LEGEND

▨	①	LAKHPERA
▨	②	GANGAULI
▨	③	TANDA
▨	⑥	KAKARI
▨	⑧	SITAULI
▨	⑨	SAIDAPUR
▨	⑩	GARHI
▨	⑬	POKARA
▨	⑭	GOSHAINGANJ
▨	⑮	UTTARGAON

LEGEND

⎯⎯⎯	District Boundary
⎯⎯⎯	Block Boundary
⎯⎯⎯	Railway
⎯⎯⎯	Road
⎯⎯⎯	Irrigation Canal
⎯⎯⎯	River, Stream, Drain
▨	Tank, Pond, Swamp
▨	Town, Village
▨	C.C.A.

Fig. C.3   Soil Map of Sataon Study Area

SCALE
0 1 2 3 4 5km
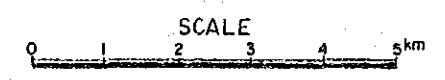
INDIA
FEASIBILITY STUDY ON IRRIGATION AND DRAINAGE DEVELOPMENT OF SHARDA CANAL CAD PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

LEGEND

[icon]	①	LAKHPERA
[icon]	②	GANGAULI
[icon]	③	TANDA
[icon]	⑥	KAKARI
[icon]	⑧	SITAULI
[icon]	⑨	SAIDAPUR
[icon]	⑩	GARHI
[icon]	⑬	POKARA
[icon]	⑭	GOSHAINGANJ
[icon]	⑮	UTTARGAON

LEGEND

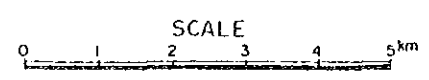|	
·············	District Boundary
— — —	Block Boundary
~~	Railway
⊥⊥	Road
————	Irrigation Canal
～～～	River, Stream, Drain
[icon]	Tank, Pond, Swamp
[icon]	Town, Village
[icon]	C.C.A

Fig. C.3   Soil Map of Sataon Study Area

SCALE
0 1 2 3 4 5km

INDIA

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
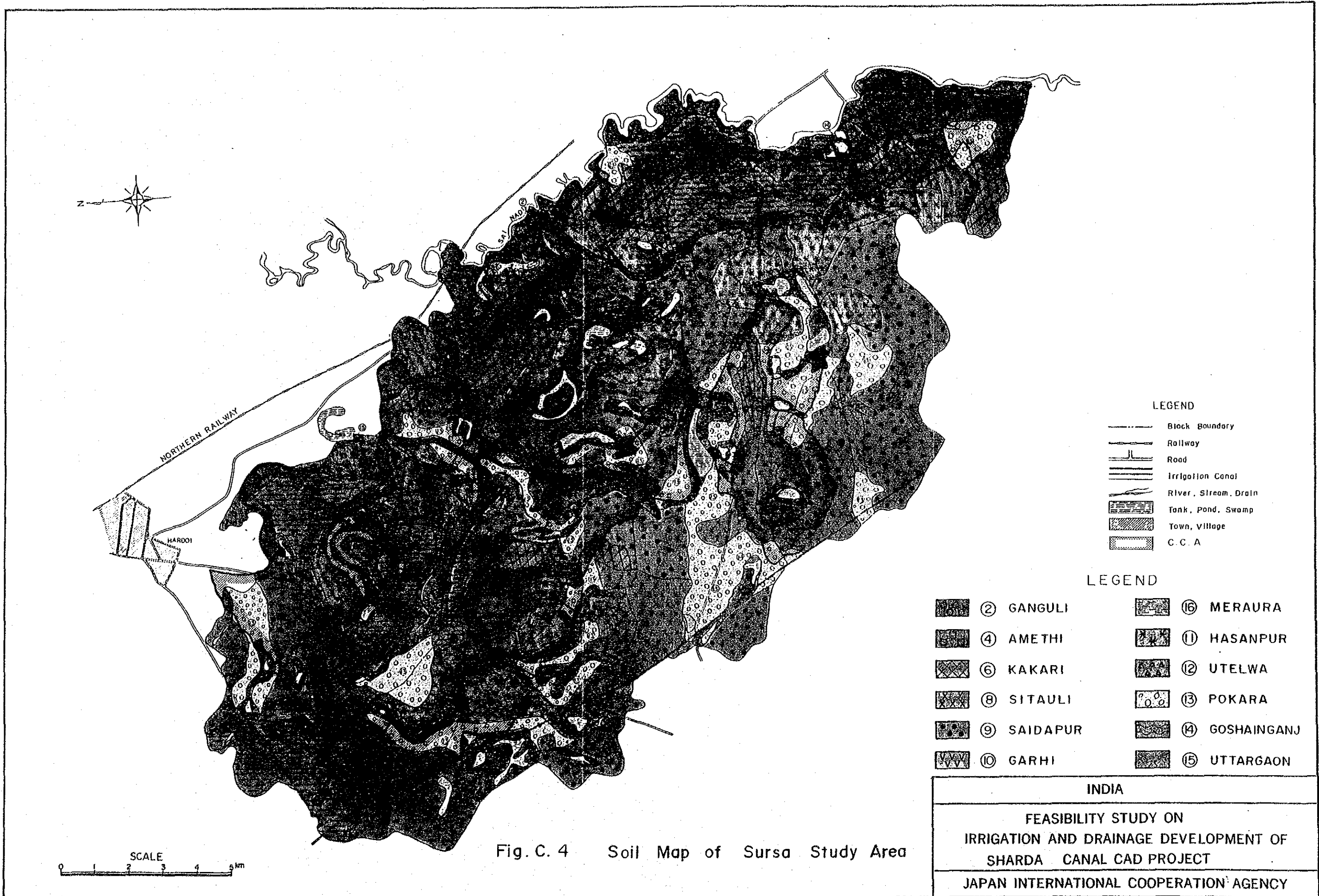SHARDA   CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

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Fig. C. 4   Soil Map of Sursa Study Area

LEGEND

— · — · —	Block Boundary
~~	Railway
—JL—	Road
≡≡≡	Irrigation Canal
~~	River, Stream, Drain
▦	Tank, Pond, Swamp
▨	Town, Village
⠿	C.C.A

LEGEND

▦	②	GANGULI	▦	⑯	MERAURA
▦	④	AMETHI	▦	⑪	HASANPUR
▦	⑥	KAKARI	▦	⑫	UTELWA
▦	⑧	SITAULI	▦	⑬	POKARA
▦	⑨	SAIDAPUR	▦	⑭	GOSHAINGANJ
▦	⑩	GARHI	▦	⑮	UTTARGAON

INDIA
FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
SHARDA   CANAL CAD PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

SCALE
0 1 2 3 4 5 km

Fig. C. 4   Soil Map of Sursa Study Area

LEGEND

-----	Block Boundary
	Railway
	Road
	Irrigation Canal
	River Stream, Drain
	Tank, Pond, Swamp
	Town, Village
	C C A

LEGEND

	② GANGULI		⑯ MERAURA
	④ AMETHI		⑪ HASANPUR
	⑥ KAKARI		⑫ UTELWA
	⑧ SITAULI		⑬ POKARA
	⑨ SAIDAPUR		⑭ GOSHAINGANJ
	⑩ GARHI		⑮ UTTARGAON

SCALE
0   1   2   3   4   5 km

INDIA

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
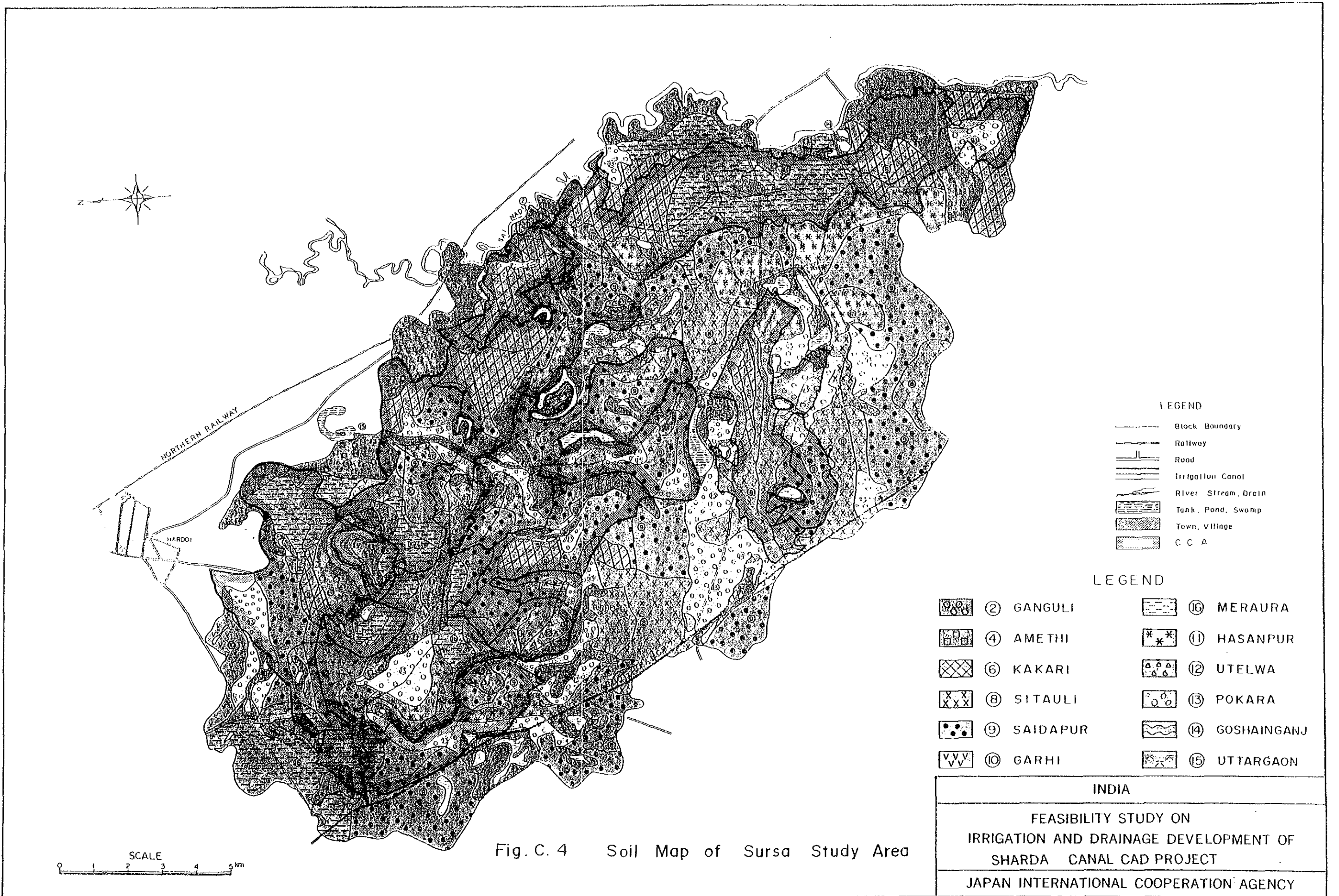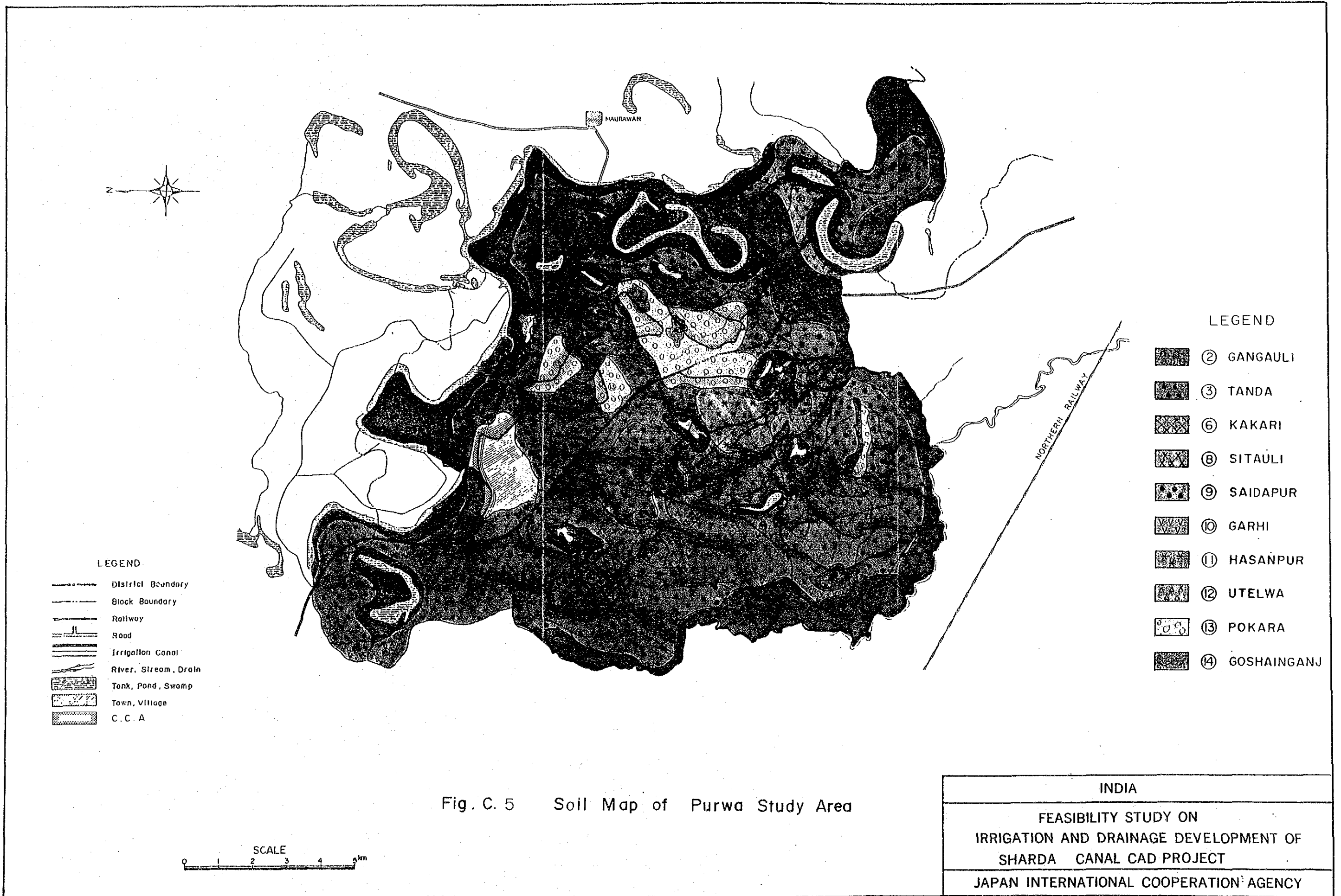SHARDA   CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. C. 5   Soil Map of Purwa Study Area

LEGEND

	②	GANGAULI
	③	TANDA
	⑥	KAKARI
	⑧	SITAULI
	⑨	SAIDAPUR
	⑩	GARHI
	⑪	HASANPUR
	⑫	UTELWA
	⑬	POKARA
	⑭	GOSHAINGANJ

LEGEND

District Boundary
Block Boundary
Railway
Road
Irrigation Canal
River, Stream, Drain
Tank, Pond, Swamp
Town, Village
C. C. A

MAURAWAN

NORTHERN RAILWAY

SCALE
0   1   2   3   4   5 km

INDIA
FEASIBILITY STUDY ON IRRIGATION AND DRAINAGE DEVELOPMENT OF SHARDA   CANAL CAD PROJECT
JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. C. 5   Soil Map of Purwa Study Area

MAURAWAN

NORTHERN RAILWAY

SCALE
0   1   2   3   4   5km

INDIA

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
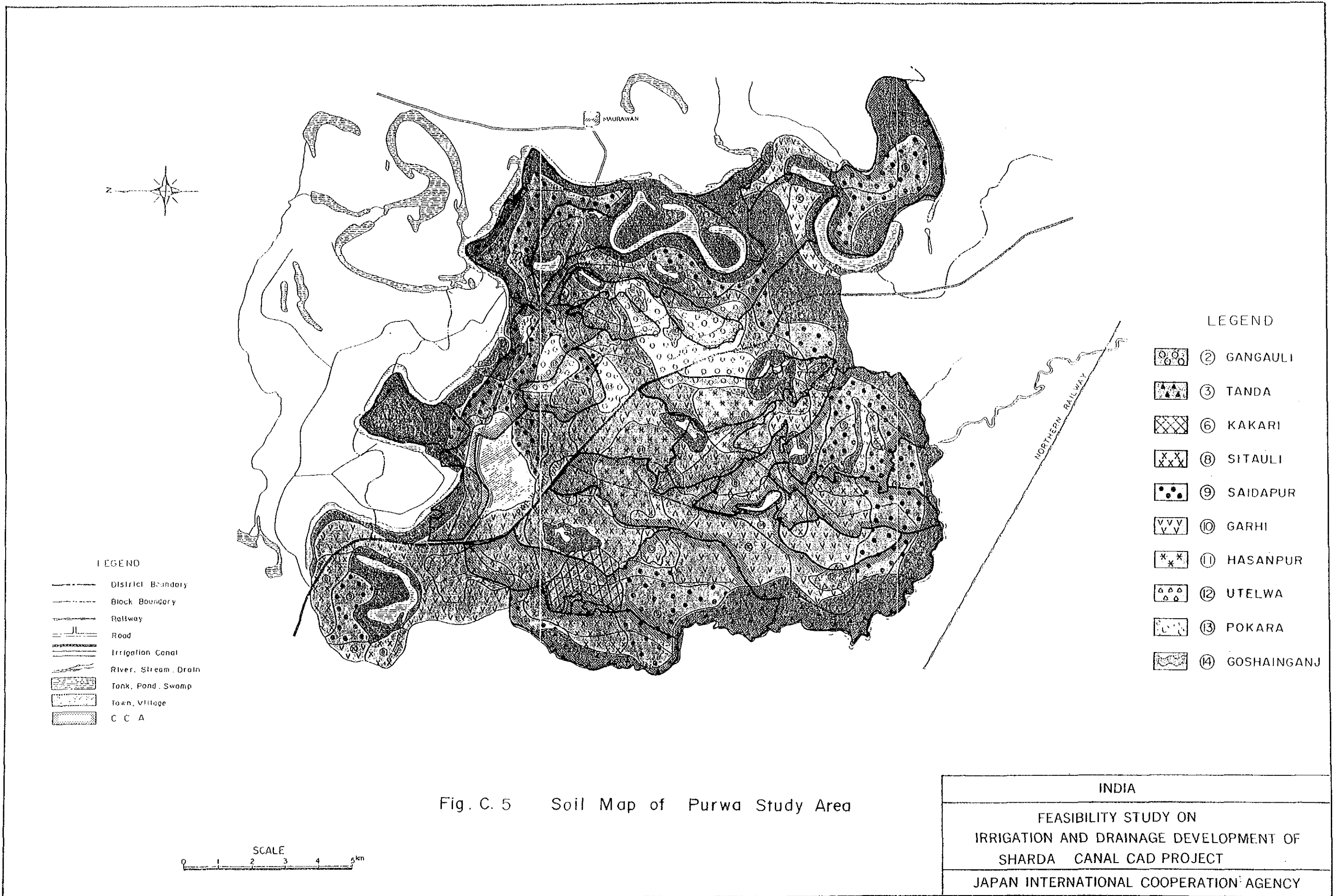SHARDA   CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

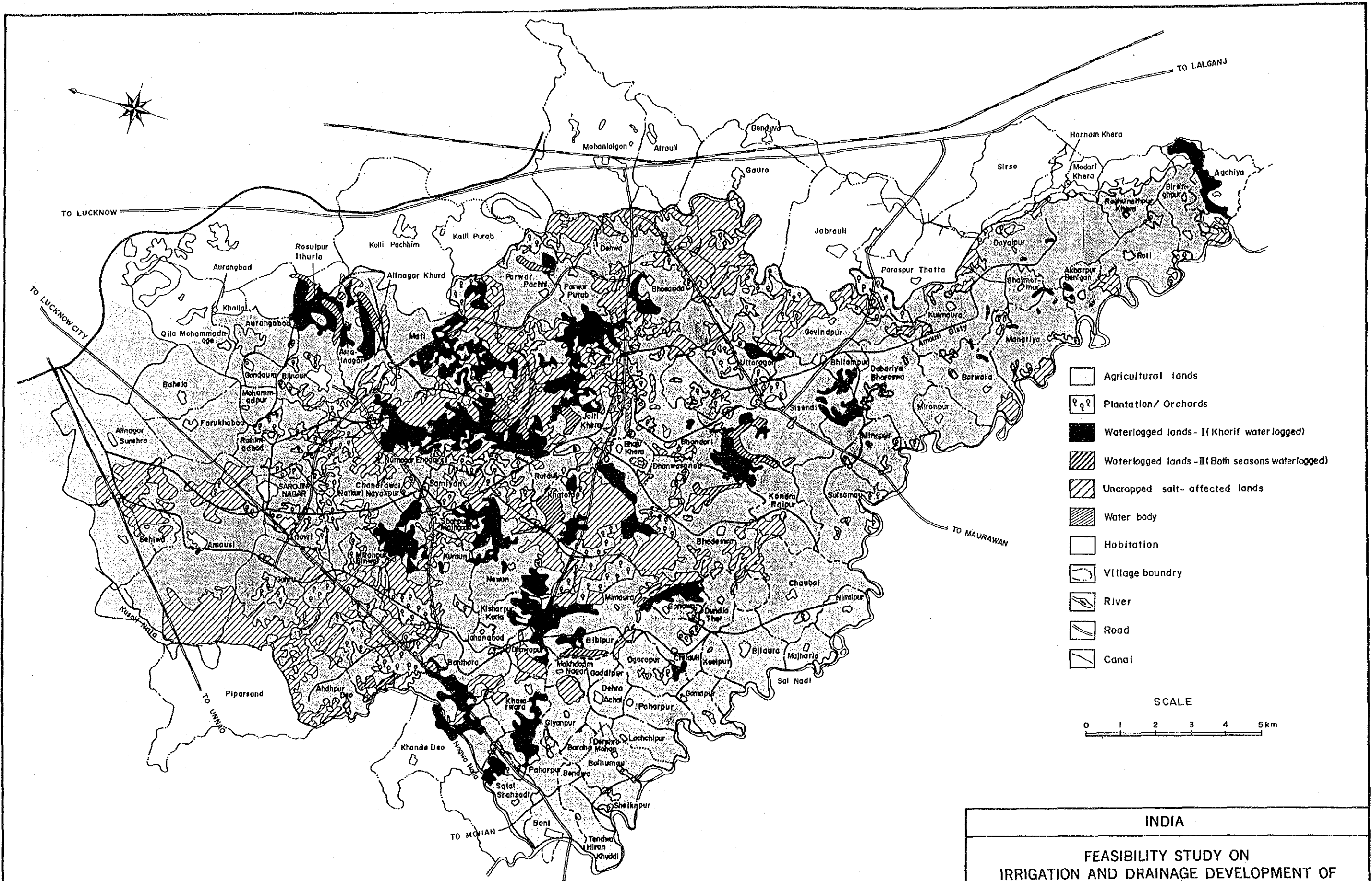Fig. C.6 Present Land Use Sarojini Nagar Study Area

Legend:
- Agricultural lands
- Plantation/ Orchards
- Waterlogged lands - I (Kharif water logged)
- Waterlogged lands - II (Both seasons waterlogged)
- Uncropped salt-affected lands
- Water body
- Habitation
- Village boundry
- River
- Road
- Canal

SCALE

0 1 2 3 4 5km

INDIA

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SHARDA CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

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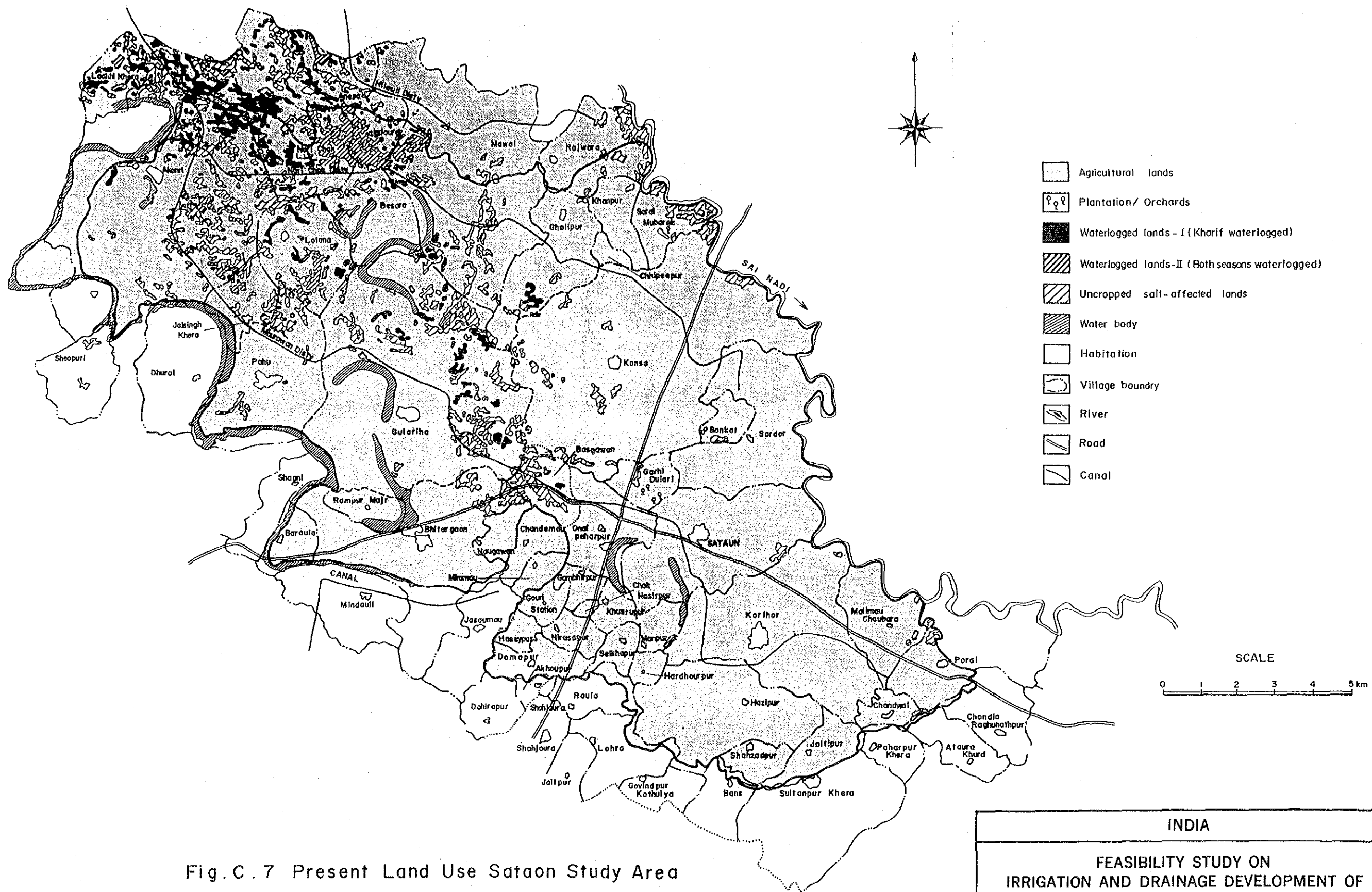Fig. C. 7 Present Land Use Sataon Study Area

Legend:
- Agricultural lands
- Plantation / Orchards
- Waterlogged lands - I (Kharif waterlogged)
- Waterlogged lands-II (Both seasons waterlogged)
- Uncropped salt-affected lands
- Water body
- Habitation
- Village boundry
- River
- Road
- Canal

SCALE

0 1 2 3 4 5 km

INDIA

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
SHARDA CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

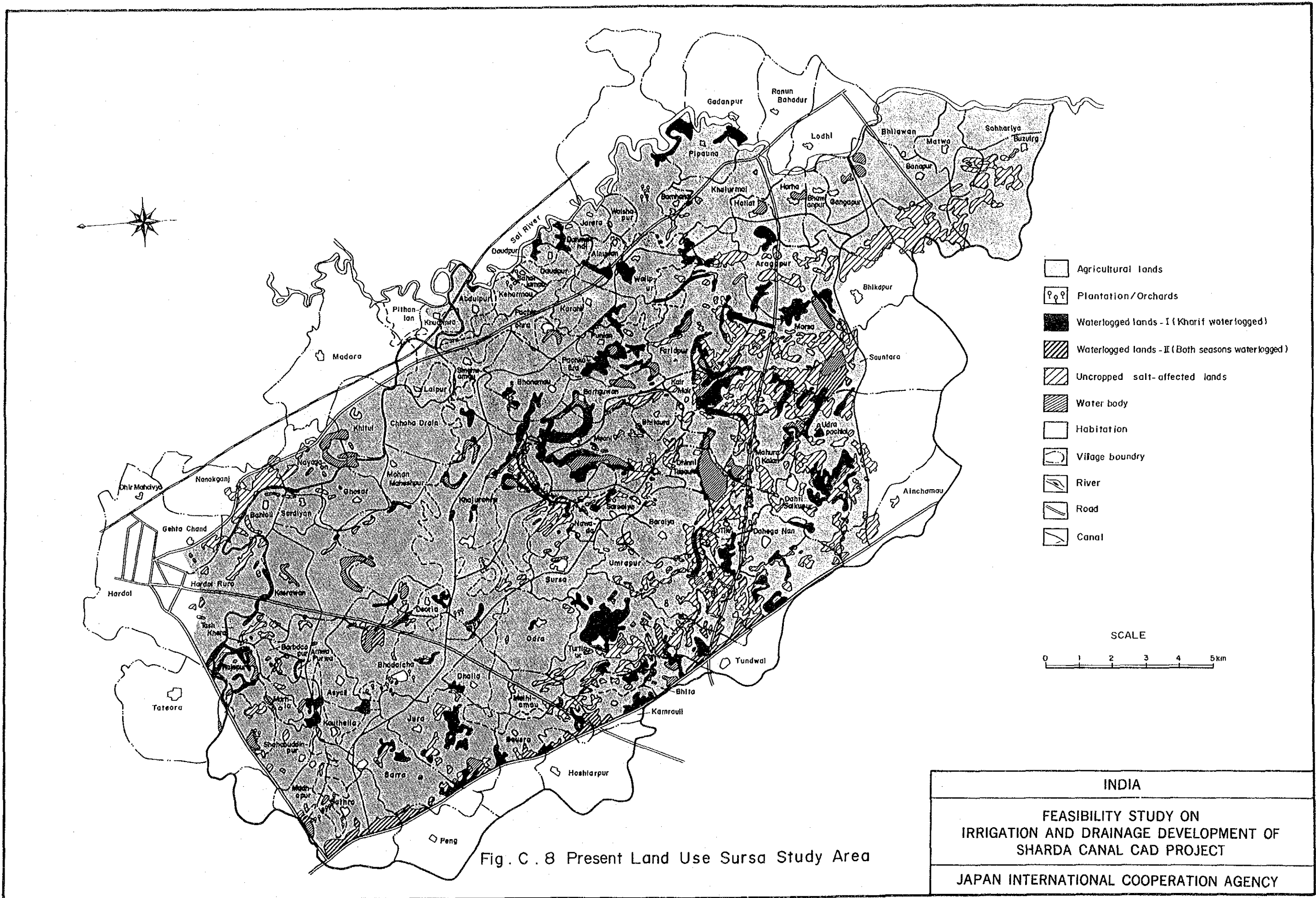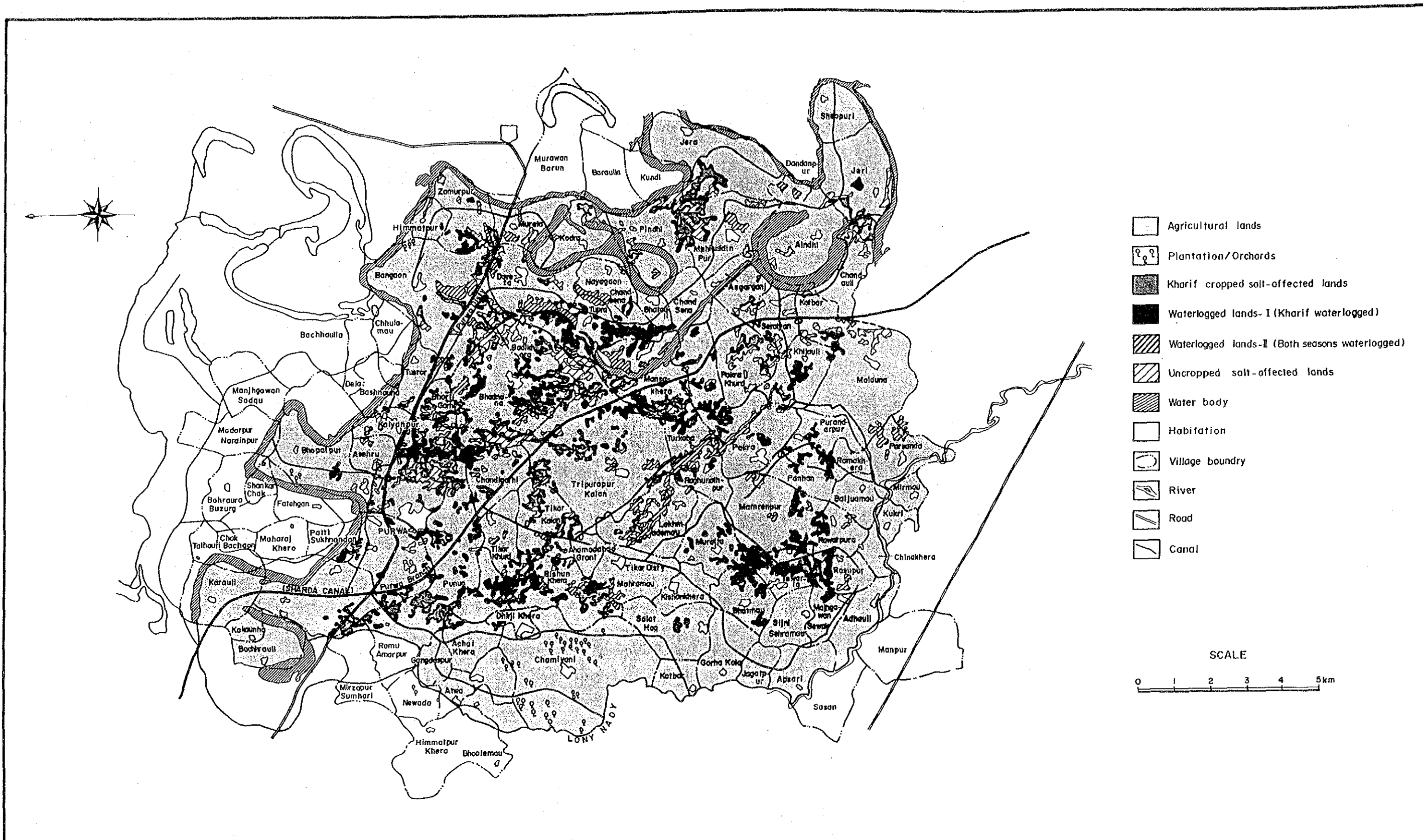Fig. C. 8 Present Land Use Sursa Study Area

Legend:

- Agricultural lands
- Plantation / Orchards
- Waterlogged lands - I (Kharif waterlogged)
- Waterlogged lands - II (Both seasons waterlogged)
- Uncropped salt-affected lands
- Water body
- Habitation
- Village boundry
- River
- Road
- Canal

SCALE

0   1   2   3   4   5km

INDIA

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
SHARDA CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

Fig. C.9 Present Land Use Purwa Study Area

Legend:

- Agricultural lands
- Plantation/Orchards
- Kharif cropped salt-affected lands
- Waterlogged lands-I (Kharif waterlogged)
- Waterlogged lands-II (Both seasons waterlogged)
- Uncropped salt-affected lands
- Water body
- Habitation
- Village boundry
- River
- Road
- Canal

SCALE

0   1   2   3   4   5km

INDIA

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE DEVELOPMENT OF
SHARDA CANAL CAD PROJECT

JAPAN INTERNATIONAL COOPERATION AGENCY

FEASIBILITY STUDY ON
IRRIGATION AND DRAINAGE IMPROVEMENT OF
SHARDA CANAL CAD PROJECT

ANNEX D
SOCIO-ECONOMY AND AGRO-ECONOMY

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ANNEX D SOCIO-ECONOMY AND AGRO-ECONOMY

1. National and State Economy

1.1 Current National Economy

1.1.1 Structure and Performance of the National Economy

India is the seventh largest country in area, and the second most populous, with a population of more than 800 million. Agriculture plays an important role in the economy, accounting for about 70 percent of employment. Although the share of the agriculture sector in the gross domestic product (GDP) has been declining, from 42.5 percent in 1965 to 34.2 percent in 1980, and to 27.1 percent in 1987, the relative dependence of the work force and agriculture households has not been declining on a comparable scale. The share of the agricultural labor force in the total labor force declined only marginally from 73 percent in 1965 to about 70 percent in 1980.

India remains in the very low income group countries. The continued prevalence of poverty in India, reflected by the high infant mortality rate (IMR), is a significant dimension of the economy that requires market as well as non-market solutions for accelerated development. The World Bank Annual Report for 1989 stated that the face of poverty has changed in India in the recent seven years posing new challenges for public policy. "First, the poor are increasingly concentrated in regions that face serious developmental constraints; second, the share of landless wage-dependent households among the poor is growing, nearly half the rural poor in some States."

On the general economic front, the GDP growth has been averaging 4.4 percent per annum since the mid-1970s. Despite inadequate rainfall leading to severe drought in 1987-1988, the growth rate averaged 5.4 percent during the first four years of the Seventh Five Year Plan (1985-1990) period. The wholesale price index in the corresponding period rose by an average of only 6.5 percent. Management of food reserves and imports, combined with a strong element of internal monetary and fiscal discipline and reform, tended to contribute toward the above features.

1.1.2 External Finances

The long-term debt went up rapidly from $26,545 million in 1984 to $51,168 million in 1988 (refer to Table D.1). While these magnitudes doubled, the total debt service (TDS) went up similarly from $2,431 million to $4,958 million during the same period. The export value of goods and service (XGS) could not, however, keep up with the pace of the above: the exports contributed to $16,160 million in 1984 and went up to $21,610 million in 1988.

The total external debt (EDT), as a percentage of GNP, went up from 15.3 to 20.7 in 1988 and is likely to reach about 29 in 1991. Despite a rather steep increase, it is significantly lower than the corresponding percentage of 44.8 (in 1988), the average for all developing countries. Besides, India has no arrears on interest payments, unlike many other developing countries.

1.1.3 Emerging Trends

In the continued planning process under various five year plans, the Eighth Five Year Plan (1990-1995) is due for finalization. The draft plan indicated the size of plan at Rs.6,100 billion (at current prices) compared to Rs.3,550 billion in the Seventh Plan. The tentative estimate of investment is Rs.2,800 billion, and the proposed to deploy about half of the rural and hence agrarian economy.

The recent shocks in the external economic environment, especially regarding energy import costs, tend to cause rather significant economic constraints in internal and external finances. There is an obvious need to tide over the temporary crisis of fall in external resource inflow and simultaneous rise in outflow. The remedial measures include enhanced external borrowings, especially in the form of concessional aid. However, at least two other ingredients appear to be necessary for healthier economic management.

- Improved climate (via greater liberalization) for international investments; and

- Enhancement of domestic productivity in resource use, including the efficiency of external capital use.

Whereas there exists a good proven record of internal monetary and fiscal discipline (including voluntary curbs on consumption), the same cannot be stated about the productivity features. Hence the need for greater emphasis on the latter.

The "Asian Development Outlook 1990" of the Asian Development Bank concluded that the deficits in the national Government of India budgets and balance of payments are a constraint on economic growth; two long-term problems include inadequate physical infrastructure and increasing degradation of the environment.

1.1.4   Main Features of the Agricultural Economy

The instability features of the Indian agricultural production system, attributable largely to vagaries of monsoon rainfall, are fairly significant. The growth rates of agricultural production in different years since 1977-1978 are given below (along with the corresponding agricultural years).

<u>Year Growth Rate</u>

1977-1978	14.3	1984-1985	1.2
1978-1979	3.8	1985-1986	2.4
1979-1980	-15.2	1986-1987	-3.7
1980-1981	15.6	1987-1988	-0.8
1981-1982	5.6	1988-1989	20.8
1982-1983	-3.8	1989-1990	1.0
1983-1984	13.7		

The first three years of the Seventh Plan (1985-1990) were marked by a succession of unfavorable monsoons culminating in the drought of 1987-1988. The GOI Economic Survey (1989-1990) stated, "The increase in agricultural production has been stimulated largely by the increase in the use of key inputs like irrigation and fertilizers." The average growth rate of agriculture during 1980-1981 to 1988-1989 was 5.4 percent, that in irrigation (measured in terms of gross irrigated area) was 3.0 percent and in fertilizer use (measured in terms of NPK) was 8.9 percent.

Given the dependence on weather, a year-to-year correlation between input use and agricultural production cannot be expected. The cropping patterns in various regions in the country are largely the end products of resultant responses of traditional factors such as habit formation in selection of crops, perceptions about critical input availability (such as availability of water and its spatial stochastic features) and about expected prices, farm household consumption needs, size distribution of farms, and others.

The role of commercial farming is largely restricted in India by institutional factors such as legislated ceilings on agricultural landholdings per household, and dynamics of size distribution of operational holdings over a period of time. The following shows the changes in percentage distributions of operational holds in various categories (marginal, less than 1 hectare; small, 1-2 hectares; semi-medium, 2-4 hectares; medium, 4-10 hectares; and large, exceeding 10 hectares) during the period 1970-1971 to 1985-1986.

Operational Holdings

Size of Holding	Percentage of Distribution					
	No. of Holding			Area of Holding		
	1985-86	1980-81	1970-71	1985-86	1980-81	1970-71
MARGINAL below 1	58.0	56.5	51.0	13.1	12.2	9.0
SMALL 1 - 2	18.2	18.0	18.9	15.5	14.1	11.9
SEMI-MEDIUM 2 - 4	13.6	14.0	15.0	22.2	21.2	18.5
MEDIUM 4 - 10	8.2	9.1	11.2	28.7	29.7	29.7
LARGE 10 & above	2.0	2.4	3.9	20.5	22.8	30.9
Average (ha)	-	-	-	1.68	1.84	2.28

Source: Statistical Outline of India 1989-90,
          Deportment of Economics & Statistics,DOI

It may be observed that the average size of farm shrunk from 2.28 hectares in 1970-1971 to 1.68 hectares in 1985-1986. Besides, 58 percent of operational holdings in 1985-1986 are marginal farms (compared to 51 percent in 1970-1971) accounting for only 13.1 percent of the total area of all operational holdings, whereas 2 percent of large farms account for about 20.5 percent of the total area.

Recently, the Bhanu Pratap Singh Committee on farm policies submitted its 1990 report to the GOI. The Committee Report viewed that the terms of trade have steadily gone against the farm sector since the mid-1970s. It was viewed that the consequential erosion of farmers' income has seriously affected their capacity to save and invest in farm development.

1.1.5   Agricultural Production and Trade

The broad features of cropping of various crops in India over the years 1978-1989 are given in Table D.2.

Details of targets and achievements of agricultural production during the Seventh Plan (1985-1990) are shown on Table D.3. The deviations are largely attributable to vagaries of monsoon rainfall, an important factor influencing productivity.

Table D.4 provides the time trend in the total values of agricultural exports and imports, and their relative shares in the total exports and imports. It may be observed that the share of the farm sector has been declining both in exports as well as imports; the relative decline in the value of agricultural imports has been more significant mainly due to drastic reduction in the import of food grains. The decline in the export share is partly attributable to the greater competitive nature of international agricultural commodity markets dominated by competing exporters.

1.1.6   Salient Features of the Irrigated Agriculture Sector

Since the 1950s the aggregate growth rate of agriculture production (around 2.8 percent per year) has been higher than that of the population (about 2.1 percent per annum), leading to the fact that the net availability in per capita terms of food and agricultural products increased during the last three decades. However, commensurate reduction in poverty does not appear to have taken place. This implies that the increased agricultural production did not increase intake of nutrients in the case of the undernourished population.

The reasons could be many, but the important ones may be:

- The increase in food production is not very significantly higher than that in population; and

- The rise in per capita incomes of the undernourished households is marginal (leading to limitations on food-purchasing power).

The aggregate growth rate of irrigation potential developed during the last quarter century worked out to about 4 percent per annum, although the corresponding figure for net irrigated area is about 3 percent. Considering the fact that irrigated agriculture is expected to contribute to higher farm productivity, the above estimates might favor a range of 4-6 percent annual growth rate in agricultural production, which turns out to be far from the realized values.

The factors behind this discrepancy are very important to note as these are central to policies governing irrigated agricultural development in India. The important features that lead to this situation are:

- Shifts in cropping pattern, favoring intense irrigation (especially in the upstream areas of canal irrigation systems);

- Lower levels of water utilization efficiencies;

- Unutilized potential in the major command areas;

- Unstable yields of agricultural commodities; and

- The continued dependence of large segments of the irrigated areas and almost the entire segment of unirrigated areas on the vagaries of monsoon rains.

Low-order irrigation efficiencies and unreliable water deliveries in tail-end/downstreams of canal command areas, as a result of over-irrigation in the head-reaches of the canal system and lack of proper hardware (water regulatory devices) to regulate delivery of water at various locations of the large irrigation systems, contributed to low production efficiencies in many command areas. The negative contributions of faulty designs of the delivery systems cannot be undermined. Also, as a result of over-irrigation, problems of waterlogging and deterioration of standards of quality of water started surfacing in the major projects (such as Nagarjunasagar, Kosi, and others).

Expansion of irrigation has been the main element of strategy for increasing food grains production. It was proposed to increase the irrigation potential to 80.4 million hectares by the end of the Seventh Plan (1985-1990).

However, GOI has admitted that there is still a gap in utilization of created irrigation potential despite undertaking developmental measures including command area development. The gap is not only between target and achievement in terms of potential created but also between potential and utilization. Utilization of the created potential in most of the major irrigation projects is considerably low largely due to lack of development of network of field drains and land shaping or levelling. Lack of involvement of farmers is also an important factor in utilizing created potential.

The GOI-sponsored Command Area Development (CAD) Programme was launched in 1974-1975 to create conditions for effective utilization of irrigation potential. The program covers construction of field channels, land leveling, field drains, and related infrastructure. It also includes institutional arrangements for supply of other agricultural inputs and provision

of infrastructure, such as off-farm warehousing and marketing. Whereas the CAD concept is admirable, the practice has serious limitations.

The Seventh Plan envisaged a coverage of 6.81 million hectares under field channels, 1.82 million hectares under land leveling, and 8.04 million hectares under *warabandi* (rotational water supply). However, the state governments fixed the corresponding targets at much lower levels: 4.25, 0.71, and 5.17 (m.ha.), respectively. During the first four years of the plan period, the reported realization of targets in respect to the above are: 2.52, 0.33, and 2.99 (m. ha.), respectively. It would be unrealistic to expect that the balance targets for the Seventh Plan period can be achieved during the last year of this plan period. According to the Economic Survey, the lower achievement is largely attributed to financial constraints at the state level and difficulties in land acquisition for undertaking the CAD works (some of these issues were discussed as potential impediments by Rao and Pant [1980]). However, the role of unreliable canal water supply as a disincentive for active farmer participation in the development works should not be lost sight of.

1.1.7 Agricultural Employment

The Working Paper of the GOI Planning Commission (1990) dealing with employment issues concluded that agriculture has shown the lowest and most rapidly declining employment-output ratio in the recent past. A major reason for this lies in the sharply declining employment potential in the regions with high output growth. Labor use per hectare declined from 77 to 65 in Punjab, from 88 to 86 in Uttar Pradesh during 1973-1974 to 1983-1984. Employment growth accompanying a 1 percent growth of output was found to be as low as 0.00, 0.07 and 0.19 in Punjab, Haryana, and Uttar Pradesh, respectively.

Significant inter-state differences are observed in the use of labor per hectare. These differences are not only due to differences in cropping pattern; large inter-state differences are observed in individual crops also. The number of man-days per hectare labor use in the production of paddy was found to be 159 in Tamil Nadu, 132 in Karnataka, 84 in Haryana, and 107 in Punjab. In the case of wheat the figures are 92 in Bihar, 80 in Uttar Pradesh, 51 in Punjab, and 50 in Haryana.

In the long run, agriculture and other land-based activities will not be able to provide employment to all rural workers at an adequate and increasing level of incomes. It is necessary that the rural economy gets diversified into nonagricultural activities to provide

productive employment to the growing labor force and also to reduce the economic disparities between urban and rural areas.

1.2 Economic Features of Uttar Pradesh State

1.2.1 Administrative Settings

The Uttar Pradesh state has been divided into five geo-economic regions (Hilly, Western, Central, Eastern, and Bundelkhand), 13 administrative divisions (each headed by a divisional commissioner), 62 districts (each headed by a district magistrate), 263 *tehsils* (each headed by a *tehsildar*), and 895 community development blocks (or blocks, each having a block development officer to coordinate development activities). There are 112,566 residential villages. The total state population was 11.09 million, according to the 1981 census. The rate of increase during 1971-1981 was 25.5 percent. Population density in 1981 stood at 377 per square kilometer, compared to 216 for all India average. The variations in population density within the five economic regions are also significant; 95 in the Hilly region to 485 in the Eastern region.

The administrative apparatus, typical of a state, is as follows: the constitutional head of the state is the governor, under whose overviewing role functions the Council of Ministers headed by the chief minister. The ministerial level is assisted by the administrative apparatus with the hierarchy: chief secretary, secretary, additional special secretary, joint secretary, deputy secretary, assistant secretary, section officer (at the State Secretariat). The functional/field administrative departments and organizations are headed by commissioners/directors. The administrative/revenue divisions are headed by divisional commissioners, and the districts by collector cum district magistrates. The collector plays the pivotal control and coordinating role at the district level whose unity of command can cut across all the departments/organizations/field offices of the state governments functioning within the respective district boundaries, thus effecting an integration. The administrative units below the district level are: *tehsil* (headed by a *tehsildar*) development block (headed by block development officer), and the village unit (with village *panchayat* officer of the administrative setup, and *gram pradhan* -- an elected representative).

1.2.2 Economy

The landed farmers constitute about 58.5 percent of the total work force, and landless agricultural laborers, 16 percent, accounting for about 74.55 percent of the state population directly dependent on the agricultural economy.

Uttar Pradesh is the most populous and fourth largest state in the country. The state comprises 9 percent of the area and 16.2 percent (1981) of the population of the country. During 1971-1981, the state's population recorded an increase of 25.5 percent, yielding by an annual growth of 2.3 percent as against substantially lower corresponding figures of 19.8 percent and 1.8 percent in the preceding decade of 1961-1971. The more recent trend of a higher growth in the state's population is likely to continue in the future also. The increase in the total population of the state was accompanied by an increase in the share of nonworking population. This took place only because employment opportunities in the state could not grow in commensuration with the increase in the population and labor force. The following are some of the highlights of the economy.

The estimated irrigation acreage in 1984-1985 was 18.82 million hectares and the estimate for 1988-1989 was 22.49 million hectares. The percentage of irrigated area in the total cultivated area is estimated at 53 % for 1986-1987 with the cropping intensity estimated at 146 percent.

The agricultural production system virtually stagnated during the period 1984-1985 to 1987-1988 because of a series of bad monsoon and drought years. The estimates for production of sugarcane, however, showed significant increases (production went up from 70.888 million metric tons (MMT) to 93.35 MMT, an increase of 31.7 percent). Average yield of sugarcane went up from 460 to 517 quintal per hectare.

Agriculture and allied sectors constitute about 46 percent of the state domestic product (at 1980-1981 prices) whereas the corresponding share of these sectors for the country as a whole is about 34 percent.

The percentage of population below the poverty line was 50.1 percent in 1977-1978 in the Uttar Pradesh state as against 48.1 percent in the country. The percentage dropped marginally in the state to 45.3 percent in 1983-1984 as against the corresponding figure 37.4 percent for the country.

The gap between per capita income of the state and the country widened over the years and there appears little chance of narrowing down soon. The growth rate of the primary sector (mainly agriculture economy) was only about 1.2 percent per annum (average) during the first three years of the Seventh Five Year Plan period.

Table D.5 provides comparative statement of average annual growth rates of income during various plan period commencing in the early 1950s, showing the relative standing of the Uttar Pradesh state compared to all India averages. The per capita income gap comparisons indicate the increasing magnitude of divergence between the two sets.

The share of area under foodgrains in the gross cropped area is 82.4 percent (1986-1987). The share of the state in total foodgrains production in the country is 21.0 percent (1988-1989). The production of commercial crops such as sugarcane and potato in the state accounts for 43.6 percent and 44.4 percent, respectively, in the country's production. However, the share of the state in the national income originating from agriculture and animal husbandry sector is 14.8 percent only. The productivity of foodgrains in the state is 18.21 quintals per hectare (1988-1989), which is 60.9 percent and 56.5 percent of this productivity in Haryana and Punjab, respectively. The productivity of sugarcane in terms of *gur* (brown sugar) in the state is 50.26 quintals per hectare (1988-1989), which is 60.9 percent and 56.5 percent of this productivity in Haryana and Punjab, respectively, despite expanded irrigation facilities in Uttar Pradesh.

Table D.6 provides details of irrigation potential created and utilized during the last few years, along with related features of power production and energy use. However, the data regarding irrigation potential utilization are subject to usual lack of precision.

1.2.3   Structure of Landholdings

The share of the state in the total number of country's cultivators is 20.5 percent, as against its share of 9.8 percent in the reporting area and 12.3 percent in the total net area sown (1986-1987). The net area sown per cultivator is 0.9 hectare (1986-1987) which is only 60 percent of the national average (1.5 hectare), 37.5 percent of Punjab (2.4 hectare), and 40.9 percent of Haryana (2.2 hectare). This is because of the abundance of uneconomic, submarginal and marginal holdings in the state. Of the total number of 178.17 lakh operational holdings in the state (1980-1981), marginal holdings of less than one hectare accounted for 71 percent covering only 28 percent of the total area. The share of marginal holdings in the state is highest among all the major states except Kerala and Bihar.

Operational holding is defined as "all land which is wholly or partly used for agricultural production is operated as one technical unit by one person or with others without regard to title, legal form, size or location."

According to the Report of the Uttar Pradesh Agricultural Census for 1970-1971:

"One of the main factors responsible for steady and progressive impoverishment of the peasant in this State was fragmentation of holdings at scattered places. Incompact holdings involved wastage of human resources, working cattle, agricultural equipment, boundary lands and the wasteful boundary disputes and litigation costs .... Efficiency of cultivation was considerably reduced because a peasant family could not manage widely scattered plots of their holding .... Fragmentation also prevented land improvement, such as the construction of agriculture, etc. Attempts were made to improve conditions through the UP Consolidation of Holdings Act 1939, but the scheme could not succeed due to the presence of intermediaries. The 1939 Act was later amended by a new Act: UP Consolidation of Holdings Act 1953, whereby the scope of litigation has also been reduced."

However, the agricultural census data indicate that in Uttar Pradesh, the state where the average size of farm has been significantly lower than all India average, there has been further decline in the size from about 1.16 hectare in 1970-1971 to 1.01 hectare in 1980-1981 and 0.93 hectare in 1985-1986 as shown in Table D.8 (corresponding to 1.81 hectare, average for all India in 1980-1981). This feature is likely to remain a rather fundamental constraint in evolving efficient agricultural production pattern, and also in adopting some of the new technological inputs.

1.2.4   Terms of Trade

The argument of unfavorable terms of trade governing agricultural products is not without foundation in Uttar Pradesh. The following table regarding Agricultural Parity Indices, compiled by the State Planning Institute, provides support to the fact that during 1985-1986 to 1988-1989, farmers paid more in successive years for their requirements relative to the prices received for their products. The only year that showed temporal neutrality of the parity index was 1987-1988, but that was a very bad drought year when most farmers did not have much to sell anyway.

AGRICULTURAL PARITY INDICES OF UTTAR PRADESH
(Base Agriculture Year 1970-1971 = 100)

	1985-1986	1986-1987	1987-1988	1988-1989
Indices of prices paid by farmers	336.2	356.6	392.6	412.4
Indices of prices received by farmers	303.6	327.6	392.4	388.5
Agricultural Parity Index	90.3	91.9	99.9	94.2

1.2.5 Planning Approach: Eighth Five Year Plan (1990-1995)

The highlights of the Draft Eighth Five Year Plan of Uttar Pradesh are summarized below. The approach is based on the national document on the subject drafted in 1990. The final plan is due to be worked out soon.

The draft "Approach" to the Eighth Plan states that the "basic objective is to ensure that the needs of ordinary people and quality of their life become the central focus of planning even as the plan seeks to promote rapid overall development and diversification of the economy and to strengthen the infrastructural base." It is in this context that employment has been described as the "central thrust of the plan" and "growth is viewed as a means to the provision of reasonable minimum living standard and essential social amenities to everyone as quickly as possible."

The major objectives of the state's Eighth Plan are to:

- Raise incomes of rural poor;

- Improve the quality of life in rural areas;

- Ensure that a reasonable share of public facilities is available to the poor;

- Maximize productivity in agriculture along with diversification and mixed farming in small and marginal holdings and in areas of low productivity;

- Reduce population grown to 1.8 percent per annum;

- Accelerate manufacturing sector growth and promote industries having greater potential for providing employment;

- Consolidate gains from and to improve efficiency and productivity of past investment and of the existing assets;

- Promote faster development of backward areas to reduce intra-state disparities in levels of development;

- Undertake special measures for the overall economic and social development of the weaker sections of the society, particularly of scheduled castes/scheduled tribes, and of women and children.

- Strengthen *panchayat raj* institutions in rural areas and local self-governing institutions in urban areas and to make them effective media for formulation and implementation of development schemes.

2. Sharda Canal and Representative Areas

2.1 Administrative and Socio-economic Settings

2.1.1. Sharda Canal Region

The command area of the Sharda Canal is constituted by partial or full inclusion of the 11 districts of Uttar Pradesh: Pilibhit, Shahjahanpur, Hardoi, Lucknow, Unnao, Rae-Bareli, Kheri, Barabanki, Sitapur, Nainital, and Bareilly. The total number of blocks covered in these districts adds to 108. Fig.D.1 provides a typical district-level administrative network.

Pilibhit, Hardoi, Unnao, and Sitapur are the four districts that are fully included in the Sharda Canal command area. Nainital has two of its 15 blocks, and Barabanki has one of its 16 blocks in this command area. A large area of this size possesses diverse agro-economic and hydro-geological features, in addition to possible variation in ensuring the availability of canal water for irrigated agriculture. The average size of farm varies from 0.85 hectares in Unnao to 1.83 hectares in Nainital, according to the Agricultural Census of 1985-1986 as shown on Table D.8.

Land holding size of Uttar Pradesh is generally very small irrespective of land tenure status, although most farmers are wholly owned and self-operated. Of the total number of holdings, about 50% or 94 lakh are in the 0.02-0.5 ha bracket. This holdings account only for 22 lakh hectares or 12.5% of the total holding area. Marginal farmers having less than 1.0 ha are 134 lakh in number and 50 lakh hectares. This accounts for 72% in number and only 28% in holding size. Small farmers holding 1.0 to 2.0 hectares of land are 30 lakh in number or 16% of the total land holdings and share about 41 lakh hectares or 23% of the total holding area. Marginal and small farmers account for as many as 88% of the total holdings and share 51% of the land.

Table D.9 provides district-wide basic data of socio-economic condition in .Sharda Canal Command Area, showing different stages of development by districts. For example, the percentage of the number of electrified village to the total number of village shows wide range by districts from 40.3% for Sitapur to 100% for Sarojini Nagar. Number of hospital per lakh of people also differ much, ranging from 1.05 for Barabanki to 13.98 for Nainital.

2.1.2. Hardoi Branch Command Region

The region covered under Hardoi branch command is as follows:

Sl No.	Name of District	Total Blocks	Blocks in the Region
1	Pilibhit	7	7
2	Shahjahanpur	14	12
3	Hardoi	19	19
4	Lucknow	8	7
5	Unnao	16	16
6	Rae Bareli	19	6
7	Kheri	15	9

The relative standing of various districts within the Hardoi command area, in terms of important economic parameters, can be assessed. This is offered in Table D.9. It may be observed that the following four districts merit highest priority, based on the criteria of per capita agricultural output value, average size of agricultural holdings, percentage of small and marginal farmers in Rae Bareli, Unnao, Hardoi, and Lucknow. The next section deals with the main characteristics of the four representative areas selected for the study — one each in the above districts.

2.2 Representative Areas

2.2.1 Administration

Each of the representative areas consists of several administrative blocks to which many panchayat and villages belong. Those blocks and villages are as shown in Tables D.11 to D.14 and Figs.D.2 to D.5, and also summarized below.

Study Area	District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village
Sarojini Nagar	2	4	16	75	107
Sataon	2	3	9	30	43
Sursa	1	2	11	76	85
Purwa	2	4	12	63	84

The total area of each representative area is 110,848 ha, which include 57,301ha of Culturable Command Area (C.C.A.); 33,488 ha (14,862 ha of C.C.A.) for Sarojini Nagar Study Area, 25,555 ha (12,874 ha of C.C.A.) for Sataon Study Area, 32,159 ha (17,313 ha

of C.C.A.) for Sursa Study Area and 19,646 ha (12,252 ha of C.C.A.) for Purwa Study Area, respectively.

2.2.2 Population

Recent population data at block level is available. They are shown as below:

| ITEM | Sarojini Nagar | | Sataon | | Purwa | Sursa |
	Sarojini Nagar	Mohanlal Ganj	Hilauli	Sataon	Purwa	Sursa
1. Total population	169027	135824	98771	94686	130500	121674
2. Nos. of families	32644	27436	19156	19892	16542	25636
3. Average family size	5.2	5.0	5.2	4.8	7.9	4.7
4. Population growth rate for last 10 years (%)	32.1	15.7	23.4	10.8	1.5	2.5
5. Population density per km^2	797	522	420	300	375	377
6. Total nos. of labors	51600	40200	29800	27900	36900	37100
7. Total nos. of farmers	30533	29650	19806	27660	19807	31232
8. Total nos. of agricultural Labors	8147	4546	5964	1955	2190	3401

Note: Data presented are as of 1987-88
Source: Statistics Patrika, U.P. State Planning Department.

Sarojini Nagar block shows higher population density than other blocks and higher growth rate as well, which may reflect recent urbanization of Lucknow urban area, adjacent to the Lucknow city. In contrast, population growth of Purwa block has been stagnant.

About 30% of total population have job. The rate of labors who are engaged in agriculture sector to total number of labors is the lowest in Sarojini Nagar block with the value of about 75%, while other blocks are higher with the rate of between 85% and 96%. Almost all labors are engaged in agriculture sector.

2.2.3 Socio-economic Aspects

(1) Sarojini Nagar, Sataon and Purwa Area

Three of the representative areas; Sarojini Nagar, Sataon and Purwa Study Areas; are largely located within a "triangle zone" which is formed by the roads connecting Lucknow, Rae Bareli and Unnao cities. Accessibility to these areas are generally good. Asphalted road network connects major cities and villages although some parts of the road are not passable by ordinal car. People usually use bicycle and animal-draft cart as means of transportation. In "Kharif" season, however, considerable part of these areas centering Purwa-Maurawan roads

become unaccessible because of inundation in Purwa Study Area. Water stagnation make the quality of groundwater and hygiene condition inferior, which often causes water-born diseases.

Most farmers in these areas seems in subsistence level. Houses are mostly made of bricks. Usually they raise several heads of cows or buffalos as means of transportation and farm power or supplemental income source by milking. Very few public facilities like school and hospital are established although electricity has been provided in most towns and villages except those in Purwa and Asoha blocks. People depend largely on groundwater as domestic water source by digging wells.

Economy in these areas are not active. Main income source is by far agriculture although there is almost no market facilities. Farmers bring their products to open markets along the road in a town or a village which are held usually twice a week. In village level, only brick and brick-made goods market, and bicycle repair shop are seen. Even a town which function as a rural center, commercial zone is limited along the main street, and small stores selling mainly necessaries like kitchen goods and cloths, some agricultural inputs distributors, agro-machinery traders, canteens, and vegetable and fruits vendors are seen there. There are scarce industry activities like processing except brick making factories.

(2) Sursa Study Area

Being far from the urban centers like Lucknow, and also apart from the trunk national road No.28, connecting Lucknow and Delhi, which passes Sitapur and Shahjahanpur, this area remains complete rural circumstances. Along the way to Hardoi from Lucknow with the distance of some 100 km, there is only one town, Sandila which seems to function as a rural center.

Accessibility in the Area is not so good. Pucca roads are not well established, and earth roads are rough. Animal drafting cart and/or bicycle are main means of transportation. Electrification has not been well-established. Domestic water supply entirely depend upon groundwater through open dug-well and hand pump. Public facilities has not well been established. Economic activity is hardly seen. There is no rural centers. Almost all income are generated from agricultural products.

(3)   Inter-block Comparison

From Table D.15, following inter-block comparison on social development situation may be pointed out:

- Purwa block has less number of village development officers on the population basis;
- Literacy rate is relatively lower in Hilauli and Sursa blocks which, however, does not necessarily reflect the number of junior basic schools;
- Health facilities are generally poorly established in Hilauli, Purwa and Sursa blocks;
- Population based pucca road length is shorter in Hilauli and Sursa block;
- Electrification rate is lower in Hilauli, Purwa and Sursa blocks;

(4)   Women's Status

Women in rural areas play a very important role. They manage not only household matters, but also farming, collecting firewood, animal care, making fuel rod by animal dung, etc. In spite of their important role in socio-economic activities, socio-cultural problem prevent them from improving their position in the community. Low education, mal-nutrition, less paid attention, etc. have caused many tragic histories on women. Considering the fact that about 60 % of the farming activities are done by women, their training as well as other social education should be programmed.

2.2.4   Farm Economy Survey

In order to grasp the present socio-economic situation of the Representative Areas and to serve as a basis for formulation of the project, a farm economy survey was conducted through interview to 600 farmers; 10 farmers each of 15 villages each of four Representative Areas. The results are processed and tabulated, and are briefly explained below:

(1)   Population

(a) The size of household

Average size of household is 7.8 on an average, ranging from 7.5 for Purwa to 8.3 for Sataon, showing rather high value as compared with the district average of 5 to 6. The household size become bigger as land holding size is bigger.

(b) Distribution by sex

The population of male exceeds female, especially in the age between 16 and 20.

(2) Educational attainment

35% of the respondents got no education while more than 15% of the respondents have attained higher education (secondary or college level).

(3) Social Infrastructure

(a) Domestic water supply

Main domestic water source is groundwater from well nearby. Water quality is in general satisfactory.

(b) Electrification

Only 6 to 17% of the sample family are electrified.

(4) Land

(a) Land tenure and land holding size

Most respondents own land. Average holding size is 1.43 ha, ranging from 1.35 ha for Purwa to 1.5 ha for Sataon.

(b) Crop land

As a result of land lease by small and marginal farmers, cultivated area is generally larger than holding size; 1.5 ha on an average.

(5) Irrigation

Of the crop land, 76% are irrigated, ranging from 53% for Sataon to 88% for Purwa. Irrigation water source is by canal or diesel tubewell/pump sets.

(6)   Cropping pattern

(a) Cropping intensity

Paddy and wheat are the main crops in Kharif and Rabi, respectively. Cropping intensity of these two crops by Areas are as follows:

Area	Paddy	Wheat
Sarojini Nagar	36%	59%
Sataon	36%	50%
Sursa	30%	68%
Purwa	69%	71%

(b) Planting time

June and July are the transplanting months for paddy while wheat is sown in November and December.

(7)   Farm input

(a) Fertilizer

Nitrogen fertilizer doses by Areas are shown below:

Unit: kgN/ha

Area	Paddy	Wheat
Sarojini Nagar	66-74	69-89
Sataon	86-108	75-136
Sursa	73-110	79-105
Purwa	36-56	60-72

(b) Agro-chemicals

The use of agro-chemicals is not common yet.

(8) Crop yield and Constraints

(a) Yield

| | | Unit: ton/ha |
Area	Paddy	Wheat
Sarojini Nagar	2.08 (1.18-2.81)	2.07 (1.68-2.50)
Sataon	2.17 (1.56-2.77)	2.35 (1.68-3.19)
Sursa	2.57 (1.15-3.04)	2.33 (1.83-2.93)
Purwa	2.29 (1.86-3.03)	1.73 (1.47-2.26)

(b) Constraints

Shortage of water is the main reason for lower yield of both paddy and wheat, according to farmers' feeling, followed by pest/diseases, salinity, water logging, and lack of cultivation knowledge.

(9) Crop disposal

The sale of produce as percentage of the value of production for marginal farmers is as shown below:

| | | Unit: % |
Area	Paddy	Wheat
Sarojini Nagar	23.7	19.0
Sataon	16.3	11.8
Sursa	34.1	21.5
Purwa	24.3	14.5

The values above increase with the land holding size.

(10) Costs

The cost of production per hectare basis varies by farm sizes. While fertilizer cost seems not to be different much, labor cost varies very much; larger farmers hire more labor than smaller farmers. Marginal farmers do not hire any labor for cultivation. Sursa and Sataon farmers tend to spend more money for fertilizer than other farmers in Sarojini Nagar and Purwa Areas.

(11)　Farm Budget

Smaller farmers tend to keep their harvested grains for domestic consumption. The farm economy survey shows more than 70% of paddy and more than 80% of wheat produced by marginal farmers are consumed by themselves. Marginal farmers naturally has minimal income. The following are the results of crop budget analysis for paddy and wheat.

Paddy

Holding Size	Average cultiv.area (ha)	Yield (ton/ha)	Gross V. (Rs.)	Marketed V. (Rs.)	Prod. cost (Rs.)	Net income (Rs.)
Marginal	0.36	2.20	1,462	357	870	-513
Small	0.67	2.27	2,774	865	1,486	-621
Semi-medium	1.26	2.30	5,538	2,005	2,263	-258
Medium and Large	1.64	2.58	7,760	3,281	2,801	480

Wheat

Holding Size	Average cultiv.area (ha)	Yield (ton/ha)	Gross V. (Rs.)	Marketed V. (Rs.)	Prod. cost (Rs.)	Net income (Rs.)
Marginal	0.42	2.01	1,776	300	1,380	-1,080
Small	0.72	2.18	3,376	1,198	1,660	-462
Semi-medium	1.27	2.18	5,869	2,018	2,192	-174
Medium and Large	2.52	2.30	12,332	6,552	2,694	3,858

Source: Farm Economy Survey by JICA Study Team.

Marginal, small and semi-medium farmers show deficits on crop budgets for paddy and wheat. The larger the farm size, the more the number of hired labor. Based on the above tables, smaller scale farmers seems not be able to live only on agriculture.

(12)　Market

About 33% of respondents do not have market channel, suggesting the existence of subsistence farmers. Those who have market channels sell their produce mostly to private traders.

(13)　The use of inputs and their source

Most respondents use chemical fertilizer and farmyard manure. Certified seeds and insecticides are used by 30% of respondents. Other inputs are less popular. Those

inputs are mainly purchased from traders although significant rate of respondents purchase inputs from Government/cooperative channels.

(14) Storage

Most respondents have storage facilities most of which are of Kucha type. Storage volume is in most case less than 10 quintals for paddy and 5 to 30 quintals for wheat. Other crops are stored with a volume of less than 5 quintals.

(15) Farmers' knowledge

(a) seeds

Smaller farmers do not know about the quality of seeds. Less than 40% of respondents use certified seeds.

(b) training

Few farmers know about training. Significant number of farmers in Sataon have experienced training while quite few in Purwa.

3. Constraints and Prospects to Agricultural Development

3.1 Socio-economic Factors

With an average literacy of about 22 percent (and much less for the female population), an average farm holding size less than one hectare, and a high infant mortality rate (IMR), any method of computation of Physical Quality of Life Index (PQLI) places Uttar Pradesh among the least-developed states in India. The agrarian economy and its possible transformation is beset, therefore, with severe (though not impossible) structural constraints. Among the constraints that are amenable for pragmatic change relate to human capital and its application for development. The highest priority sectors include elementary education, skills training, and diversification of economic development activities (along with their sustainability). Within the context of increasing farm incomes, the above could imply greater emphasis on agricultural extension services.

An important aspect that needs to be emphasized here is that any form of human capital formation tends to lower costs of implementing other related development strategies, in addition to yielding returns to financial and human resources investments and enhancing sustainability of development initiatives and their impact. Such a process can encourage participative people-oriented development, reduce administrative costs, and ensure improved compliance with declared policies and programs affecting resource allocation and its efficiency of utilization. In this context, the potential for literacy improvement for women and their development needs to be recognized and relevant pragmatic programs undertaken. A conventional farmers' training program, for example, inhibits large-scale farmer participation - - especially women, hence the need for devising more appropriate training/education programs for agricultural development.

Table D.16 provides details of socio-economic infrastructure in the select blocks of the study area. The relative disparity in the enrollment of boys and girls in the school system is significant. The initial ratio of about 2 to 1 widens to about 10 to 1 by the stage the students enter grades 9 to 12. This also suggests that there may not be any scope for additional skill formation for the women group as they deviate from the formal and informal education system permanently. An agrarian economy-based development with ever-increasing land resource constraints, diversification into agro-based and other economic development activities requires improved formal and informal education, in activities related to both the farm and nonfarm sectors.

3.2 Prospects

The Command Area Development approach to the development of irrigated agricultural development allows a comprehensive area development, along with relevant policy instruments for achieving development objectives. However, an extensity of coverage of instrument is only a necessary but not sufficient requirement for accelerated development. Besides, the interactions of social, economic, administrative, and technical factors under new innovative approaches in public policy tend to remain blurred in an evolutionary process. The deviations between declared measures of implementation of policies and programs and their effective realization lead to mismatch of resources in a larger context, and generate inertia for change and for subsequent reforms.

Accelerated area development would require effective development strategies for the agricultural as well as nonagricultural sectors, emphasizing the complementarity of intersectoral linkages. Within the context of a CAD approach, integrated management of agricultural inputs and outputs, so as to maximize rural income generation, remains the primary objective. The critical elements of the approach include: provision of irrigation water in various segments of the command region, supply of other agricultural inputs such as fertilizers, seeds and extension services, marketing, storage, and processing of farm output. Inherent features include: reduced agricultural production instabilities, efficient allocation of scarce resources, and development of local institutions — especially water user organizations.

Irrigation systems are designed to reduce uncertainty about the adequacy and timing of water deliveries to crop root zones. This objective is not necessarily achieved in large segments of the command region, and, where achieved, there appears conspicuous environmental degradation (such as waterlogging, salinity) caused by excessive use of water resources. The externalities caused by upstream water users to the tail-enders in the canal network are not expected to be evenly distributed — rather, they accumulate from the head to the tail of each distributary, inducing a demotivating factor in some of the potential farmers' organizations for water management. The CAD Authority (headed by an administrator) as well as the Irrigation Management Organization (headed by the canal chief engineer) tend to remain X-inefficient (Liebenstein's [1969] X-inefficiency) due to informational asymmetries. The role of farmers' organizations for efficient water management in this context can also be viewed.

The desirability of reliable water delivery at the farm level remains obvious both from production efficiency requirements, as well as distributive equity requirements. From a typical microeconomic viewpoint, it may be noted that the uncertainty governing the timely

availability of critical input (water) affects efficient allocation of other complementary inputs (safety first, minimizing losses rather than maximizing profits), and hence significantly lower agricultural output. Next to provision of water (by canal and/or other sources), the critical inputs that deserve priority are agricultural credit (at lesser costs, including transaction costs involved in the banking systems), high-yielding seed varieties along with their associated agrochemicals. The interventions required at the post-production stage include storage, marketing, and processing. The role of water user organizations and other farmer organizations is a prerequisite for successful implementation of relevant policies and programs.

3.2.1 Some Practical Aspects of Water Distribution

Below the outlet farmers are responsible for water distribution. In paddy areas, continuous flow is normally maintained to each field or the group of fields with farmers cooperating informally to adjust flows to take into account local variations in topography and field water requirements. So long as the water flows are adequate, such cooperation among the farmers is normally obtained, but as the flows decline, the cooperation breaks down and conflicts result.

What happens in practice represents the net effect of two continuing conflicts: (1), between the farmer (often in league with the patrol, who lives in the village and identifies more with the farmer) and the engineering staff; and (2) between the farmers of the head reach and the tail end.

There exist tendencies of farmers at the head reach to tamper the outlet and damage the gates of the main distributary, construct cross bunds and breach channel banks to maximize their supplies. Farmers at the tail end respond to the uncertain supplies by night irrigation, adopting less water-intensive crops, and supplementary exploitation of water.

Participation, as a process, is evolutionary in nature. Depending upon the strength of the social decision system, the participatory process can be classified as conflict resolving, welfare or development oriented. The evolutionary nature of participation may not be triggered without catalysts. These requirements, in the context of water user participation for water distribution management have several implications. The conflict resolution may not be entirely fair in the absence of other fair overviewing (or enforcement) mechanisms. A development-oriented approach can be subject to supersession of collective interests by interests of the more powerful or of those who could adversely affect the system with no cost to themselves.

3.2.2 Analytical Dimensions

Normative economic theory of institutions suggests that increased resource scarcity and technological advances that reduce the transaction costs involved in the provision of production inputs encourage innovation in allocative institutions to economize on the scarce resource. Given the supply and demand characteristics of irrigation water specific to various locations/regions within a major irrigation system, transaction costs (which include collection and utilization of information regarding varying water requirements, contracting various activities, enforcement, monitoring and evaluation, and so forth) for water management and allocation tend to be rather high. In most irrigation systems the consideration of normative economic efficiency are compromised in favor of distribution of gains to various interest groups (not excluding various categories of farmers and other water users). As generally argued by Maass and Anderson (1978):

1. "A community's concept of social justice is normally the basis of one or more objectives that irrigation communities seek when they determine their operating procedures and institutions."

2. "The objective functions of irrigation communities vary, of course; but most . . . share common goals although these are assigned different values in different systems . . . each irrigation community somehow decides on trade-off values among its several objectives, thereby establishing a composite objective function that represents its will."

Schumacher (1975) pointed out: "Development does not start with goods, it starts with people and their education, organization, and discipline. Without these all resources remain latent, untapped potential."

Maass and Anderson (1978), based on several historical studies in the world, concluded, "To succeed for any length of time, to capture and distribute available water, and to control the amount of land placed under irrigation, farmers must develop self discipline and a high level of community organization."

The potential role of water user organizations was envisaged by the GOI even at the early stages of planning and implementation of CAD programs. The Draft Five Year Plan (1978-1983) document stated (p. 15): "Critical for the success of all redistributive laws, policies and programs is that the poor be organized and made conscious of the benefits

intended for them. . . . The general lesson of the experience so far is that because of leakages in delivery system and ineffective administration, rural programs fail to improve the distribution of income. . . . Whether the larger resources will have the desired equality effect will depend on the extent to which the organized pressure of the beneficiaries counteracts the weaknesses of the administration and the opposition of the vested interests."

TABLES

Table D.1 External Debts (US Million)

SL. NO.	DESCRIPTION	1984	1985	1986	1987	1988	1989	1990	1991
(A)	MACROECONOMIC AGGREGATES								
1.	GROSS NATIONAL PRODUCT (GNP)	192,538	212,969	227,411	251,669	265,594	260,236	261,957	267,622
2.	EXPORTS OF GOODS & SERVICE (XGS)	16,160	15,420	16,467	19,390	21,610	21,215	24,192	27,451
(B)	SUMMARY DEBT. DATA								
1.	LONG TERM DEBT.(L DOD)	26,545	32,924	40,286	47,783	51,168	58,327	65,500	72,870
2.	INTEREST ARREARSON (L DOD)	0	0	0	0	0	0	0	0
3.	TOTAL EXTERNAL DEBT.(INCL IMF) (EDT)	33,857	40,886	48,351	55,325	57,513	64,050	-	-
4.	PRINCIPAL REPAYMENT ON (L DOD)	1,091	1,309	1,933	2,043	2,117	2,131	2,436	2,610
5.	INTEREST PAYMENT ON (L DOD)	1,025	1,311	1,725	2,090	2,554	3,098	3,649	4,211
6.	INTEREST PAYMENT ON SHORT TERM DEPT.	316	226	225	250	287	378	390	406
7.	TOTAL INTEREST PAYMENTS (INT)	1,340	1,537	1,950	2,340	2,841	3,476	4,039	4,617
8.	TOTAL DEPT. SERVICE (TDS)	2,431	2,846	3,883	4,384	4,958	5,607	6,475	7,227
(C)	IMPORTANT RATIOS								
1.	EDT / XGS	210	265	293	285	266	302	289	282
2.	EDT / GNP	17.6	19.2	21.3	22.0	21.7	24.6	27.0	29.0
3.	TDS / XGS	15.0	18.5	23.6	22.6	22.9	26.4	26.8	26.3
4.	INT / XGS	8.2	10.0	11.8	12.1	13.1	16.4	16.7	16.8
5.	INT / GNP	0.7	0.7	0.9	0.9	1.1	1.3	1.5	1.7

SOURCE : WORLD BANK : WORLD DEPT. TABLES 1989-90--EXTERNAL DEPT. OF
DEVELOPING COUNTRIES (1ST SUPPLEMENT) ; 1990.

NOTE : * ; PROJECTED FIGURES