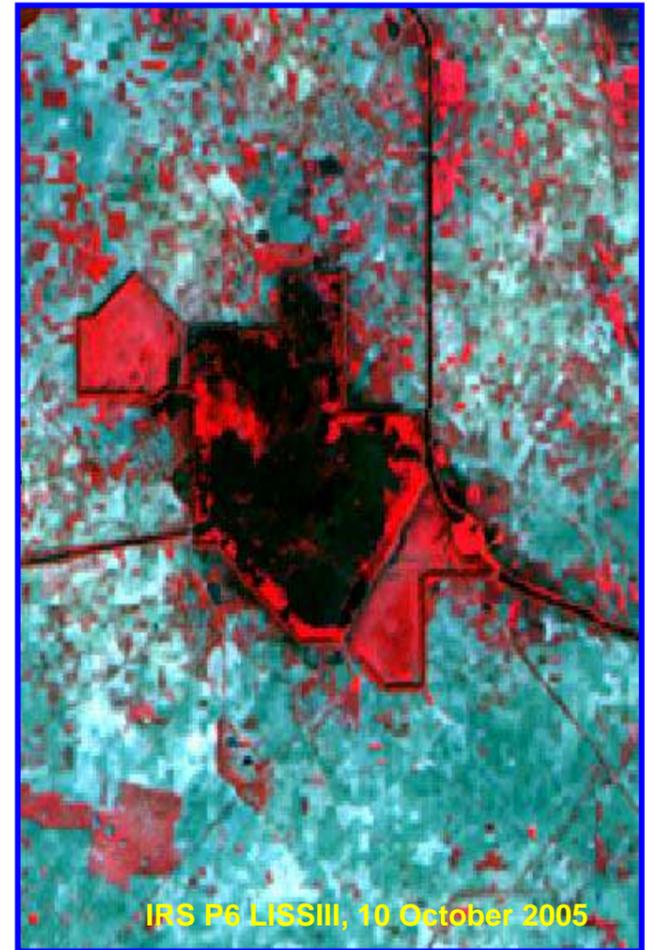


Plate 6: Bhindawas Bird Sanctuary

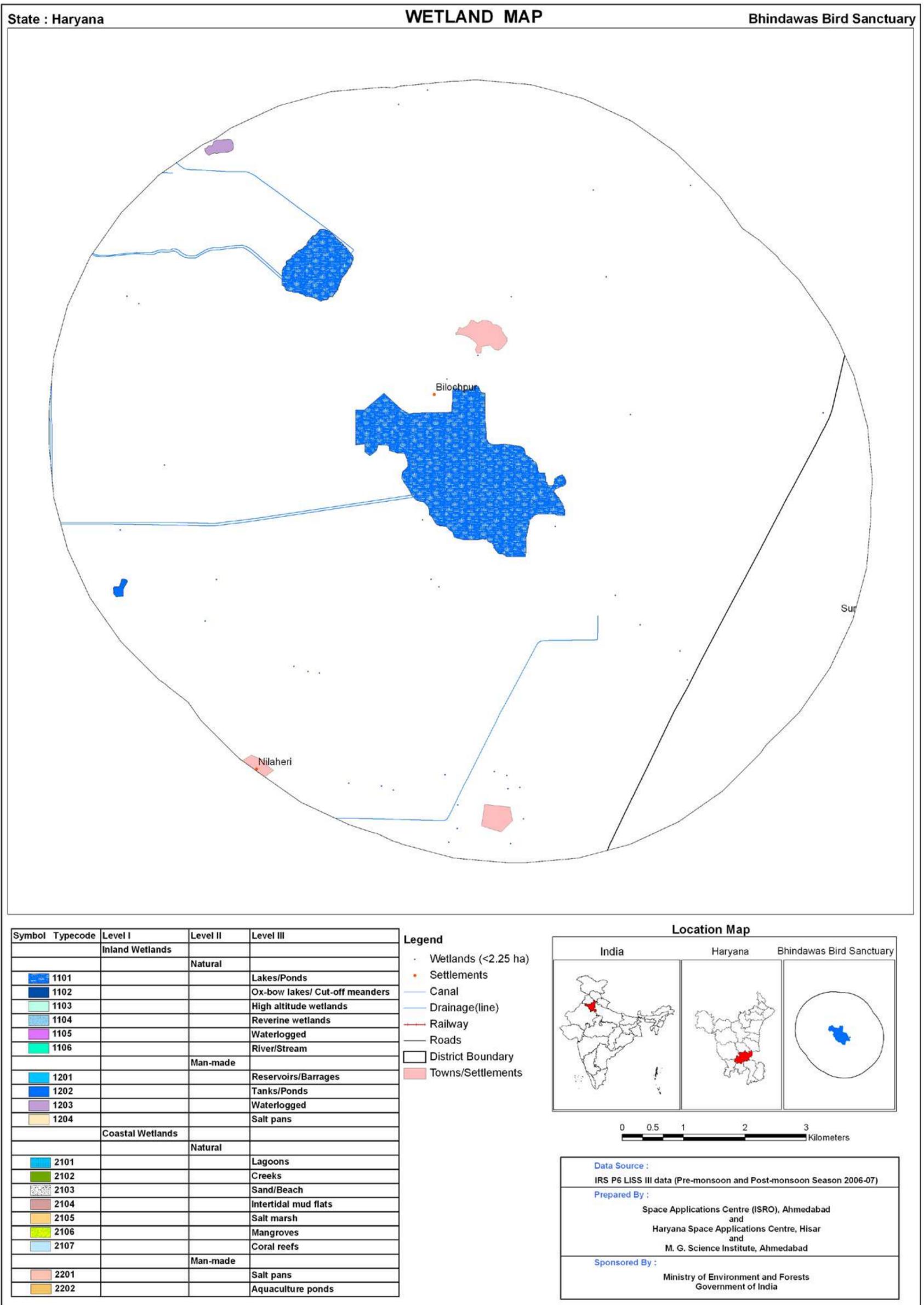
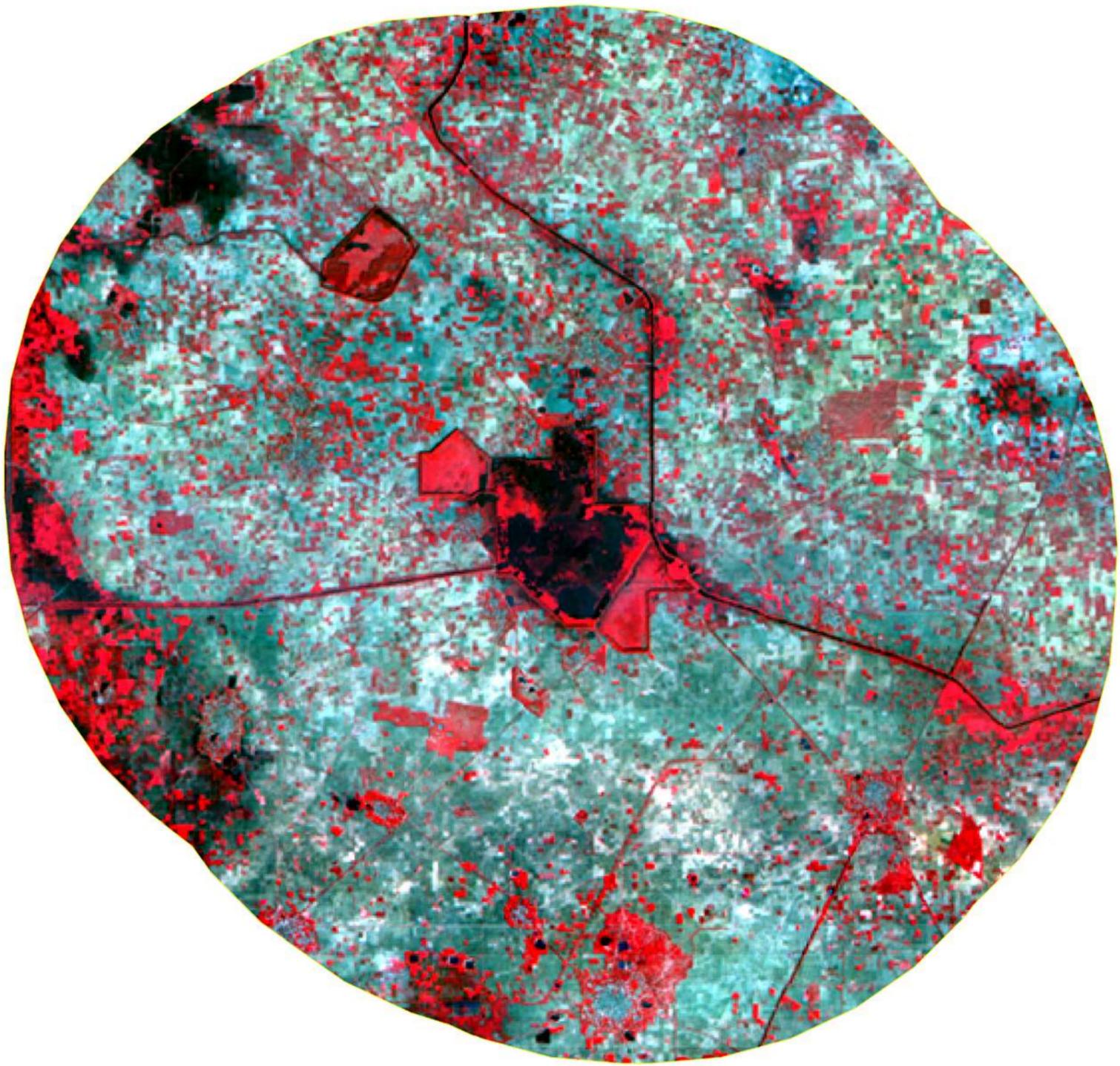


Plate 7: Wetland map - 5 km buffer area of Bhindawas Bird Sanctuary



IRS P6 LISS-III post monsoon data (2006)

Plate 8: IRS LISS-III FCC - 5 km buffer area of Bhindawas Bird Sanctuary

## 9.3 Damdama Lake

**Name: Damdama Lake**

**Location:**

Latitude : 28° 18 ' 50" N and 28° 17' 54"  
 Longitudes: 77° 07' 37" E and 77° 08' 09" E

**Area:** 43 ha

**Average Annual Rainfall:**

Average annual rainfall: 300 mm  
 Mean Temperature: 24 to 28° C.

**Morphometric features :**

Maximum length: 1.5 km  
 Maximum breadth: 0.5 km  
 Average depth: 38 cm

**Vegetation:**

Aquatic vegetation of this lake includes grasses, reeds, water hyacinth, Ipomea aquatica and acacia sps. .

**Fauna:**

White-throated Kingfisher, Great Egret, Eurasian Collared Dove, spoon bill, Crested Lark, Jungle Babbler, cormorant, Green bee eater etc are some of the more common birds found in and around the lake. Overall turbidity is moderate.

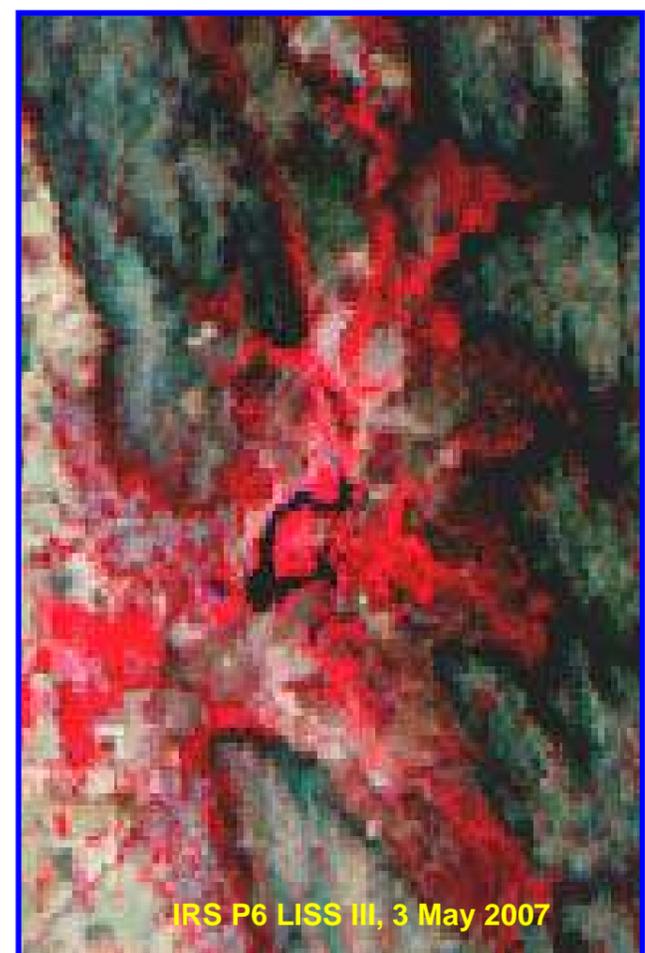
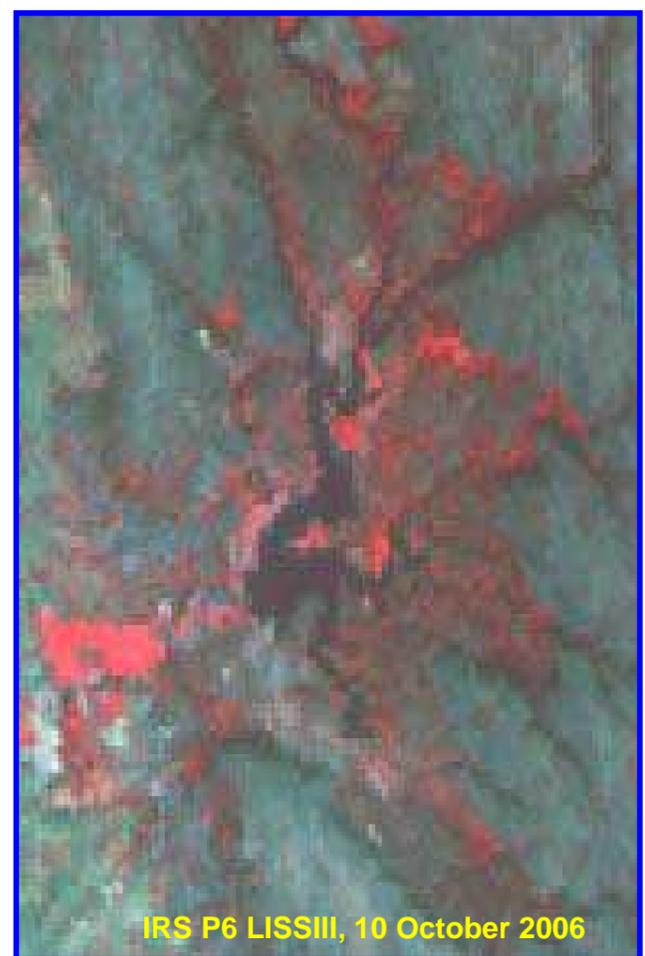


Plate 9: Damdama Lake

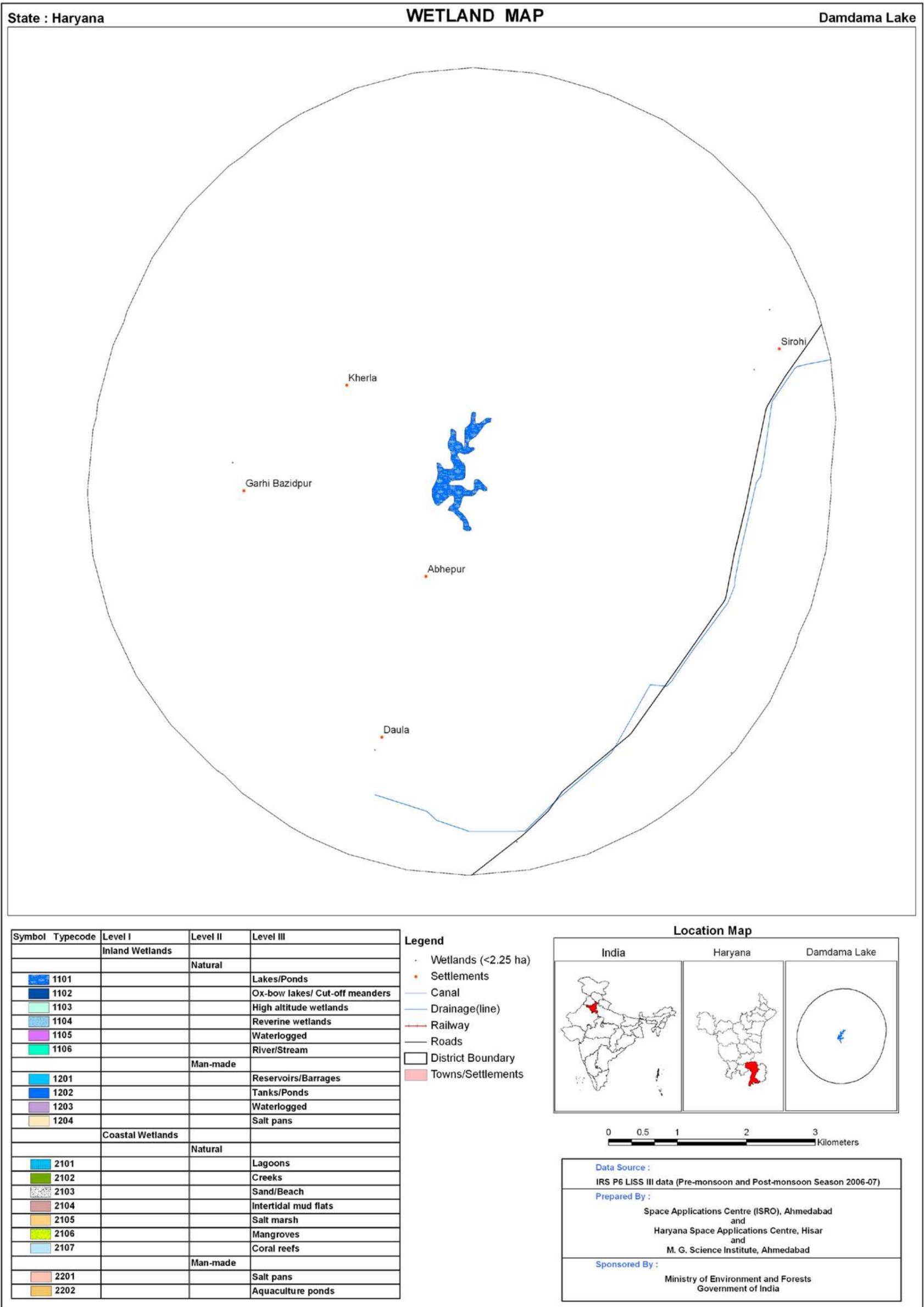
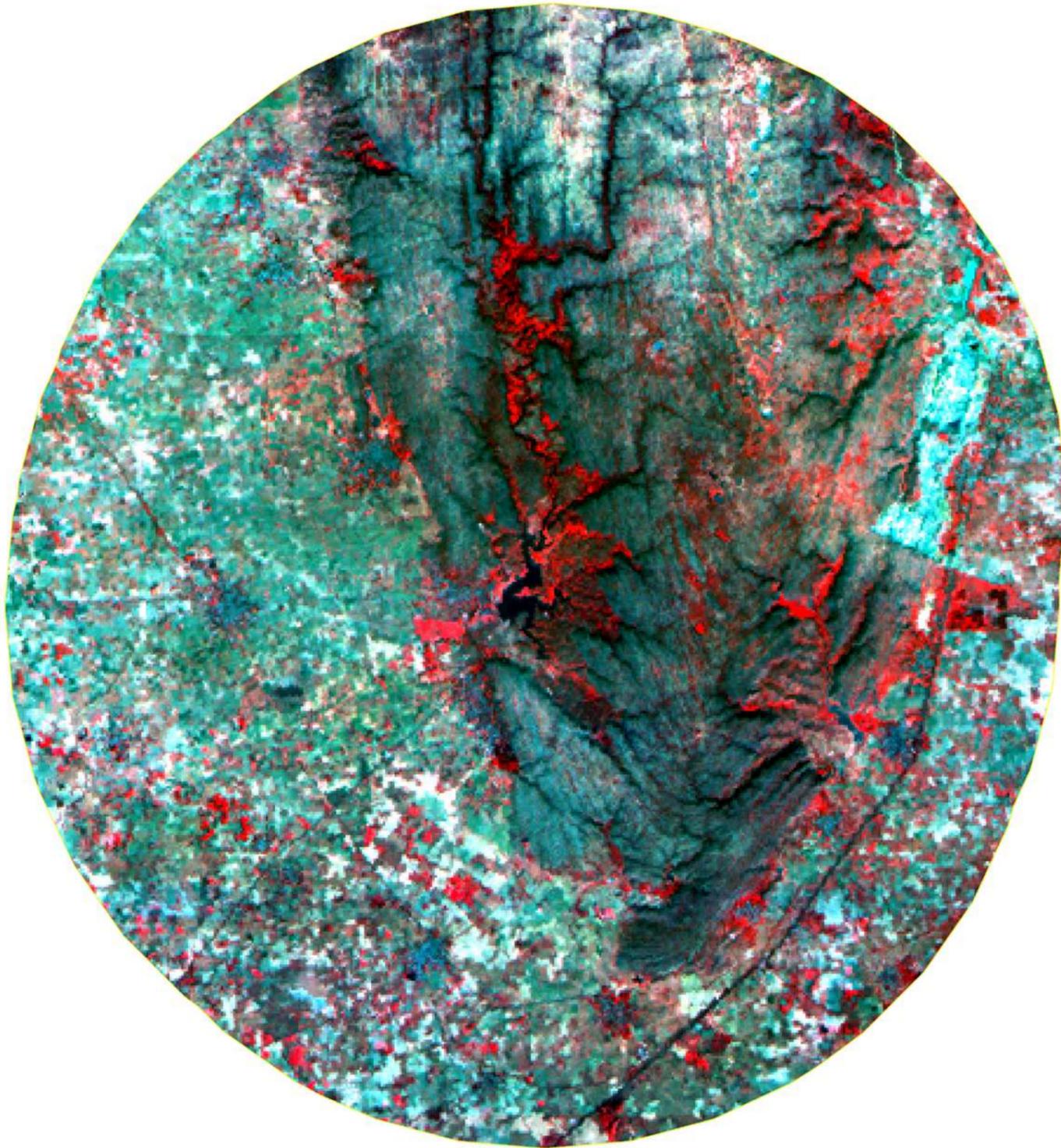


Plate 10: Wetland map - 5 km buffer area of Damdama Lake

State : Haryana

Damdama Lake



IRS P6 LISS-III post monsoon data (2006)

Plate 11: IRS LISS-III FCC - 5 km buffer area of Damdama Lake

## 9.4 Brahm Sarovar

**Name:** Brahm Sarovar

**Location:**

Latitude : 29° 57' 51" N and 29° 57' 32" N  
 Longitudes: 76° 49' 20" E and 76° 49' 59" E

**Area:** 44 ha

**Average Annual Rainfall:**

Average annual rainfall: 300 mm  
 Mean Temperature: 24 to 28° C.

**Morphometric features :**

Maximum depth 1 km  
 Average depth 475 cm

**Vegetation:**

There is no aquatic vegetation except phytoplankton.

**Fauna:**

It is a man made lake and managed by the authorities to encourage recreational and religious rites. Fauna mainly includes zooplankton and fishes. Overall turbidity is moderate.

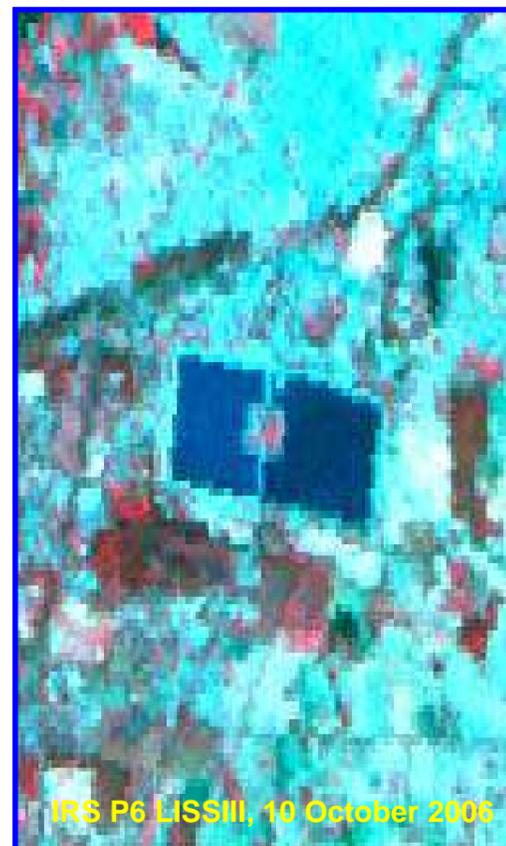


Plate 12: Brahm Sarovar

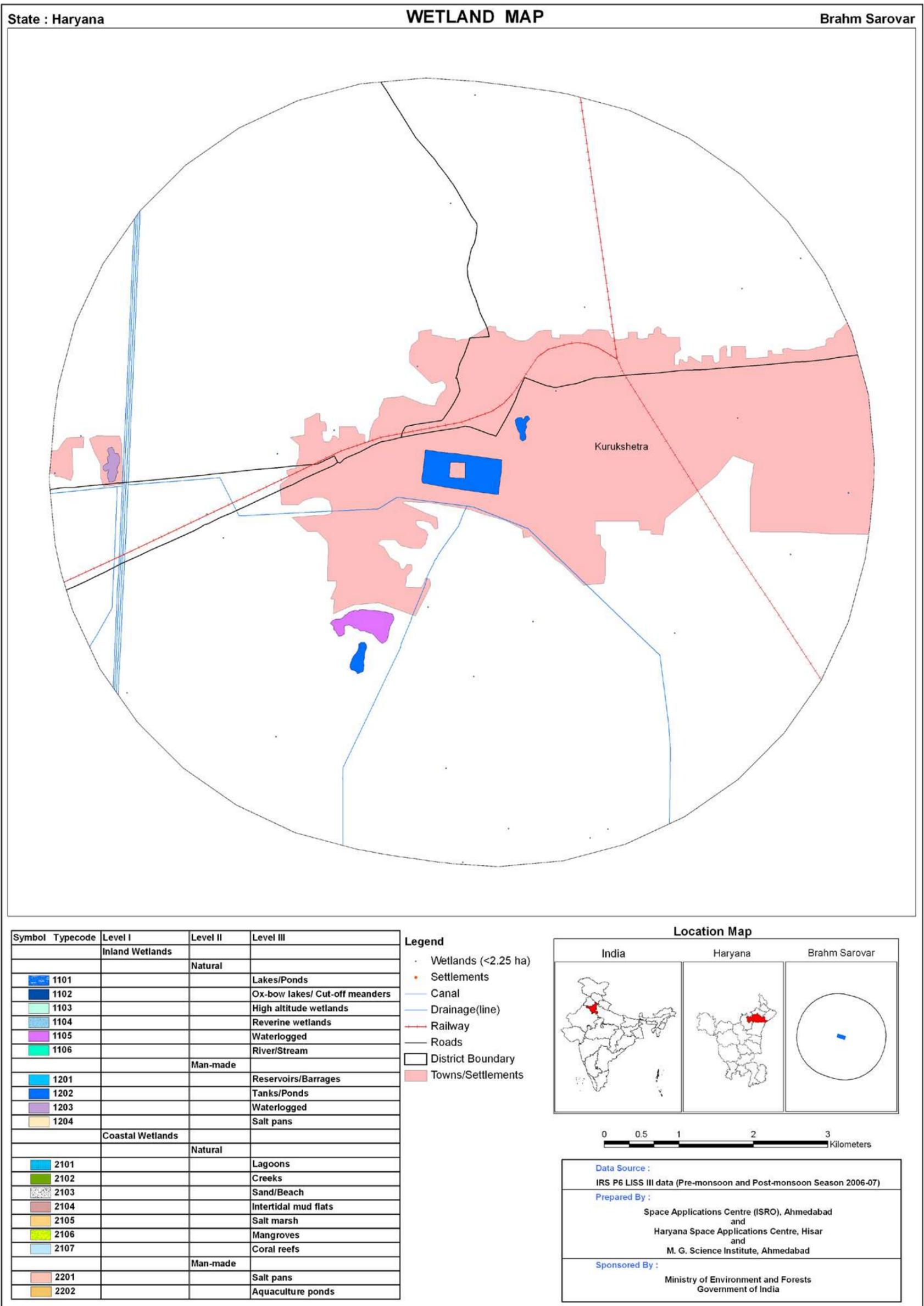
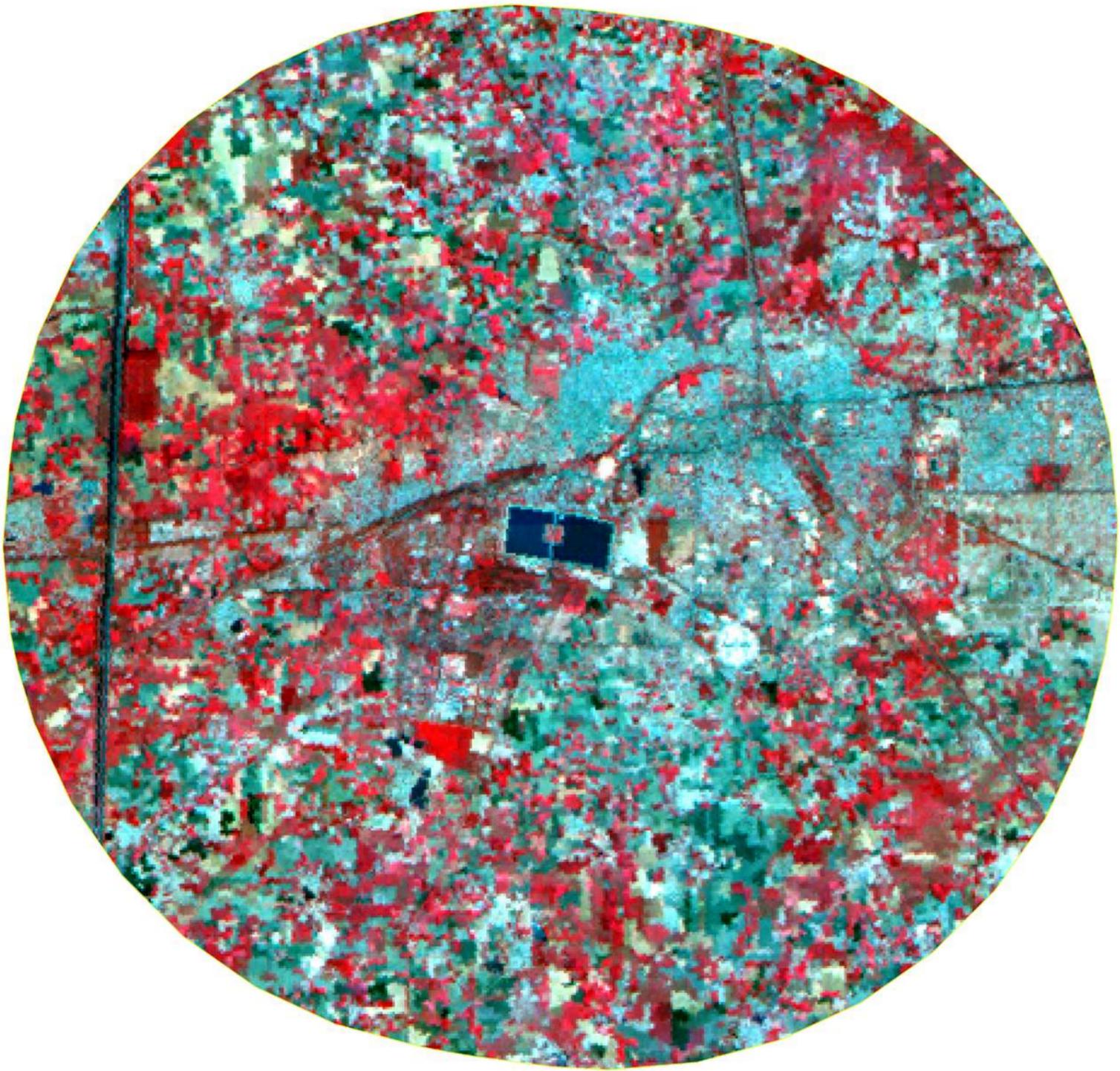


Plate 13: Wetland map - 5 km buffer area of Brahm Sarovar

State : Haryana

Brahm Sarovar



IRS P6 LISS-III post monsoon data (2006)

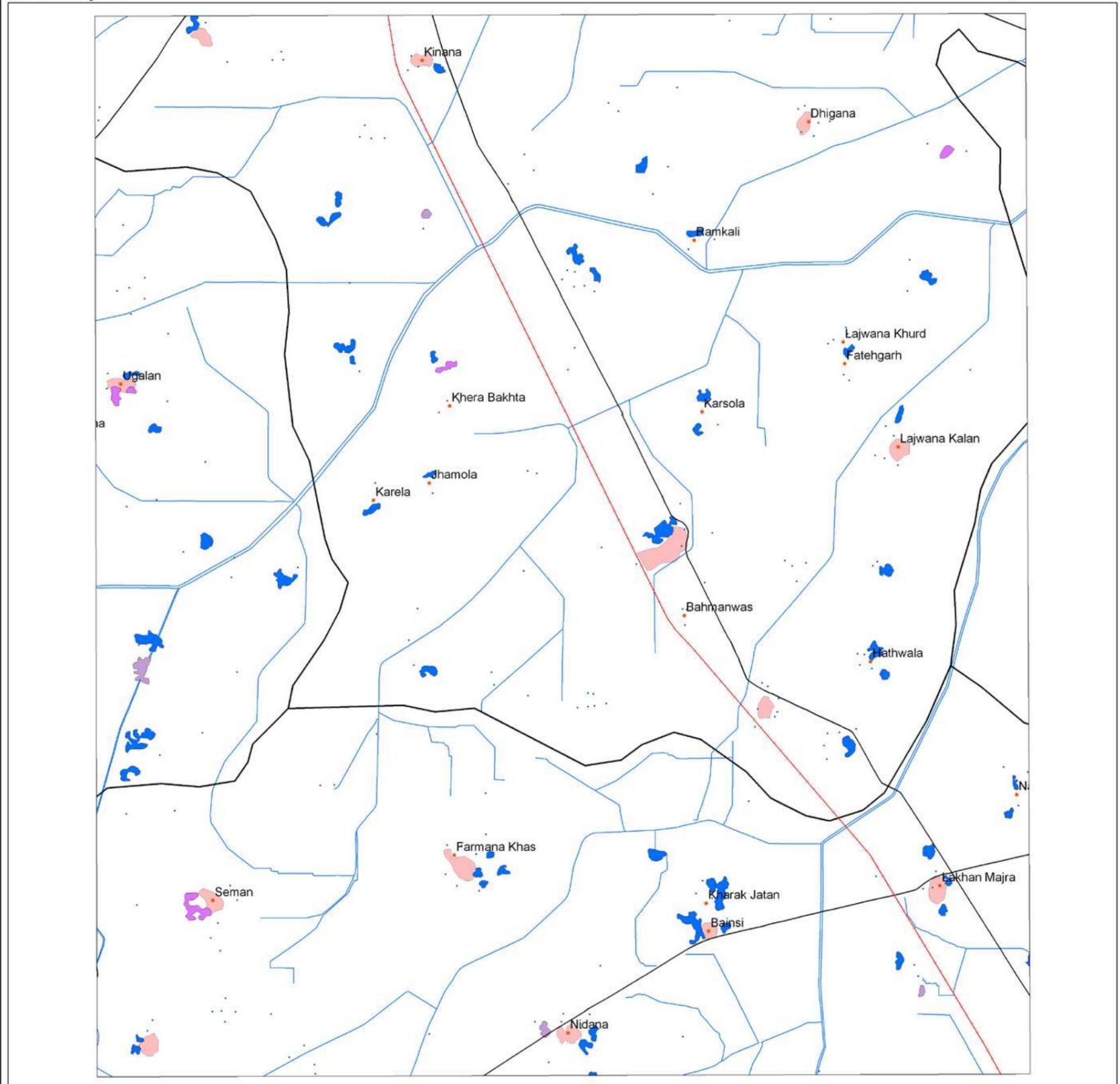
Plate 14: IRS LISS-III FCC - 5 km buffer area of Brahm Sarovar

**SOI MAP SHEET-WISE WETLAND MAPS  
(Selected)**

State : Haryana

WETLAND MAP

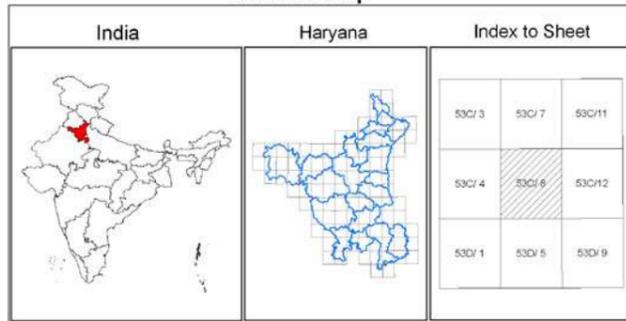
Map No. : 53C/08



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

Location Map

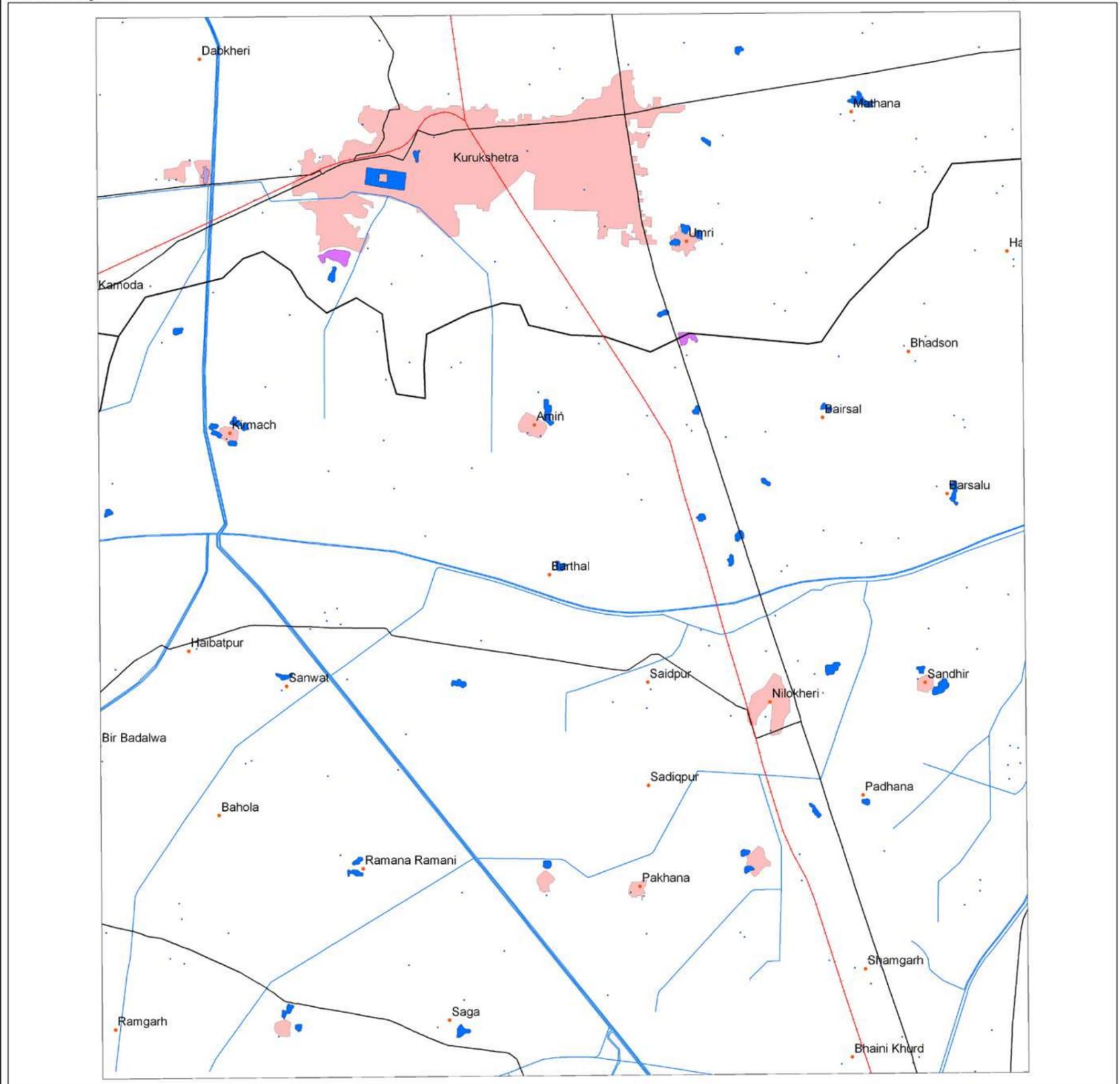


0 1 2 4 6 Kilometers

**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

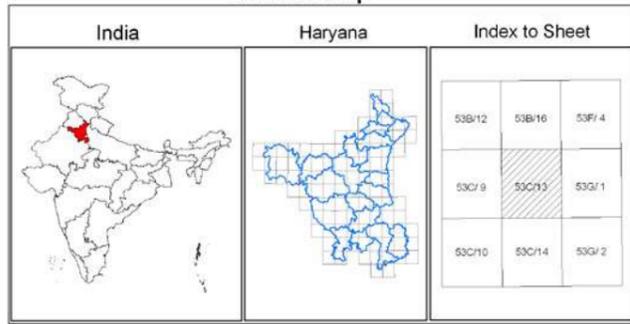
**Sponsored By :**  
Ministry of Environment and Forests  
Government of India



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

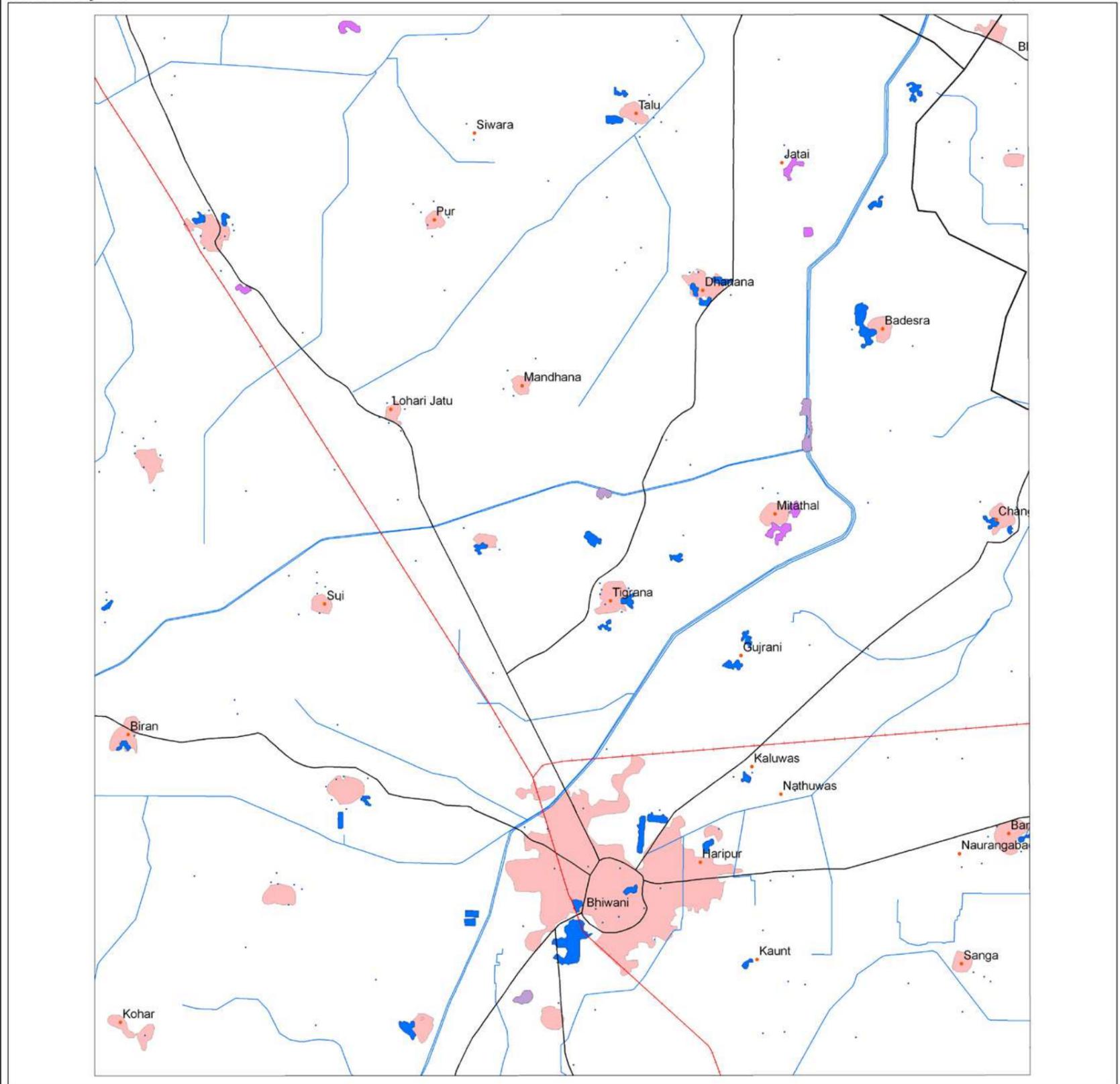
**Location Map**



**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

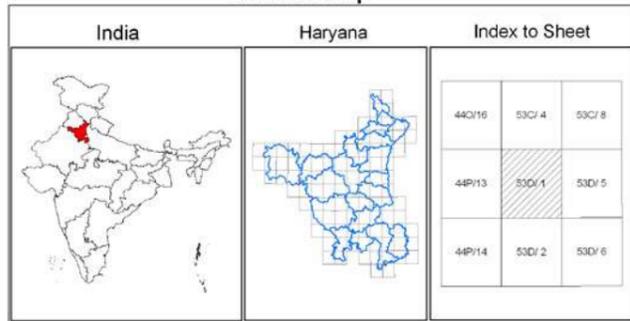
**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

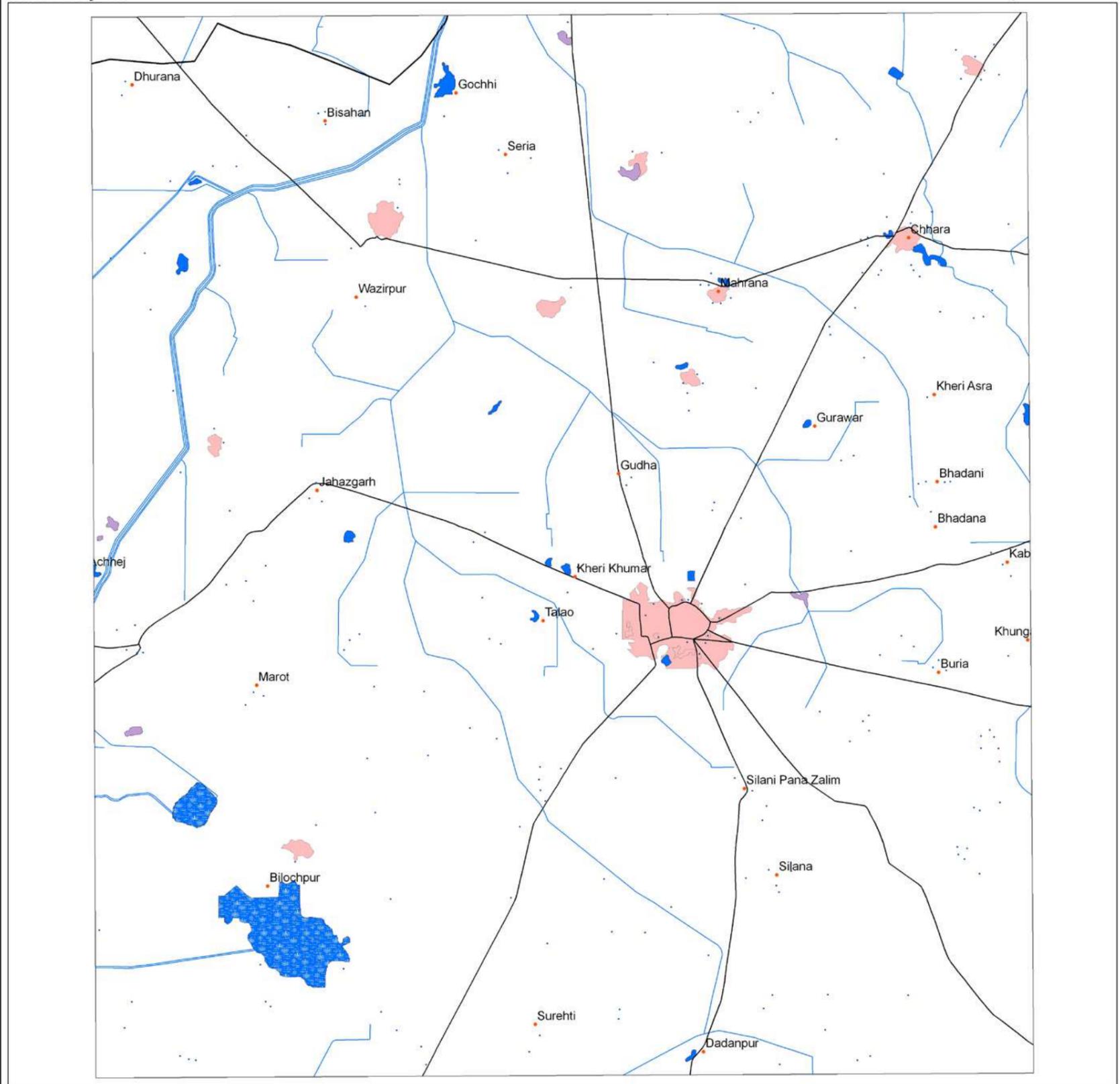
**Location Map**



**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

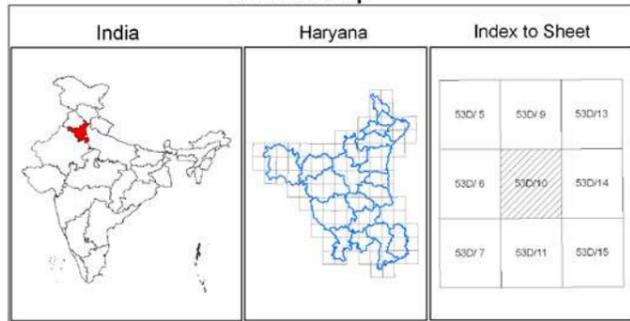
**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India



Symbol	Typecode	Level I	Level II	Level III
		Inland Wetlands		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		Coastal Wetlands		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

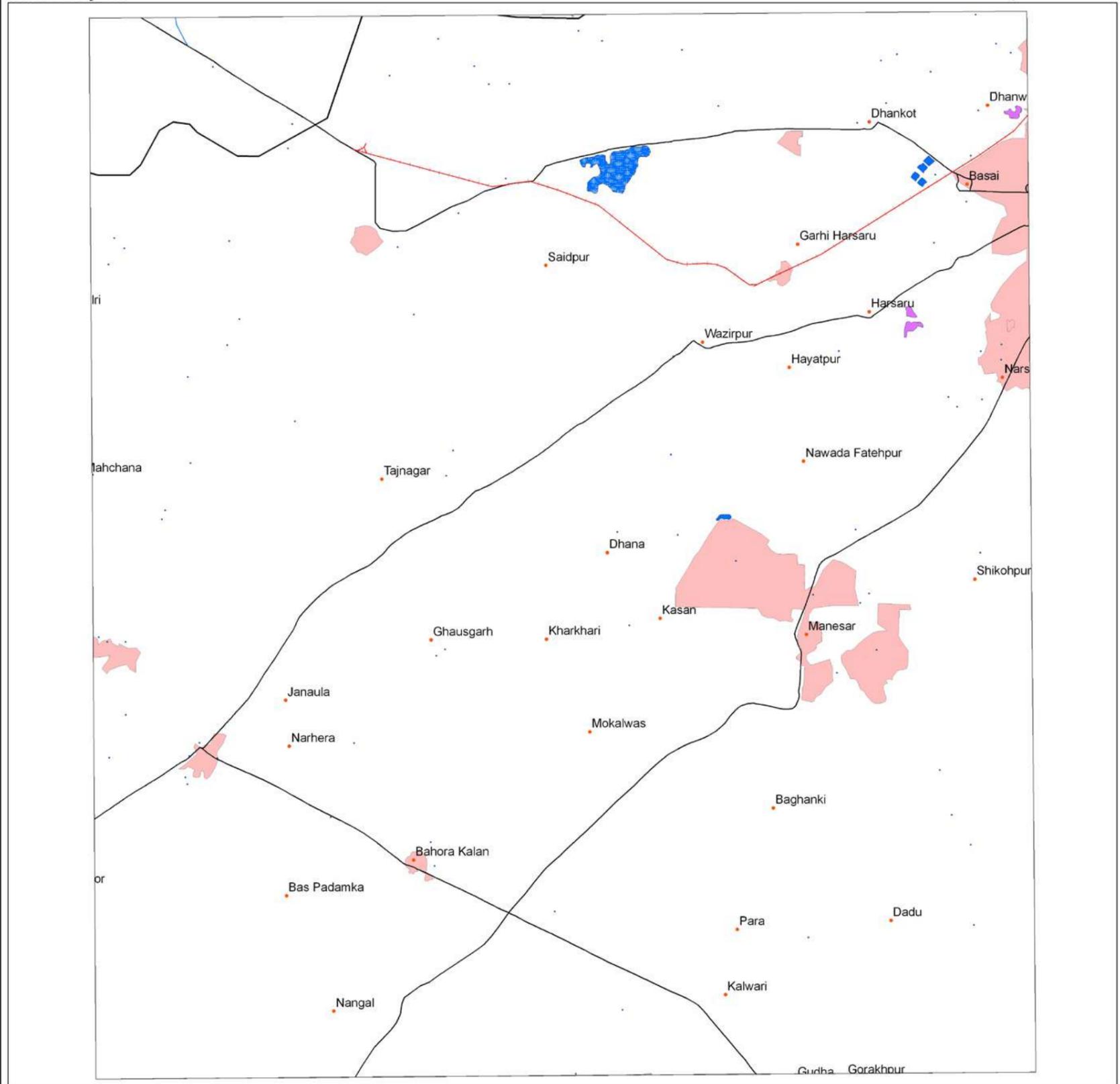
**Location Map**



**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

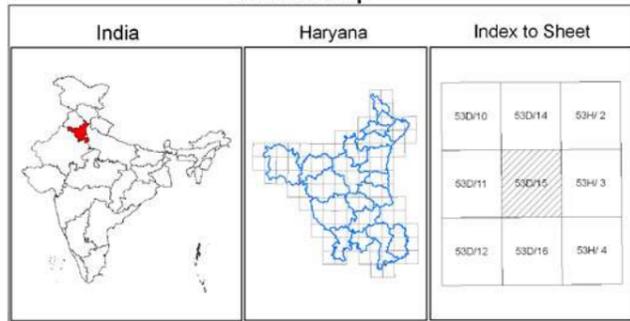
**Sponsored By :**  
Ministry of Environment and Forests  
Government of India



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

**Location Map**



**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

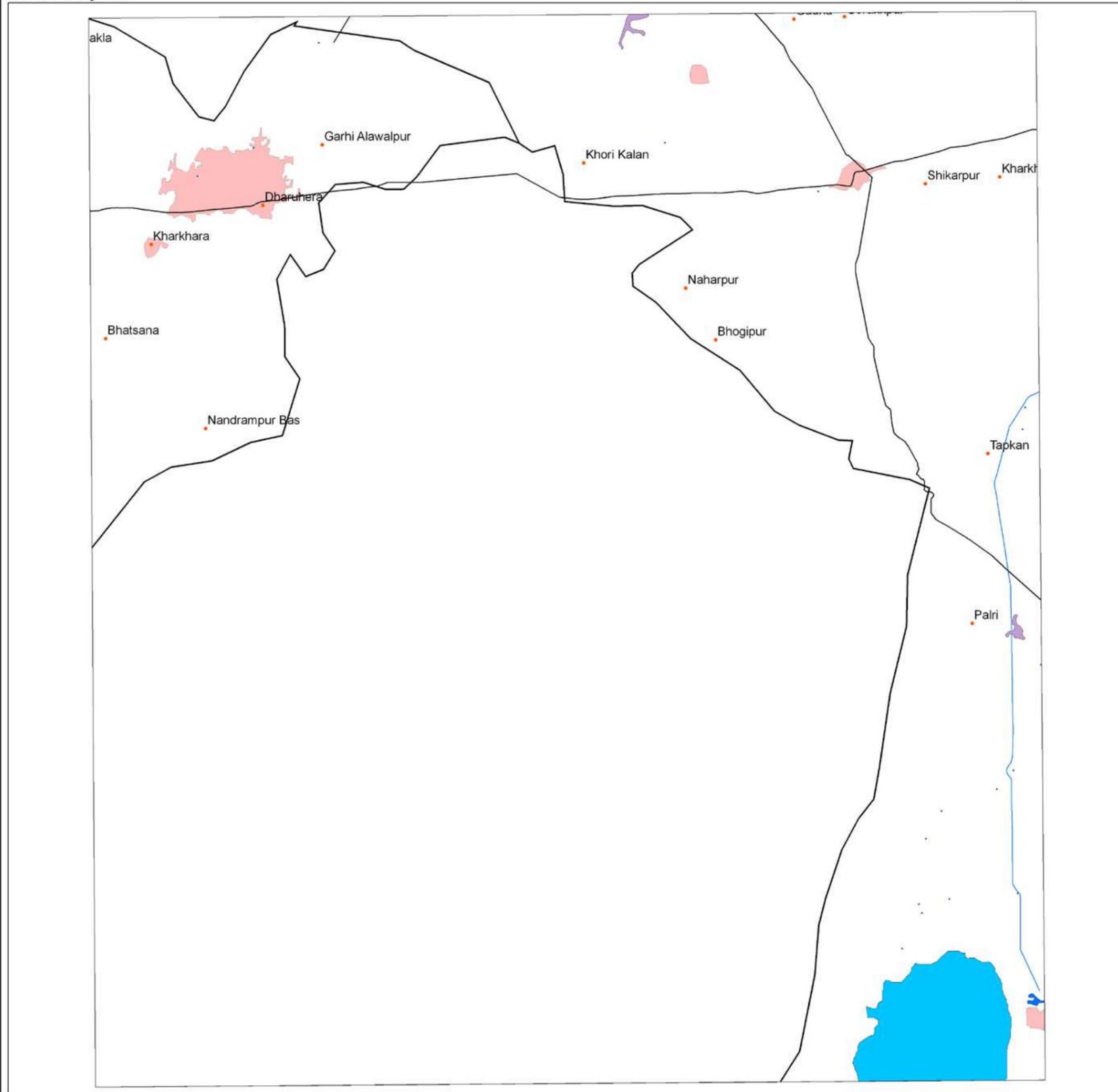
**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

**Sponsored By :**  
Ministry of Environment and Forests  
Government of India

State : Haryana

**WETLAND MAP**

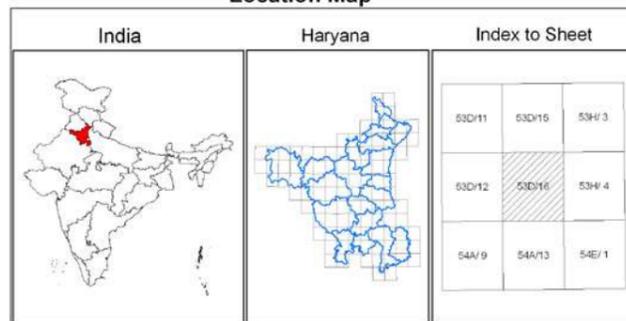
Map No. : 53D/16



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
				Lakes/Ponds
				Ox-bow lakes/ Cut-off meanders
				High altitude wetlands
				Reverine wetlands
				Waterlogged
				River/Stream
			Man-made	
				Reservoirs/Barrages
				Tanks/Ponds
				Waterlogged
				Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
				Lagoons
				Creeks
				Sand/Beach
				Intertidal mud flats
				Salt marsh
				Mangroves
				Coral reefs
			Man-made	
				Salt pans
				Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

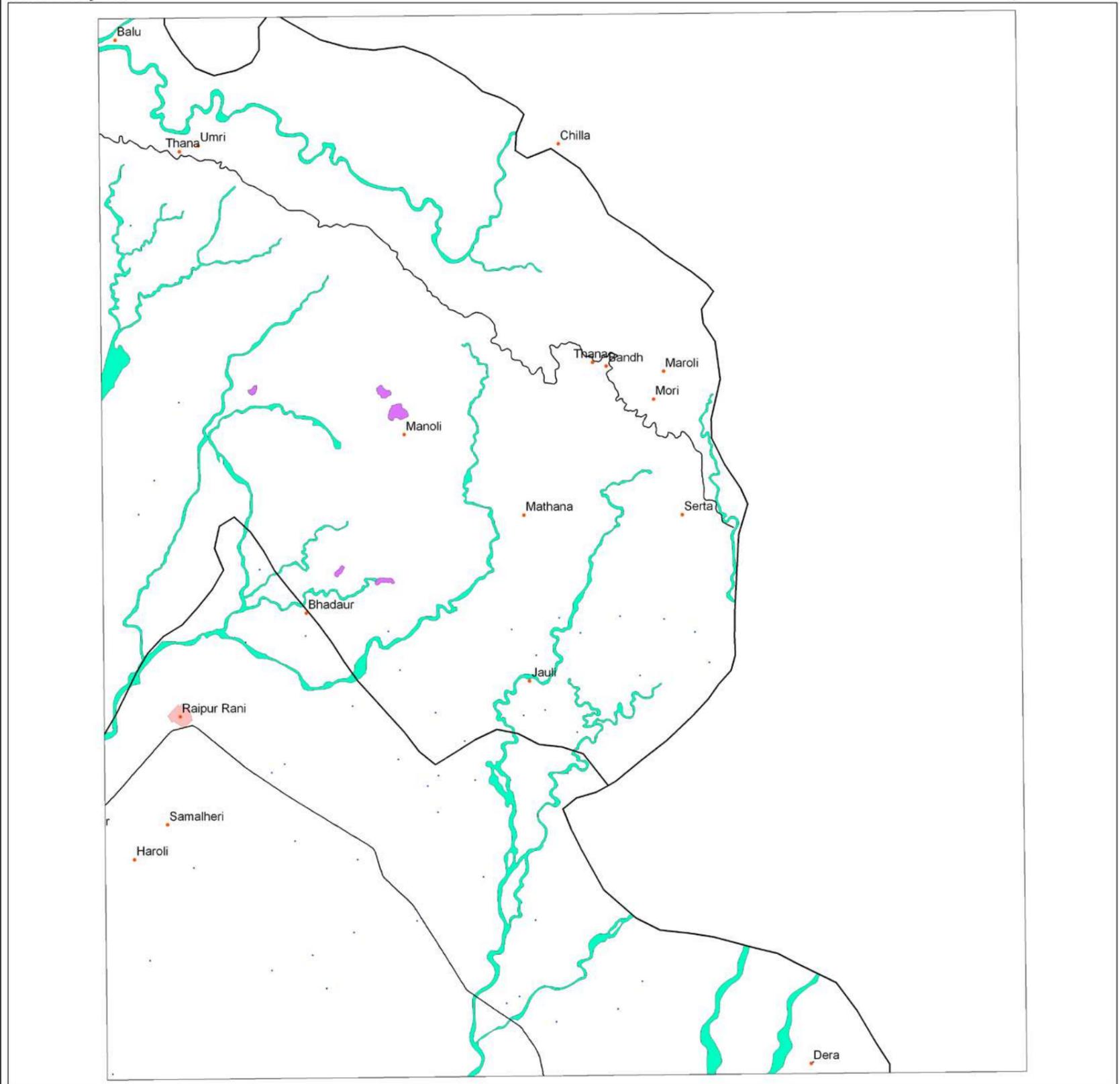
**Location Map**



**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

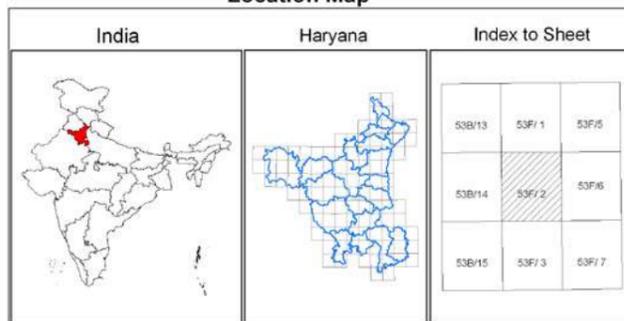
**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

**Location Map**



**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

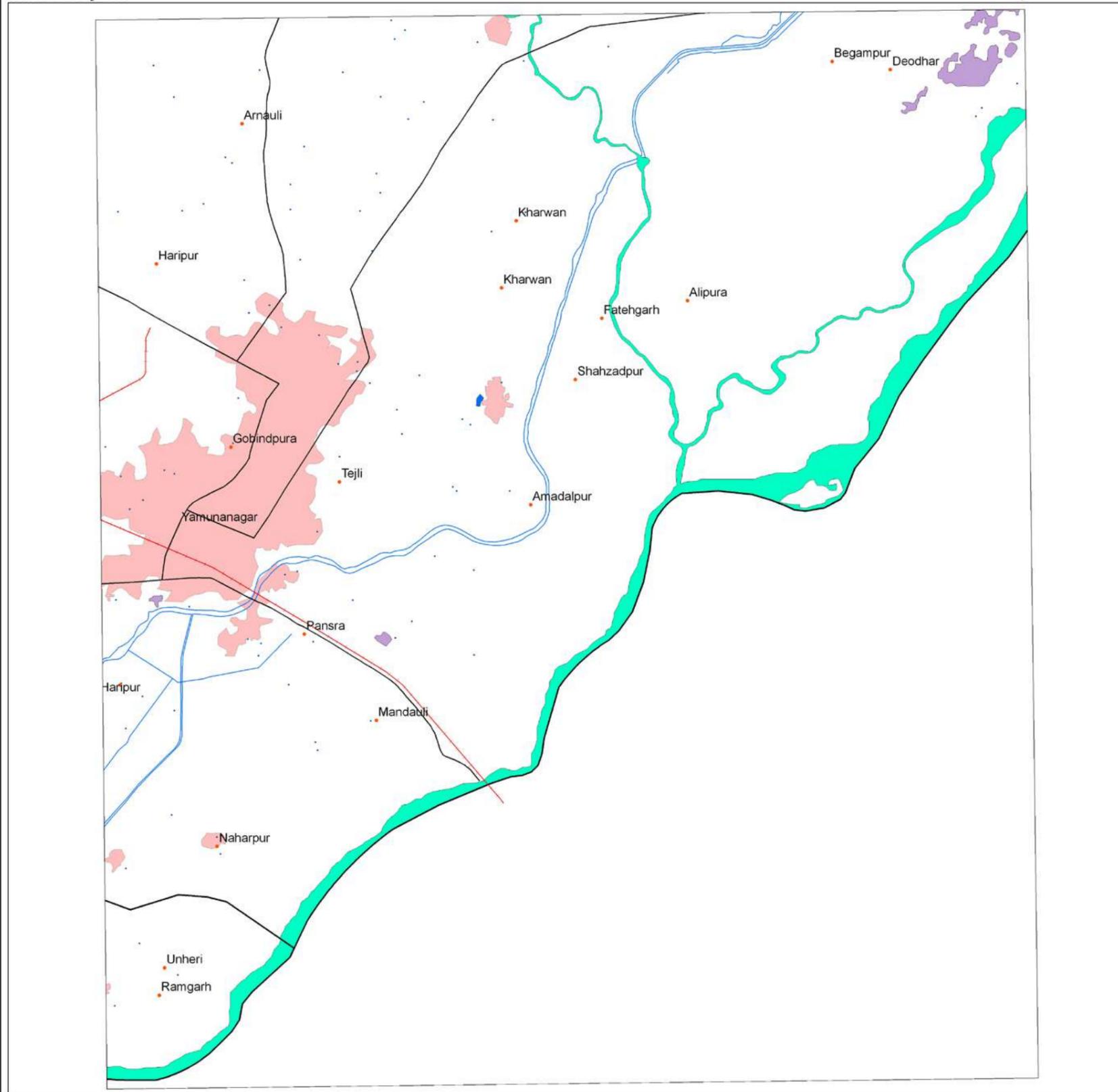
**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

**WETLAND MAP**

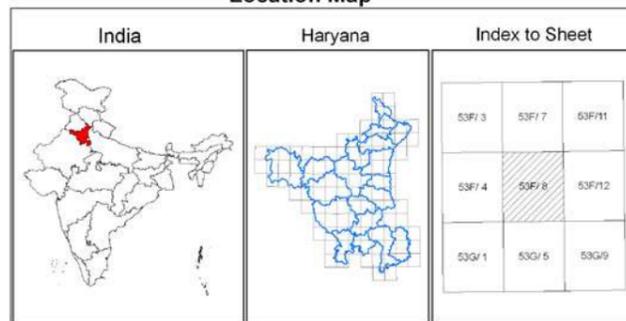
Map No. : 53F/08



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

**Location Map**



**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

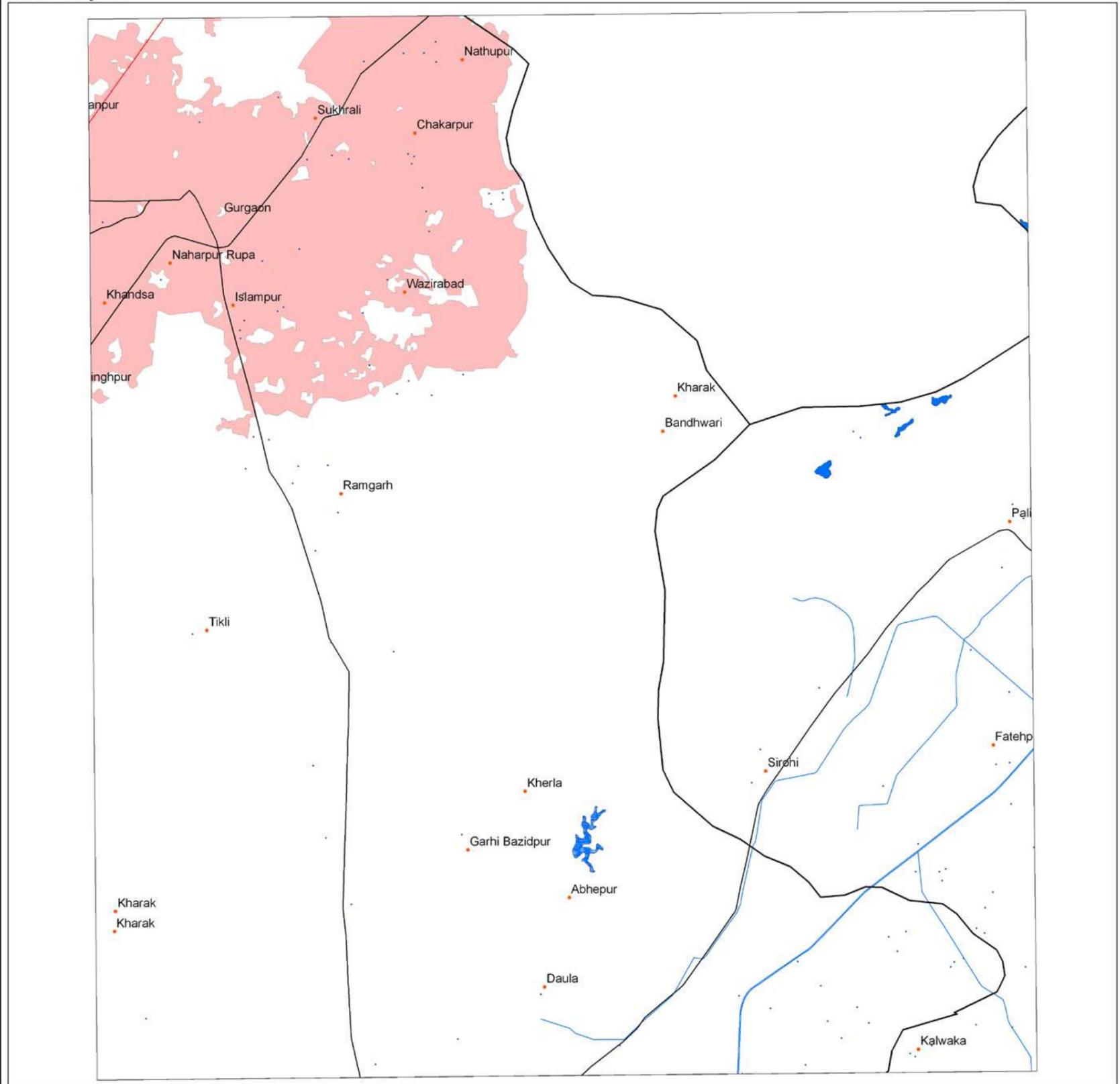
**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

**Sponsored By :**  
Ministry of Environment and Forests  
Government of India

State : Haryana

WETLAND MAP

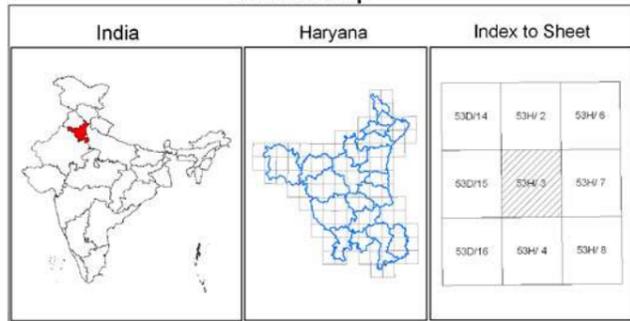
Map No. : 53H/03



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

Location Map



**Data Source :**  
 IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

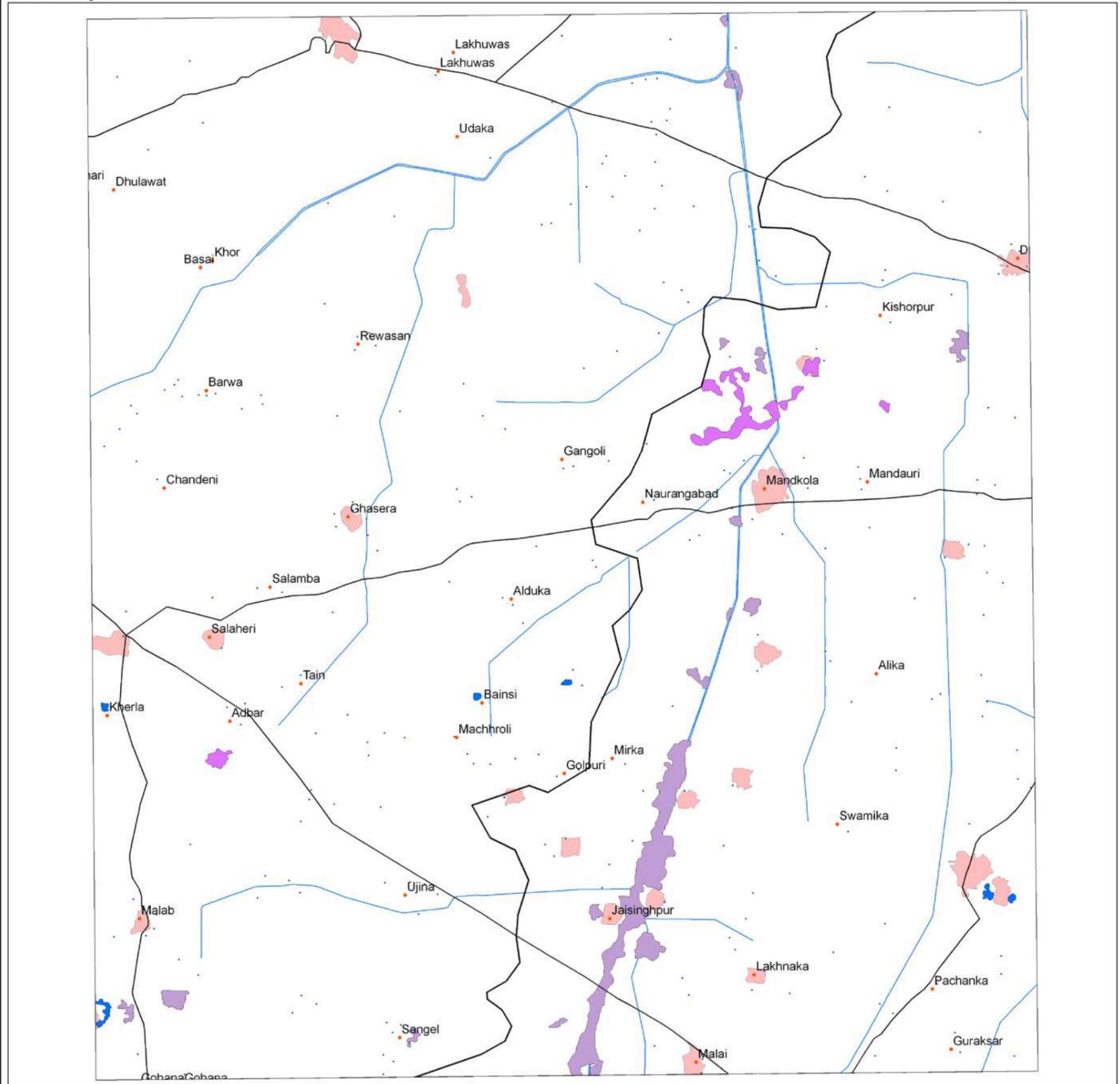
**Prepared By :**  
 Space Applications Centre (ISRO), Ahmedabad  
 and  
 Haryana Space Applications Centre, Hisar  
 and  
 M. G. Science Institute, Ahmedabad

**Sponsored By :**  
 Ministry of Environment and Forests  
 Government of India

State : Haryana

**WETLAND MAP**

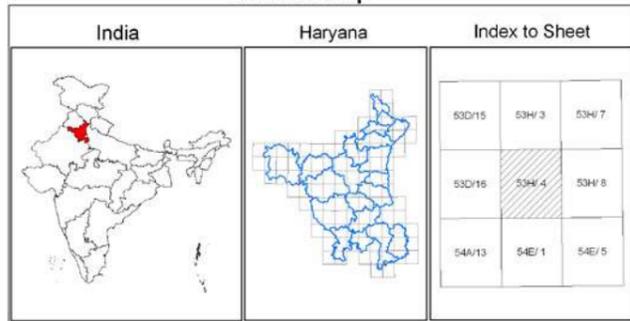
Map No. : 53H/04



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

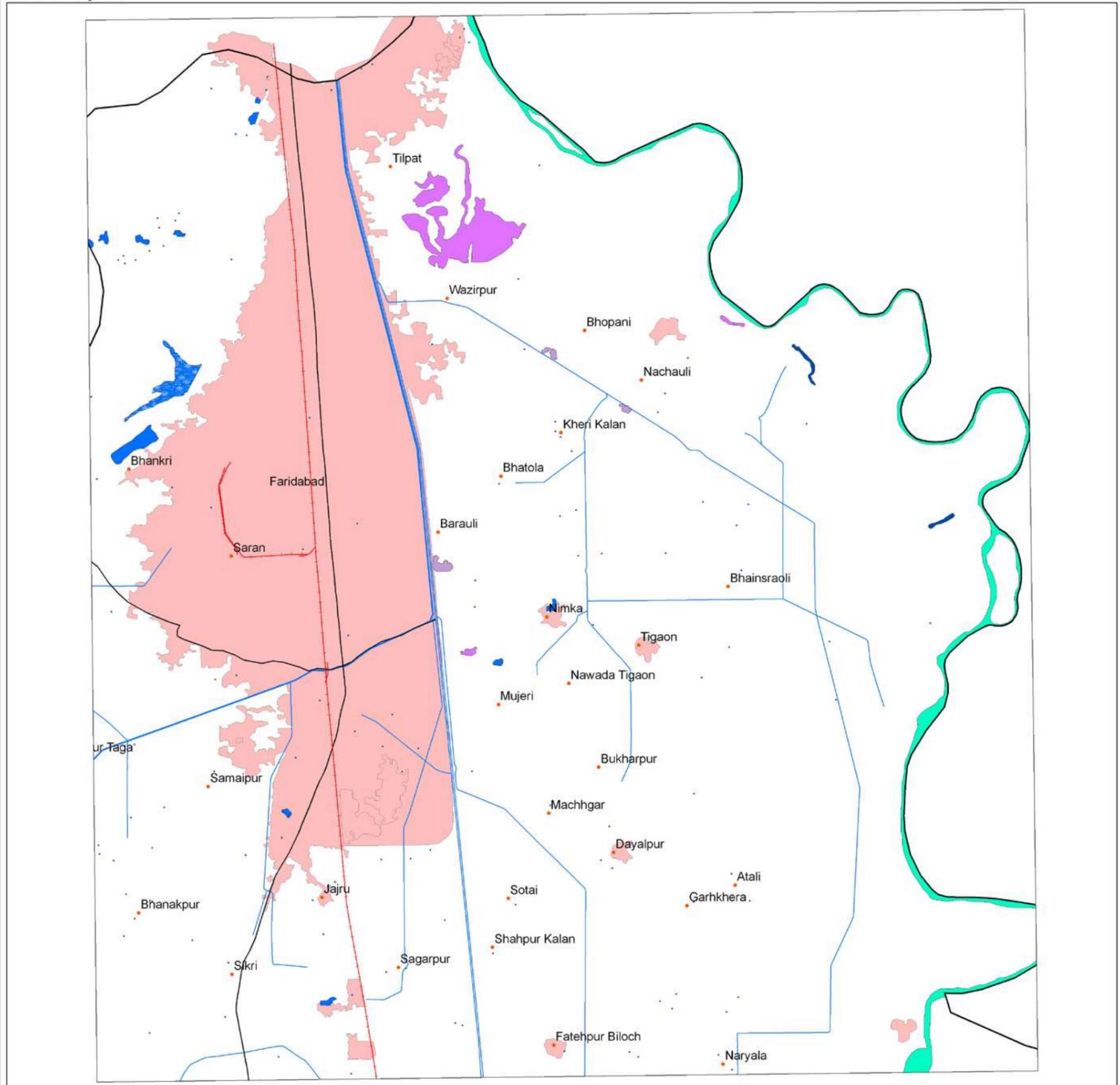
**Location Map**



**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

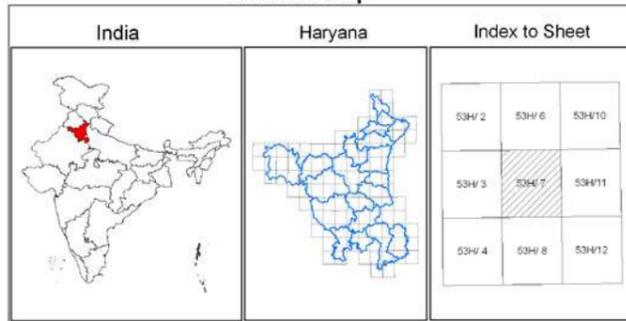
**Sponsored By :**  
Ministry of Environment and Forests  
Government of India



Symbol	Typecode	Level I	Level II	Level III
		<b>Inland Wetlands</b>		
			Natural	
	1101			Lakes/Ponds
	1102			Ox-bow lakes/ Cut-off meanders
	1103			High altitude wetlands
	1104			Reverine wetlands
	1105			Waterlogged
	1106			River/Stream
			Man-made	
	1201			Reservoirs/Barrages
	1202			Tanks/Ponds
	1203			Waterlogged
	1204			Salt pans
		<b>Coastal Wetlands</b>		
			Natural	
	2101			Lagoons
	2102			Creeks
	2103			Sand/Beach
	2104			Intertidal mud flats
	2105			Salt marsh
	2106			Mangroves
	2107			Coral reefs
			Man-made	
	2201			Salt pans
	2202			Aquaculture ponds

- Legend**
- Wetlands (<2.25 ha)
  - Settlements
  - Canal
  - Drainage(line)
  - Railway
  - Roads
  - District Boundary
  - Towns/Settlements

**Location Map**



**Data Source :**  
IRS P6 LISS III data (Pre-monsoon and Post-monsoon Season 2006-07)

**Prepared By :**  
Space Applications Centre (ISRO), Ahmedabad  
and  
Haryana Space Applications Centre, Hisar  
and  
M. G. Science Institute, Ahmedabad

**Sponsored By :**  
Ministry of Environment and Forests  
Government of India

## REFERENCES

1. Anon. 2005, NNRMS Standards. A National Standards for EO images, thematic & cartographic maps, GIS databases and spatial outputs. ISRO:NNRMS: TR:112:2005. A Committee Report: National Natural Resources Management System, Bangalore
2. Anon. 1993. Directory of Indian Wetlands, 1993. WWF India, New Delhi and AWB Kuala Lumpur, xvi+264pp., 32 maps.
3. Clark, John R. (1977). *Coastal Ecosystem Management*, A Wiley Interscience Publication, John Wiley & Sons, New York,.
4. Cowardin, L.M., Carter, V., Golet, E.C. and La Roe (1979). *Classification of wetlands and deep water habitats*. USFWS/085-79/31, Office of the Biological Services, U.S. Fish and Wildlife Service, Washington, D.C.
5. *Encyclopaedic Directory of Environment (1988)*. (Ed. By G.R. Chatwal, D.K. Pandey, and K.K. Nanda). Vol. I-IV, Anmol Publications, New Delhi.
6. Garg, J.K., Singh, T.S. and Murthy, T.V.R. (1998). *Wetlands of India*. Project Report: RSAM/sac/resa/pr/01/98, June 1998, 240 p. Space Applications Centre, Ahmedabad,
7. Garg J.K. and Patel J. G., 2007. National Wetland Inventory and Assessment, Technical Guidelines and Procedure Manual, Technical Report, SAC/EOAM/AFEG/NWIA/TR/01/2007, June 2007, Space Applications Centre, Ahmedabad,
8. *Glossary of Geology (1974)*. (Ed. By Margarate G., Robbert, M. Jr. and Wolf, C.L), American Geological Institute, Washington, D.C..
9. Jensen, J.R. (1986). *Introductory Digital Image Processing: A Remote Sensing Perspective*, Prentice Hall, Englewoods Cliff, NJ.
10. Lacaux, J.P., Tourre, Y.M., Vignolles, C., Ndione, J.A. and Lafaye, M. 2007. Classification of ponds from high-spatial resolution remote sensing: Application to Rift valley fever epidemics in Senegal. *Remote Sensing of Environment*, 106, pp. 66-74
11. Lillesand, T.M. and Keifer, R.W. 1987. *Remote Sensing and Image Interpretation*. John Wiley and Sons, New York.
12. *Manorama Yearbook 2007*
13. *McGraw - Hill Encyclopaedia of Environmental Science (1974)*. (Ed. Sybil P. Parkar), McGraw-Hill Book Company, New York.
14. McFeeters, S.K. 1996. The use of Normalised Difference Water Index (NDWI) in the delineation of open water features. *International Journal of remote Sensing*, 7, pp. 1425-1432.
15. Millennium Ecosystem Assessment. 2005, *Ecosystems and Human Well-being: A Framework for Assessment*, <http://www.MAweb.org>
16. Mitsch, William J. and Gosselink, James G. (1986). *Wetlands*, Van Nostrand Reinhold Company, New York.
17. Navalgund, R.R., Nayak, S.R., Sudarshana, R., Nagaraja, R. and Ravindran, S. 2002. Proceedings of the ISPRS Commission VII. Symposium on Resource and Environmental Monitoring, IAPRS & SIS, Vol.35, Part-7, NRSA, Hyderabad.
18. Patel J.G., Singh T.S., Garg J.K. et al, Wetland Information System, West Bengal, SAC/RSAM/RESA/FLPG/WIS/01/2003, A Technical report: Space Applications Centre, Ahmedabad
19. Ramsar Convention (2007). [www.ramsar.org](http://www.ramsar.org)
20. Reid, George K and Wood, Richard D. (1976). *Ecology of Inland Waters and Estuaries*. D. Van Nostrand Company, New York.
21. SACON, 2004, *Inland Wetlands of India : Conservation Atlas*. Coimbatore, Salim Ali Centre for Ornithology and Natural History, 2004, ISBN 81-902136-1-X. ,Vedams eBooks (P) Ltd. Vardhaman Charve Plaza IV, Building # 9, K.P Block, Pitampura,
22. Singh T.S., Patel J.G., Garg J.K. et al. Loktak Lake Resources Information System (LRIS), SAC/RSAM/RESIPA/FLPG/WIS/02/2003, A Technical report: Space Applications Centre, Ahmedabad
23. Townshend, J.R., and Justice, C.O. 1986. Analysis of dynamics of African vegetation using the Normalised difference Vegetation Index. *International Journal of Remote Sensing*, 7, pp. 1435-1445.
24. Tucker, C.J. and Sellers, P.J. 1986. Satellite remote sensing of primary productivity. *International Journal of Remote Sensing*, 7, pp. 1395-1416.
25. Xu Hanqiu, 2006. Modification of normalised difference water index (NDWI) to enhance open water features in remotely sensed imagery. *International Journal of Remote Sensing*, 7, pp. 3025-3033.

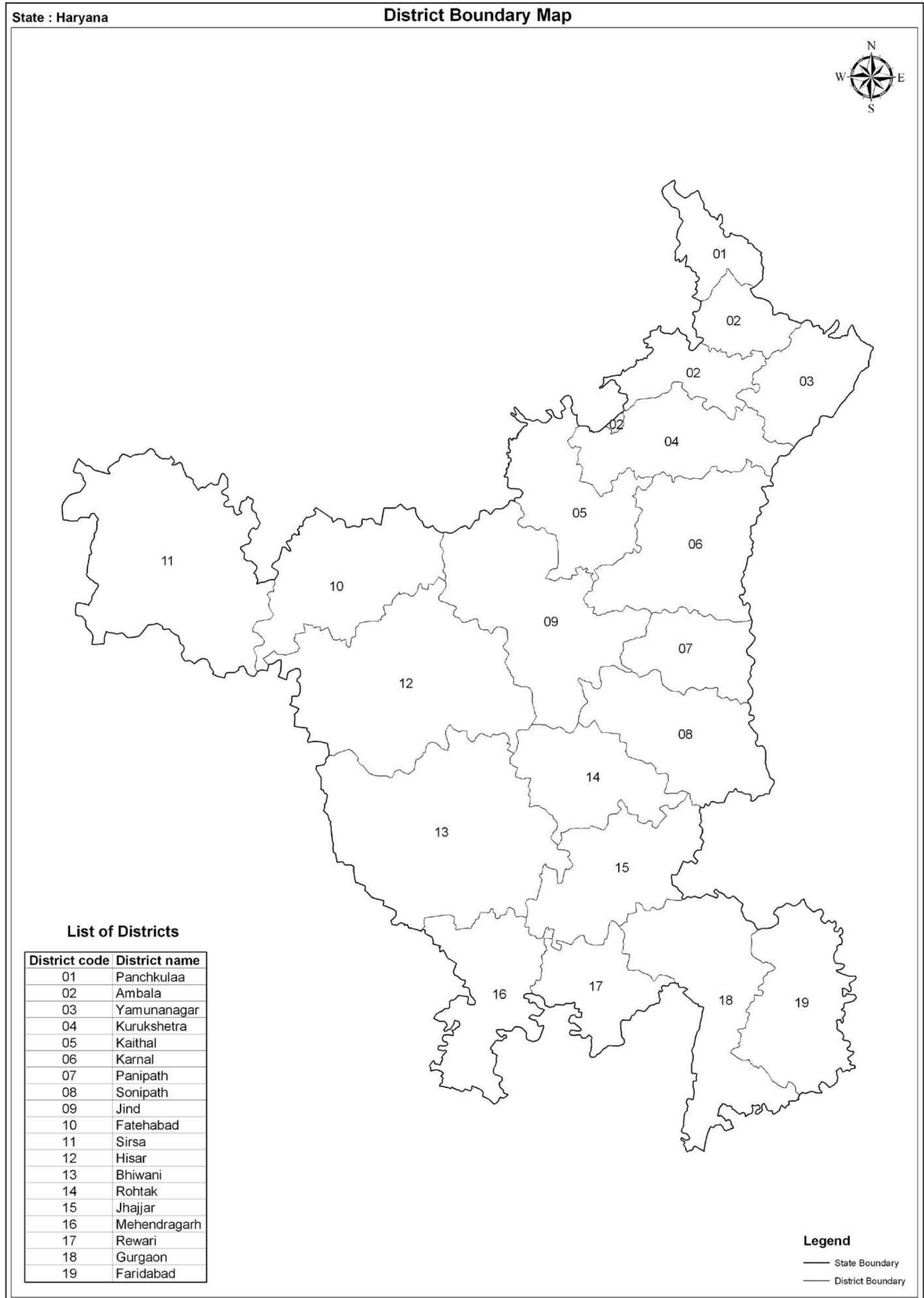
**Annexure I**  
**Definitions of wetland categories used in the project**

For ease of understanding, definitions of wetland categories and their typical appearance on satellite imagery is given below:

Wetland type code	Definition and description
1000	<b>Inland Wetlands</b>
1100	<b>Natural</b>
1101	<b>Lakes:</b> Larger bodies of standing water occupying distinct basins (Reid <i>et al</i> , 1976). These wetlands occur in natural depressions and normally fed by streams/rivers. On satellite images lakes appear in different hues of blue interspersed with pink (aquatic vegetation), islands (white if unvegetated, red in case of terrestrial vegetation). Vegetation if scattered make texture rough.
1102	<b>Ox-bow lakes/ Cut off meanders:</b> A meandering stream may erode the outside shores of its broad bends, and in time the loops may become cut-off, leaving basins. The resulting shallow crescent-shaped lakes are called oxbow lakes (Reid <i>et al</i> , 1976). On the satellite image Ox-bow lakes occur near the rivers in plain areas. Some part of the lake normally has aquatic vegetation (red/pink in colour) during pre-monsoon season.
1103	<b>High Altitude lakes:</b> These lakes occur in the Himalayan region. Landscapes around high lakes are characterized by hilly topography. Otherwise they resemble lakes in the plain areas. For keeping uniformity in the delineation of these lakes contour line of 3000 m above msl will be taken as reference and all lakes above this contour line will be classified as high altitude lakes.
1104	<b>Riverine Wetlands:</b> Along the major rivers, especially in plains water accumulates leading to formation of marshes and swamp. <b>Swamps</b> are 'Wetland dominated by trees or shrubs' (U.S. Definition). In Europe, a forested fen (a peat accumulating wetland that has no significant inflows or outflows and supports acidophilic mosses, particularly <i>Sphagnum</i> ) could be called a swamp. In some areas reed grass - dominated wetlands are also called swamps). (Mitsch and Gosselink, 1986).  <b>Marsh:</b> A frequently or continually inundated wetland characterised by emergent herbaceous vegetation adapted to saturated soil conditions. In European terminology a marsh has a mineral soil substrate and does not accumulate peat (Mitsch and Gosselink, 1986). Tone is grey blue and texture is smooth.  <b>Comment:</b> Using satellite data it is difficult to differentiate between swamp and marsh. Hence, both have been clubbed together.
1105	<b>Waterlogged:</b> Said of an area in which water stands near, at, or above the land surface, so that the roots of all plants except hydrophytes are drowned and the plants die (Margarate <i>et al</i> , 1974). Floods or unlined canal seepage and other irrigation network may cause waterlogging. Spectrally, during the period when surface water exists, waterlogged areas appear more or less similar to lakes/ponds. However, during dry season large or all parts of such areas dry up and give the appearance of mud/salt flats (grey bluish).
1106	<b>River/stream:</b> Rivers are linear water features of the landscape. Rivers that are wider than the mapping unit will be mapped as polygons. Its importance arises from the fact that many stretches of the rivers in Indo-Gangetic Plains and peninsular India are declared important national and international wetlands (Ex. The river Ganga between Brajghat and Garh Mukteshwar, is a Ramsar site, Ranganthattu on the Cavery river is a bird sanctuary etc.). Wherever, rivers are wide and features like sand bars etc. are visible, they will be mapped.
1200	<b>Man-made</b>
1201	<b>Reservoir:</b> A pond or lake built for the storage of water, usually by the construction of a dam across a river (Margarate <i>et al</i> , 1974). On RS images, reservoirs have irregular boundary behind a prominent dyke. Wetland boundary in case of reservoir incorporates water, aquatic vegetation and footprint of water as well. In the accompanying images aquatic vegetation in the reservoir is seen in bright pink tone. Tone is dark blue in deep reservoirs while it is ink blue in case of shallow reservoirs or reservoirs with high silt load. These will be annotated as Reservoirs/Dam.  <b>Barrage:</b> Dykes are constructed in the plain areas over rivers for creating Irrigation/water facilities. Such water storage areas develop into wetlands (Harike Barrage on Satluj – a Ramsar site, Okhla barrage on the Yamuna etc. – a bird sanctuary). Water appears in dark blue tone with a smooth texture. Aquatic vegetation appears in pink colour, which is scattered, or contiguous depending on the density. Reservoirs formed by barrages will be annotated as reservoir/barrage.

1202	<p><b>Tanks/Ponds:</b> A term used in Ceylon and the drier parts of Peninsular India for an artificial pond, pool or lake formed by building a mud wall across the valley of a small stream to retain the monsoon (Margarate <i>et al</i>, 1974). <b>Ponds</b> Generally, suggest a small, quiet body of standing water, usually shallow enough to permit the growth of rooted plants from one shore to another (Reid <i>et al</i>, 1976). Tanks appear in light blue colour showing bottom reflectance.</p> <p>In this category <b>Industrial ponds/mining pools mainly comprising Abandoned Quarries are also included</b> (Quarry is defined as "An open or surface working or excavation for the extraction of stone, ore, coal, gravel or minerals." In such pits water accumulate (McGraw Hill Encyclopaedia of Environmental Sciences, 1974), <b>Ash pond/Cooling pond</b> (The water body created for discharging effluents in industry, especially in thermal power plants (Encyclopaedic Directory of Environment, 1988) and <b>Cooling pond:</b> An artificial lake used for the natural cooling of condenser-cooling water serving a conventional power station (Encyclopaedic Directory of Environment, 1988). These ponds can be of any shape and size. Texture is rough and tonal appearance light (quarry) to blue shade (cooling pond).</p>
1203	<p><b>Waterlogged :</b> Man-made activities like canals cause waterlogging in adjacent areas due to seepage especially when canals are unlined. Such areas can be identified on the images along canal network. Tonal appearance is in various hues of blue. Sometimes, such waterlogged areas dry up and leave white scars on the land. Texture is smooth.</p>
1204	<p><b>Salt pans:</b> Inland salt pans in India occur in Rajasthan (Sambhar lake). These are shallow rectangular man-made depressions in which saline water is accumulated for drying in the sun for making salt.</p>
2000	<b>Coastal Wetlands</b>
2100	<b>Natural</b>
2101	<p><b>Lagoons/Backwaters:</b> Such coastal bodies of water, partly separated from the sea by barrier beaches or bass of marine origin, are more properly termed lagoons. As a rule, lagoons are elongate and lie parallel to the shoreline. They are usually characteristic of, but not restricted to, shores of emergence. Lagoons are generally shallower and more saline than typical estuaries (Reid <i>et al</i>, 1976). <b>Backwater:</b> A creek, arm of the sea or series of connected lagoons, usually parallel to the coast, separated from the sea by a narrow strip of land but communicating with it through barred outlets (Margarate <i>et al</i>, 1974).</p>
2102	<p><b>Creek:</b> A notable physiographic feature of salt marshes, especially low marshes. These creeks develop as do rivers "with minor irregularities sooner or later causing the water to be deflected into definite channels" (Mitsch and Gosselink, 1986). Creeks will be delineated, however, their area will not be estimated.</p>
2103	<p><b>Sand/Beach:</b> Beach is an unvegetated part of the shoreline formed of loose material, usually sand that extends from the upper berm (a ridge or ridges on the backshore of the beach, formed by the deposit of material by wave action, that marks the upper limit of ordinary high tides and wave wash to low water mark(Clark,1977).Beach comprising rocky material is called rocky beach.</p>
2104	<p><b>Intertidal mudflats:</b> Most unvegetated areas that are alternately exposed and inundated by the falling and rising of the tide. They may be mudflats or sand flats depending on the coarseness of the material of which they are made (Clark, 1977).</p>
2105	<p><b>Salt Marsh:</b> Natural or semi-natural halophytic grassland and dwarf brushwood on the alluvial sediments bordering saline water bodies whose water level fluctuates either tidally or non- tidally (Mitsch and Gosselink, 1986). Salt marshes look in grey blue shade when wet.</p>
2106	<p><b>Mangroves:</b> The mangrove swamp is an association of halophytic trees, shrubs, and other plants growing in brackish to saline tidal waters of tropical and sub-tropical coastlines (Mitsch and Gosselink, 1986). On the satellite images mangroves occur in red colour if in contiguous patch. When mangrove associations are scattered or are degraded then instead of red colour, brick red colour may be seen.</p>
2107	<p><b>Coral reefs:</b> Consolidated living colonies of microscopic organisms found in warm tropical waters. The term coral reef, or organic reef is applied to the rock- like reefs built-up of living things, principally corals. They consist of accumulations of calcareous deposits of corals and corraline algae with the intervening space connected with sand, which consists largely of shells of foraminefera. Present reefs are living associations growing on this accumulation of past (Clark, 1977). Reefs appear in light blue shade.</p>
2200	<b>Man-made</b>
2201	<p><b>Salt pans:</b> An undrained usually small and shallow rectangular, man-made depression or hollow in which saline water accumulates and evaporates leaving a salt deposit (Margarate <i>et al</i>, 1974). Salt pans are square or rectangular in shape. When water is there appearance is blue while salt is formed tone is white.</p>
2202	<p><b>Aquaculture ponds:</b> Aquaculture is defined as "The breeding and rearing of fresh-water or marine fish in captivity. Fish farming or ranching". The water bodies used for the above are called aquaculture ponds (Encyclopaedic Directory of Environment, 1988). Aquaculture ponds are geometrical in shape usually square or rectangular. Tone is blue.</p>

**Annexure – II**  
**Details of District information followed in the atlas**



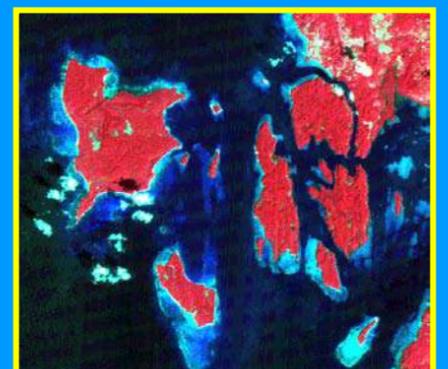
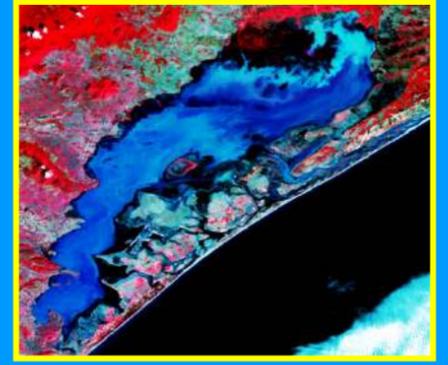
Source : Survey of India (Surveyed in 2004 and published in 2005)

Space Applications Centre (SAC) is one of the major centres of the Indian Space Research Organisation (ISRO). It is a unique centre dealing with a wide variety of disciplines comprising design and development of payloads, societal applications, capacity building and space sciences, thereby creating a synergy of technology, science and applications. The Centre is responsible for the development, realisation and qualification of communication, navigation, earth & planetary observation, meteorological payloads and related data processing and ground systems. Several national level application programmes in the area of natural resources, weather and environmental studies, disaster monitoring/mitigation, etc are also carried out. It is playing an important role in harnessing space technology for a wide variety of applications for societal benefits.

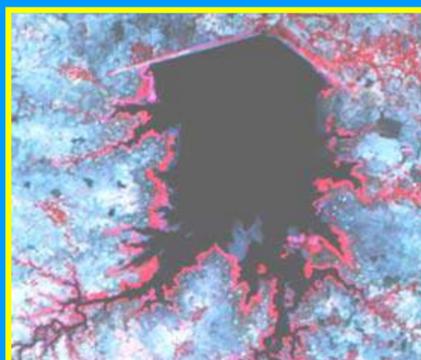
SAC is a host institution for the training programmes related to Satellite Communication, Satellite Meteorology and global change under the Centre for Space Science & Technology Education in Asia and the Pacific (CSSTEAP) affiliated to the United Nations (UN).

<http://www.isro.org>





Space Applications centre  
Indian Space Research Organisation  
Ahmedabad – 380 015



SUDHIR RAJPAL, IAS

578



D.O.No. SWAH/2025/377  
 Addl. Chief Secretary to Govt. Haryana,  
 Health & Family Welfare, AYUSH and Medical  
 Education & Research and Environment  
 Departments.  
 Dated 13/09/25

Subject: Regarding - W.P.(c) No. 304/2018 - AnandArya Vs. Union of India along with W.P.(c) No. 230/2001 and W.P.(c) No. 302/2020 before the Hon'ble Supreme Court - Demarcation of wetland boundary supported by accurate digital maps with coordinates and validated by ground truthing

Dear Deputy Commissioner,

It is brought to your notice that in W.P.(C) No. 304/2018- Anand Arya vs. Union of India, Hon'ble Supreme Court vide its orders dated 11.12.2024 (enclosed) has inter-alia directed that each of the State/UT Wetland Authorities shall complete ground truthing as well as the demarcation of wetland boundaries of each of the Wetland which have been identified for their State by the Space Application Centre Atlas (SAC Atlas), 2021 as expeditiously as possible, but definitely within a period of three months from 11.12.2024.

The State Government has constituted the District Level Wetland Management Committees headed by respective Deputy Commissioner of each district to look after the various issues regarding Wetlands in their respective districts vide order dated 07.03.2025.

In recent orders dated 19.08.2025 (enclosed) in the present matter, the Hon'ble Supreme Court has directed to expedite the ground truthing and boundary demarcation expeditiously and at any rate within an outer limit of two months from today, failing which, the Secretaries of the concerned States of the Department of Environment and Ecology will have to personally remain present before this court on next date of hearing i.e., 07.10.2025.

Furthermore, a meeting was also held on 25.08.2025 under the Chairmanship of Joint Secretary, MoEF&CC wherein with the Wetland Authority of all the States & UTs wherein the State of Haryana was directed to expedite the work & complete the same before next date of hearing. The MoEF&CC will hold meetings every week/fortnight regarding compliance of order dated 19.08.2025 of the Hon'ble Supreme Court.

In this regard, the district-wise list of 1881 water bodies in excel format were circulated on 01.09.2025 for ground truthing as well as demarcation of boundaries of these water bodies falling under your respective jurisdiction.

I would request you to take this matter on top priority and will submit the information to the office of State Wetland Authority, Haryana till 15<sup>th</sup> of September, 2025.

Treat it as **MOST URGENT**.

Yours sincerely,

  
 (Sudhir Rajpal, IAS) 13/9/25

To  
 All the Deputy Commissioners of  
 Haryana State

**Government of Haryana  
State Wetland Authority, Haryana  
Order**

The Governor of Haryana is pleased to constitute the "District Level Wetland Management Committee" in each district of Haryana State, as follows: -

Sr. no.	Name of the post	Designation in the Committee.
1.	Deputy Commissioner of the District	Chairperson
2.	District Revenue Officer, Revenue & Disaster Management, Department	Member
3.	District Fisheries Officer, Fisheries Department Haryana	Member
4.	District Development & Panchayat Officer, Development & Panchayats Department	Member
5.	Executive Engineer, Irrigation & Water Resources Department	Member
6.	Regional Officer, Haryana State Pollution Control Board	Member
7.	One local expert (to be nominated by the Committee)	Member
8.	Divisional Forest Officer (Wildlife). In District where there is no Divisional Forest Officer (Wildlife), Divisional Forest Officer (Territorial) shall be Convener/Member Secretary.	Convener/Member Secretary

The District Level Wetland Management Committees will perform the following functions:

- To be responsible for management and conservation of Wetlands in the District and will be accountable to the State Wetland Authority, Haryana.
- It may recommend any activity related to development and management of any wetlands to State Wetland Authority, Haryana for approval.
- It may co-opt experts and specialists in Technical and Scientific fields to undertake study, work as may be required from time to time.
- To be responsible for preparation of Brief Document on prioritized wetlands as well as delineating zone of influence.
- Formulate District Wetland Inventory Team for collecting data as well the delineation of boundary and zone of influence of enlisted wetlands to enable field validation. The team will involve assessment based on the scientific sampling as well as data derived from stakeholder consultations and indigenous traditional knowledge. After detailed assessment and to ensure standardization, the team will prepare the brief report on prioritized wetlands.
- To be entrusted with the responsibility of managing district level database.
- Oversee and monitor the water sources available in the respective Districts, Eco system services, factors adversely affecting the wetlands, analysis of Wetland Management needs, etc.,
- Enforcement of Wetlands (Conservation and Management) Rules, 2017 in the respective Districts.
- To interact with all the line departments viz., Revenue Department, Forest Department, Agricultural Department, Publics Works Department, Irrigation & Water Resources Department and Urban Local bodies Departments etc.
- Function as advisory body for smooth functioning of the State Wetland Authority, Haryana.

- Implementation of schemes at district level allocated by the Government of Haryana, Ministry of Environment, Forest & Climate Change (MoEF&CC) and State Wetland Authority, Haryana from time to time.

Dated 05.03.2025

**ANAND MOHAN SHARAN**  
Additional Chief Secretary to Government, Haryana,  
Environment, Forest and Wildlife Department.

Endst No. 16/15/2017-3Env

Dated: 07.03.2025

A copy is forwarded to the following for further necessary action:-

1. All the Deputy Commissioner of the Haryana State.
2. All the District Revenue Officer, Revenue & Disaster Management, Department
3. All the District Fisheries Officer, Fisheries Department Haryana
4. All the District Development & Panchayat Officer, Development & Panchayats Department
5. Executive Engineer, Irrigation & Water Resources Department
6. Regional Officer, Haryana State Pollution Control Board
7. Divisional Forest Officer (Wildlife). In District where there is no Divisional Forest Officer (Wildlife), Divisional Forest Officer (Territorial) shall be Convener/Member Secretary.

*Shiv Kumar*  
Dy. Superintendent, Environment  
for Additional Chief Secretary to Govt. of Haryana  
Environment, Forest and Wildlife Department

Endst No. 16/15/2017-3Env

Dated: 07.03.2025

A copy (along with their file) is forwarded to the Member Secretary, State Wetland Authority, Haryana for further necessary action.

*Shiv Kumar*  
Dy. Superintendent, Environment  
for Additional Chief Secretary to Govt. of Haryana  
Environment, Forest and Wildlife Department