

Table D.2 Agricultural Production in India

(Unit: million tons/bales)

Crop	1978-79	1979-80	1980-81	1981-82	1982-83	1983-84	1984-85	1985-86	1986-87	1987-88	1988-89
Rice	53.77 (2.1)	42.33 -(21.3)	53.63 (26.7)	53.25 -(0.7)	47.12 -(11.5)	60.10 (27.6)	58.34 -(2.9)	63.83 (9.4)	60.56 -(8.1)	56.86 -(6.1)	70.67 (24.3)
Wheat	39.91 (11.8)	31.83 -(10.4)	36.31 (14.1)	37.45 (3.1)	42.79 (14.3)	45.48 (6.3)	44.07 -(3.1)	47.05 (6.8)	44.32 -(5.8)	46.17 (4.2)	53.99 (16.9)
Pulses	12.18 (1.8)	8.57 -(29.6)	10.63 (24.0)	11.51 (8.3)	11.86 (3.0)	12.89 (8.7)	11.96 -(7.2)	13.36 (11.7)	11.71 -(12.4)	10.96 -(6.4)	13.70 (25.0)
Coarsegrains	30.44 (1.4)	26.97 -(11.4)	29.20 (8.6)	31.09 (7.1)	27.75 (10.7)	33.90 (22.2)	31.17 -(8.0)	26.20 -(15.9)	26.83 (2.4)	26.36 -(1.8)	31.89 (21.0)
Kharif Foodgrains	78.08 (0.5)	63.25 -(19.0)	77.65 (22.8)	79.38 (2.2)	69.90 -(11.9)	89.23 (27.6)	84.52 -(5.3)	85.25 (0.9)	80.20 -(5.9)	74.56 -(7.0)	96.42 (29.3)
Rabi Foodgrains	53.82 (10.9)	46.45 -(13.7)	51.94 (11.8)	53.92 (3.8)	59.62 (10.6)	63.14 (5.9)	61.02 -(3.4)	65.19 (6.8)	63.22 -(3.0)	65.79 (4.1)	73.83 (12.2)
All Foodgrains	131.90 (4.3)	109.70 -(16.8)	129.59 (18.1)	133.30 (2.9)	129.52 -(2.8)	152.37 (17.6)	145.54 -(4.5)	150.44 (3.4)	143.42 -(4.7)	140.35 -(1.2)	170.25 (21.3)
Groundnut	6.21 (1.9)	5.77 -(7.1)	5.01 (13.3)	7.22 (44.4)	5.28 -(20.9)	7.09 (34.3)	6.43 -(9.3)	5.12 -(20.4)	5.88 (14.6)	5.85 -(0.5)	9.54 (63.1)
Repeseed & Mustard	1.86 (12.7)	1.43 -(23.1)	2.30 (60.8)	2.38 (3.5)	2.21 -(7.1)	2.61 (18.1)	3.07 (17.6)	2.68 -(12.7)	2.60 -(2.8)	3.45 (32.7)	4.41 (27.8)
Oilseeds@	10.10 (4.5)	8.74 -(13.5)	9.37 (7.2)	12.08 (28.9)	10.00 -(17.2)	12.69 (26.9)	12.95 (2.1)	10.83 -(16.5)	11.27 (4.1)	12.65 (12.2)	17.89 (41.4)
Sugarcane	151.66 (14.3)	128.83 -(15.1)	154.25 (19.7)	186.36 (20.8)	189.51 (1.7)	174.08 -(8.1)	170.32 -(2.2)	170.65 (0.2)	186.09 (9.0)	196.74 (5.7)	204.63 (4.0)
Cotton (lint)*	7.96 (9.9)	7.65 -(3.9)	7.01 -(8.4)	7.88 (12.4)	7.53 -(4.4)	6.39 -(15.1)	8.51 (33.2)	8.73 (2.6)	6.91 (20.9)	6.83 -(7.7)	8.69 (36.2)
Jute & Mesta*	8.33 (16.5)	7.96 -(4.4)	8.16 (2.5)	8.38 (2.6)	7.17 -(14.3)	7.72 (7.7)	7.79 (0.9)	12.65 (62.4)	8.62 (31.9)	6.78 -(21.3)	7.70 (13.6)

*170 kg each for cotton and 180 kg each for jute and mesta.

@ Nine major oilseeds including groundnut, easterseed, sesamum, rapeseed and mustard, linseed, safflower, nigerseed, sunflower and soyabean.
Figures in brackets are per cent increase or decrease over the year.

Source: Economic Survey of India 1989-90, GOI, 1990

Table D.3 National Targets Achievement of Agricultural Production during Seventh Plan

(Unit : million ton / bales)

Crop	1985-86		1986-87		1987-88		1988-89		1989-90	
	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
1 Rice	63.50	63.83	65.00	60.56	64.56	56.86	67.95	70.67	72.50	70.5-71.2
2 Wheat	49.20	47.05	49.00	44.32	50.51	46.17	52.32	53.99	54.00	52.5-53.8
3 Coarse cereals	33.00	26.20	32.00	26.83	32.0-32.5	26.36	33.00	31.89	33.75	33.0-33.5
4 Pulses	13.50	13.36	14.00	11.71	14.0-14.5	10.96	13.30	13.70	14.75	14.0-14.5
5 Total Foodgrains	159.20	150.44	160.00	143.42	160.0-16.3	140.35	166.57	170.25	175.00	170.0-173.0
6 Oil seeds	13.60	10.83	14.80	11.27	14.15	12.65	15.66	17.89	16.50	16.90
7 Cotton*	8.50-8.60	8.73	8.80	6.91	8.30	6.38	9.78	8.69	10.00	9.50
8 Jute & Mesta@	8.65	12.65	8.50	8.62	8.60	6.78	9.20	7.70	9.50	7.90
9 Sugarcane	191.00	170.65	185-190	186.09	180-185	196.74	195.00	204.63	212.00	205.00

* Bale of 170kg

@Bale of 180kg

Source : Economic Survey of India, 1989-90, GOI, 1990

Table D.4 Share of Agricultural Exports and Imports in the Total Value of Exports and Imports

(Unit: Rs. crores)

Year (April-March)	Exports			Imports		
	Exports of Selected Agri. Commodities	Total Exports from India	% Share of Agri. Exports to Total Exports	Imports of Selected Agri. Commodities	Total Imports into India	% Share of Agri. Imports to Total Imports
1965 - 66	334.9	805.6	41.6	535.7	1,394.1	38.4
1970 - 71	565.3	1,535.2	36.8	604.3	1,634.2	37.0
1971 - 72	585.0	1,608.8	36.4	576.0	1,824.5	31.6
1972 - 73	751.5	1,970.8	38.1	484.3	1,867.4	25.9
1973 - 74	1,006.8	2,523.4	39.9	917.5	2,955.4	31.1
1974 - 75	1,401.5	3,328.8	42.1	1,563.5	4,518.8	34.6
1975 - 76	1,685.5	4,042.3	41.9	2,142.0	5,265.2	40.7
1976 - 77	1,800.6	5,142.3	35.0	1,605.1	5,073.8	31.6
1977 - 78	2,000.3	5,407.9	37.0	1,215.5	6,020.2	20.2
1978 - 79	1,902.6	5,724.6	33.2	1,286.2	6,810.6	18.9
1979 - 80	2,238.3	6,418.4	34.9	1,642.1	9,142.6	18.0
1980 - 81	2,375.7	6,683.2	35.5	2,299.5	12,549.1	18.3
1981 - 82	2,623.2	7,805.9	33.6	2,679.5	13,607.6	20.9
1982 - 83	2,642.8	8,803.4	30.0	1,952.5	14,292.7	13.7
1983 - 84	2,819.4	9,770.7	28.9	2,851.4	15,831.5	18.0
1984 - 85	3,248.0	11,743.7	27.7	3,717.4	17,134.2	21.7
1985 - 86	3,271.5	10,874.6	30.0	3,884.8	19,665.4	19.8

Note: 1) Value figures are not comparable due to devaluation of Indian rupee effected in June, 1966.
2) Exports include re-exports.

Source: Monthly Statistics of Foreign Trade of India.
Volumes I & II, published by Department of Commercial Intelligence
and Statistics, Calcutta.
Indian Agriculture in Brief, (22nd Edition), GOI, 1990

Table D.5 Comparative Growth Rate and Per Capita Income

Plan Period	Average Annual Growth Rate (Percent)		(at 1970-71 prices) Per Capita Income Group (Rs.)		
	U.P.	India	U.P.	India	GAP
	First Plan (1951-56)	1.9	3.6	447	508
Second Plan (1956-61)	1.9	4.0	453	559	106
Third Plan (1961-66)	1.6	2.2	450	559	109
Three Annual Plans (1966-69)	0.3	4.0	429	589	160
Fourth Plan (1969-74)	2.3	3.3	436	621	185
Fifth Plan (1974-79)	5.7	5.3	514	717	203
Sixth Plan (1980-85) (1979-80 Base)	8.7	5.3	585	775	190
Seventh Plan (1985-90) Target	6	5.0			
1985-86*	3.8	4.7	1,438	1,836	398
1986-87*	5.3	5.1	1,483	1,892	409
1987-88*	2.3	3.4	1,486	1,918	432

* At 1980-81 prices

Table D.6 Target and Achievement of Irrigation Potential created and Utilization during 1985 - 1990

Item	Unit	Base year 1984-85	Seventh Plan 1985-90		Annual Plan 1985-86		Annual Plan 1986-87		Annual Plan 1987-88		Annual Plan 1988-89		Annual Plan 1989-90	
			Target	Achivmnt	Annual Plan	Achivmnt	Annual Plan	Achivmnt	Annual Plan	Achivmnt	Annual Plan	Achivmnt	Annual Plan	Achivmnt
1. Irrigation Potential														
A. Potential created														
(i) Major and Medium Irrigation	100,000 ha	62.15	6.37	0.38	0.64	1.05	1.55	2.14	1.20					
(ii) State Minor Irrigation	100,000 ha	33.43	7.03	1.34	1.42	1.09	1.27	0.79	1.29					
(iii) Private Minor Irrigation	100,000 ha	92.59	35.00	7.10	7.30	7.67	6.13	7.43	11.21					
B. Utilization														
(i) Major and Medium Irrigation	100,000 ha	55.10	6.00	0.41	0.26	0.40	1.50	1.50	1.54					
(ii) State Minor Irrigation	100,000 ha	16.00	6.33	0.40	0.32	0.42	0.43	0.32	0.54					
(iii) Private Minor Irrigation	100,000 ha	92.59	35.00	7.10	7.30	7.67	6.13	7.43	11.21					
2. Private Tube well/Pump Sets														
a) Electrically operated	Nos	1,782,793	660,000	136,982	140,726	148,280	119,560	121,000	222,000					
b) Diesel operated	Nos	484,509	247,950	27,904	30,082	21,917	15,075	23,301	21,100					
	Nos	1,298,284	412,050	109,078	110,644	126,363	104,485	97,699	200,900					
3. Power														
(i) Installed capacity	MW	4,136	1,638	210	210	305	650	530	220					
(ii) Power generation	WU	11,331	26,428	12,226	14,740	16,581	21,483	18,853	21,858					
(iii) Villages electrified	No	63,075	25,170	4,486	4,003	4,185	2,688	2,771	2,698					
(iv) Harijan Bastis electrified	No	29,601	24,300	5,282	43	4,302	2,586	2,223	2,554					

Table D.7 Percentage Distribution of Numbers and Area of Operational Holdings in U.P.
in 1980-81 and 1985-86

Sl. Size Class No. (in hectares)	Number		Area	
	1980-81	1985-86	1980-81	1985-86
Marginal(Below 1.0 hect.)	70.56	72.60	25.68	28.29
(Below 0.5)	50.52	51.64	11.29	12.56
(0.5-1.0)	20.04	20.96	14.39	15.73
Small (1.0-2.0)	16.27	15.61	22.61	23.32
Semi Medium (2.0-4.0)	9.06	8.33	24.56	24.44
(2.0-3.0)	6.16	5.70	14.72	14.76
(3.0-4.0)	2.90	2.63	9.84	9.68
Medium (4.0-10.0)	3.71	3.17	20.97	19.14
(4.0-5.0)	1.59	1.41	7.04	6.75
(5.0-7.5)	1.59	1.33	9.47	8.48
(7.5-10.0)	0.53	0.43	4.46	3.91
Large (10.0 and above)	0.40	0.29	6.18	4.81
(10.0-20.0)	0.36	0.26	4.55	3.53
(20.0-30.0)	0.03	0.02	0.77	0.58
(30.0-40.0)	0.01	0.01	0.27	0.21
(40.0-50.0)			0.12	0.09
(50.0 and above)			0.47	0.40
Total	100.00	100.00	100.00	100.00

Table D.8 Number and Operational Holdings in Sharda Canal Command (1/2)

No. Size Class (Hect.)	NAINITAL			PILBHIT			BAREILLY			SHAHJAHANPUR			KHORI							
	Number	%	Area	Number	%	Area	Number	%	Area	Number	%	Area	Number	%	Area					
1 Below 0.02	2,306	2.0	34	0.0	1,258	0.7	20	0.0	3,883	1.1	54	0.0	3,415	1.0	37	0.0	4,311	1.0	56	0.0
2 0.02-0.5	39,408	33.8	9,120	4.3	73,078	39.2	19,496	9.0	157,675	46.2	36,693	11.0	160,801	45.1	40,051	11.4	174,261	41.1	50,711	11.8
3 0.5-1.0	19,617	16.8	14,138	6.6	41,281	22.2	28,460	13.1	74,364	21.8	52,702	15.8	82,176	23.0	57,521	16.4	111,239	26.3	76,498	17.7
Marginal (below 1.0ha)	61,331	52.5	23,292	10.9	115,617	62.0	47,976	22.1	235,922	69.1	89,449	26.8	246,392	69.1	97,609	27.9	289,811	68.4	127,265	29.5
4 1.0-2.0	21,694	18.6	31,569	14.8	39,842	21.4	54,251	25.0	59,870	17.5	83,420	25.0	65,485	18.4	90,052	25.7	78,702	18.6	107,363	24.9
Small																				
5 2.0-3.0	13,422	11.5	31,497	14.8	15,940	8.6	37,362	17.2	23,706	6.9	58,796	17.6	22,878	6.4	56,087	16.0	28,291	6.7	66,203	15.4
6 3.0-4.0	7,241	6.2	25,804	12.1	6,540	3.5	21,204	9.8	10,698	3.1	36,495	10.9	10,146	2.8	34,457	9.8	13,126	3.1	46,116	10.7
Semi Medium (2.0-4.0)	20,663	17.7	57,301	26.9	22,480	12.1	58,566	26.9	34,404	10.1	95,291	28.5	33,024	9.3	90,544	25.9	41,417	9.8	112,319	26.0
7 4.0-5.0	4,158	3.6	18,264	8.6	4,060	2.2	17,139	7.9	5,127	1.5	22,568	6.8	5,417	1.5	23,863	6.8	6,873	1.6	31,723	7.4
8 5.0-7.5	5,735	4.9	34,381	16.1	2,851	1.5	16,303	7.5	4,335	1.3	25,602	7.7	4,464	1.3	26,778	7.6	4,550	1.1	26,962	6.3
9 7.5-10.0	1,804	1.5	14,948	7.0	817	0.4	6,820	3.1	1,087	0.3	9,076	2.7	1,251	0.4	10,126	2.9	1,368	0.3	11,411	2.6
Medium (4.0-10.0)	11,697	10.0	67,593	31.7	7,728	4.1	40,262	18.5	10,549	3.1	57,246	17.1	11,132	3.1	60,767	17.4	12,791	3.0	70,096	16.3
10 10.0-20.0	1,187	1.0	14,720	6.9	564	0.3	7,135	3.3	549	0.2	6,867	2.1	666	0.2	8,315	2.4	750	0.2	9,394	2.2
11 20.0-30.0	86	0.1	2,009	0.9	48	0.0	1,136	0.5	36	0.0	864	0.3	56	0.0	1,367	0.4	86	0.0	2,002	0.5
12 30.0-40.0	38	0.0	1,300	0.6	25	0.0	865	0.4	12	0.0	421	0.1	10	0.0	338	0.1	21	0.0	720	0.2
13 40.0-50.0	15	0.0	637	0.3	9	0.0	423	0.2	5	0.0	216	0.1	4	0.0	168	0.0	17	0.0	736	0.2
14 50.0 and above	36	0.0	14,826	7.0	25	0.0	6,705	3.1	3	0.0	366	0.1	12	0.0	964	0.3	13	0.0	1,363	0.3
Large (10.0 Hect. and above)	1,362	1.2	33,492	15.7	671	0.4	16,264	7.5	605	0.2	8,734	2.6	748	0.2	11,152	3.2	887	0.2	14,215	3.3
TOTAL	116,747	100.0	213,247	100.0	186,338	100.0	217,319	100.0	341,350	100.0	334,140	100.0	356,781	100.0	350,124	100.0	423,608	100.0	431,238	100.0
Average Holding Size		1.83		1.17		1.17		0.98		0.98		0.98		1.02		1.02		1.02		1.02

Source: Number and Area of Operational Holdings, Agriculture Census in Uttar Pradesh 1985-86
Board of Revenue, Uttar Pradesh, 1990

Table D.8 Number and Operational Holdings in Sharda Canal Command (2/2)

No. Size Class (Hect.)	HARDOI			SITAPUR			UNNAO			LUCKNOW			RAE BARELI			BARABANKI								
	Number	%	Area	Number	%	Area	Number	%	Area	Number	%	Area	Number	%	Area	Number	%	Area						
1 Below 0.02	3,328	0.8	49	0.0	3,191	0.6	46	0.0	3,533	1.0	47	0.0	1,681	1.0	25	0.0	3,609	0.9	54	0.0	2,909	0.7	41	0.0
2 0.02-0.5	201,435	45.6	49,624	11.9	242,459	47.2	59,759	13.1	168,674	46.9	43,480	14.2	71,182	41.6	22,369	13.9	205,816	50.5	55,538	17.9	205,512	52.3	50,587	16.3
3 0.5-1.0	102,179	23.1	73,734	17.6	125,452	24.4	88,604	19.5	91,744	25.5	62,185	20.4	46,970	27.4	33,965	21.1	106,021	26.0	71,511	23.1	92,497	23.5	64,993	20.9
Marginal (below 1.0ha)	306,942	69.4	123,407	29.5	371,102	72.2	148,409	32.6	265,951	73.4	105,712	34.6	119,833	70.0	56,359	35.0	315,446	77.4	127,103	41.0	300,918	76.5	115,621	37.2
4 1.0-2.0	81,290	18.4	108,014	25.8	89,209	17.4	131,506	28.9	61,115	17.0	82,304	26.9	54,279	20.0	48,050	29.8	61,002	15.0	81,689	26.4	59,410	15.1	81,997	26.4
Small																								
5 2.0-3.0	28,691	6.5	66,331	15.9	31,786	6.2	72,058	15.8	19,182	5.3	44,713	14.6	10,645	6.2	25,929	16.1	17,723	4.3	41,523	13.4	18,629	4.7	43,074	13.9
6 3.0-4.0	12,094	2.7	40,998	9.8	10,783	2.1	37,787	8.3	7,332	2.0	24,944	8.2	3,370	2.0	11,473	7.1	6,944	1.7	22,871	7.4	7,237	1.8	24,718	8.0
Semi Medium (2.0-4.0)	40,785	9.2	107,329	25.7	42,569	8.3	109,845	24.1	26,514	7.4	69,657	22.8	14,015	8.2	37,402	23.2	24,667	6.1	64,394	20.8	25,866	6.6	67,792	21.8
7 4.0-5.0	5,723	1.3	24,603	5.9	5,067	1.0	23,226	5.1	3,733	1.0	16,098	5.3	1,448	0.8	6,358	3.9	3,186	0.8	14,109	4.6	3,289	0.8	14,830	4.8
8 5.0-7.5	5,031	1.1	28,717	6.9	3,941	0.8	22,953	5.0	2,936	0.8	17,363	5.7	1,162	0.7	6,613	4.1	2,276	0.6	13,590	4.4	2,640	0.7	15,762	5.1
9 7.5-10.0	1,544	0.3	12,955	3.1	1,285	0.3	10,372	2.3	933	0.3	7,867	2.6	338	0.2	2,902	1.8	608	0.1	5,084	1.6	730	0.2	6,167	2.0
Medium (4.0-10.0)	12,298	2.8	66,275	15.9	10,293	2.0	56,551	12.4	7,602	2.1	41,328	13.5	2,948	1.7	15,873	9.8	6,070	1.5	32,723	10.6	6,659	1.7	36,759	11.8
10 10.0-20.0	733	0.2	9,050	2.2	577	0.1	6,761	1.5	445	0.1	5,264	1.7	177	0.1	2,177	1.4	275	0.1	3,434	1.1	397	0.1	5,608	1.8
11 20.0-30.0	56	0.0	1,318	0.3	21	0.0	495	0.1	28	0.0	646	0.2	19	0.0	478	0.3	15	0.0	349	0.1	46	0.0	1,173	0.4
12 30.0-40.0	17	0.0	597	0.1	16	0.0	539	0.1	5	0.0	162	0.1	5	0.0	188	0.1	4	0.0	129	0.0	9	0.0	287	0.1
13 40.0-50.0	6	0.0	266	0.1	2	0.0	88	0.0	0	0.0	0	0.0	2	0.0	88	0.1	3	0.0	132	0.0	2	0.0	92	0.0
14 50.0 and above	16	0.0	1,878	0.4	2	0.0	871	0.2	5	0.0	349	0.1	5	0.0	637	0.4	0	0.0	0	0.0	4	0.0	1,281	0.4
Large (10.0 Hect and above)	828	0.2	13,109	3.1	618	0.1	8,754	1.9	483	0.1	6,421	2.1	208	0.1	3,568	2.2	297	0.1	4,044	1.3	458	0.1	8,441	2.7
TOTAL	442,143	100.0	418,134	100.0	513,791	100.0	455,965	100.0	359,665	100.0	305,422	100.0	171,283	100.0	161,232	100.0	407,482	100.0	309,953	100.0	393,311	100.0	310,610	100.0

Average Holding Size 0.95
 Number and Area of Operational Holdings, Agriculture Census in Uttar Pradesh 1985-86
 Source: Board of Revenue, Uttar Pradesh, 1990

Table D.9 Some Important Figures for Related Districts of Sharda Canal Command

District	Area (km ²)	Population (1,000)	Nos. Blocks	Nos. Holdings	Area of Holdings (km ²)	Average Holdings (ha/farm)	Net Sown Area (1,000ha)	Net Irrig. Area (1,000ha)	Irrig. Rate (%)	Length of Canal (km)	Gov. Tubewells (nos.)
1. Nainital	6,794	1137	15	116,747	2,132	1.83	201	157	78.1	1,816	241
2. Bareilly	4,120	2273	15	341,350	3,341	0.98	330	185	56.1	1,360	548
3. Pilibhit	3,499	1008	7	186,338	2,173	1.17	216	147	68.1	595	78
4. Shahjahanpur	4,575	1648	14	356,781	3,501	0.98	351	213	60.7	892	351
5. Kheri	7,680	1953	15	423,608	4,313	1.02	454	206	45.4	1,670	729
6. Hardoi	5,986	2275	19	442,143	4,181	0.95	395	243	61.5	1,310	550
7. Sitapur	5,743	2337	19	513,791	4,551	0.89	414	167	40.3	1,092	544
8. Lucknow	2,528	2015	8	171,283	1,613	0.94	144	86	59.7	656	293
9. Unnao	4,558	1823	16	359,665	3,054	0.85	286	204	71.3	1,869	149
10. Barabanki	4,401	1992	16	393,311	3,106	0.79	290	185	63.8	1,407	198
11. Rae Bareli	4,609	1887	19	407,482	3,100	0.76	266	167	62.8	2,775	371
Total	54,493	20,348	163	3,712,499	35,065	0.94	3,347	1,960	58.6	15,442	4,052

District	Total Villages	Electri-fied Villages	(%)	Average Family Size(1981)	Nos. of Gobar Gas Plant	Nos. of Cold Storages	Nos. of School	Literacy Rate (%)	Nos. of Cinema Hall	Nos. of National Bank	Other Financial Banks	Net Deposited in National
1. Nainital	1806	1518	84.1	6.0	5064	5	1746	38	24	155	26	1523
2. Bareilly	1901	1235	65.0	5.0	2505	14	1893	22	16	149	15	1247
3. Pilibhit	1198	721	60.2	6.0	1830	5	950	20	6	79	6	762
4. Shahjahanpur	2124	989	46.6	5.4	3247	17	1327	21	12	113	18	685
5. Kheri	1699	1186	69.8	5.5	2643	3	1917	18	7	181	4	159
6. Hardoi	1881	863	45.9	5.3	4273	13	2065	22	6	148	3	445
7. Sitapur	2330	938	40.3	5.0	4574	8	2139	19	8	193	3	1084
8. Lucknow	899	899	100.0	5.8	3345	28	1792	40	28	233	8	5964
9. Unnao	1687	818	48.5	5.4	2721	7	1772	25	7	122	2	698
10. Barabanki	2043	849	41.6	5.0	n.a.	n.a.	1861	19	10	136	3	437
11. Rae Bareli	1731	1715	99.1	5.0	4867	10	1618	23	7	156	0	1221
Total	19299	11731	60.8				19080		131	1665	88	14225

District	Nos. of Hospital	Nos. of Hospital per Lakh	Primary Health Centres	PHC per Lakh	Nos. of Post Office	Nos. of Telephone
1. Nainital	159	13.98	28	2.46	286	66
2. Bareilly	117	5.15	64	2.82	298	721
3. Pilibhit	56	5.56	17	1.69	137	1026
4. Shahjahanpur	64	3.88	34	2.06	275	1803
5. Kheri	76	3.89	49	2.51	363	1832
6. Hardoi	139	6.11	57	2.51	302	1074
7. Sitapur	85	3.64	40	1.71	362	1284
8. Lucknow	123	6.10	27	1.34	231	28016
9. Unnao	119	6.53	45	2.47	225	746
10. Barabanki	21	1.05	80	4.02	n.a.	n.a.
11. Rae Bareli	130	6.89	52	2.76	395	90
Total	1089	5.35	493	2.42		

Table D.10 A Ranking of District According to Various Indicators

Sl. No.	Per Capita Net Value of Output (1985-86) Rs. at 1970-71 Prices	Per Capita Agriculture Output (Rural Population) Rs. at 1982-83 Prices	Percentage Canal Irrigation Area (1986-87)	Per Ha Fertilizer Used* (kg/ha)	Average Size of Agriculture Holding (ha) 1985-86	Percentage of Small & Marginal Farmers (0-2ha) 1985-86	Value of Agriculture Output per ha (Rs.1,000)	No. of Tractor (per 1,000ha)	Literacy Rate (%) (1981)	Percentage Electrified Villages (1988-89)
1.	Pilibhit 527	Shahjahanpur 1,509	Rae Bareilly 57.44	Shahjahanpur 96	Pilibhit 1.17	Pilibhit 83.78	Pilibhit 1,743	Pilibhit 4.80	Lucknow 40	Lucknow 100.00
2.	Rae Bareilly 422	Pilibhit 1,123	Unnao 53.87	Pilibhit 91	Kheri 1.02	Kheri 87.00	Shahjahanpur 1,446	Kheri 4.20	Unnao 25.28	Rae Bareilly 99.00
3.	Shahjahanpur 399	Kheri 859	Lucknow 45.81	Kheri 90	Shahjahanpur 1.01	Shahjahanpur 87.20	Kheri 1,385	Shahjahanpur 3.00	Rae Bareilly 23.08	Kheri 59.81
4.	Kheri 398	Rae Bareilly 724	Pilibhit 40.74	Lucknow 87	Hardoi 0.95	Hardoi 88.28	Lucknow 1,198	Lucknow 1.80	Hardoi 22.19	Pilibhit 60.18
5.	Lucknow 309	Unnao 712	Hardoi 36.96	Unnao 64	Lucknow 0.90	Lucknow 89.90	Rae Bareilly 1,161	Hardoi 0.93	Shahjahanpur 21.44	Unnao 48.69
6.	Hardoi 308	Lucknow 707	Shahjahanpur 25.94	Hardoi 63	Unnao 0.85	Unnao 90.37	Hardoi 1,149	Rae Bareilly 0.90	Pilibhit 20.4	Shahjahanpur 46.60
7.	Unnao 281	Hardoi 649	Kheri 18.50	Rae Bareilly 59	Rae Bareilly 0.76	Rae Bareilly 92.38	Unnao 1,080	Unnao 0.90	Kheri 17.7	Hardoi 45.88

Remarks: *: Per ha Fertilizer Used is calculated by dividing fertilizer used amount by gross sown areas in 1987-88

Sources: 1. District Level Development Indicators, State Planning Department, Government of Uttar Pradesh, 1989
 2. G.S. Bhalla and D.S. Tyagi (1989)
 3. Sankhyakiya Patrika, Various Issues, Government of Uttar Pradesh, 1990

Table D.11 Administrative Setting of the Sarojini Nagar Study Area (1/2)

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Area(ha)	Code No.*		
Lucknow	Sarojini Nagar	Lucknow Urban		Amausi	1,645	4		
				Anaura	324	5		
				Alinagar Sunhara	499	8		
				Gauri	337	20		
				Gaharu	619	21		
				Faroukhabad Chillawan	341	35		
				Beha	115	39		
				Behsa	395	40		
				Rahimabad	381	52		
				Kurauni	Kurauni	Kurauni	719	13
			Shahpur Majhgawan		Shahpur Majhgawan	130	55	
			Saraiya		Saraiya	154	58	
			Nurnagar Bhadarsa		Nurnagar Bhadarsa	321	28	
			Chandrawal		Chandrawal	239	23	
			Kishanpur Kaudiya		Kishanpur Kaudiya	149	14	
					Jahanabad	43	24	
					Kasarwara	176	2	
				Dhawapur	111	26		
				Bibipur	Bibipur	289	41	
			Bijnaur	Meeranpur Pinwat	Meeranpur Pinwat	301	50	
				Bijnaur	Bijnaur	752	36	
				Asraf Nagar	Asraf Nagar	255	2	
				Kamlapur Ahmadpur	Kamlapur Ahmadpur	121	1	
				Alinagar Khurd	Alinagar Khurd	126	9	
				Rasulpur Itthuria	Rasulpur Itthuria	130	53	
				Natkur	Natkur	661	27	
			Mati	Mati	Mati	1,187	44	
				Bhagukhera	Bhagukhera	170	42	
				Jaiti Khera	Jaiti Khera	558	25	
				Khatola	Khatola	464	17	
				Ratauli	Ratauli	165	51	
				Neewan	Neewan	512	29	
				Makudumpur Kaithi	Makudumpur Kaithi	349	46	
			Meraura	Meraura	360	47		
			Kalli Paschim	Parvar Paschim	Parvar Paschim	910	31	
				Parvar Purab	Parvar Purab	515	32	
			Banthara	Khande Dev	Khande Dev	521	1	
				Banthara Sikandarpur	Banthara Sikandarpur	696	10	
				Paharpur	Paharpur	180	9	
				Saray Shahzadi	Saray Shahzadi	250	22	
				Bani	Bani	181	11	
			Amausi	Andhpur Dev	Andhpur Dev	260	7	
			Bhatgaon	Aurawan	Aurawan	241	11	
			Mohanlal Ganj	Bhaundari	Bhaundari	Bhaundari	682	24
					Uttar Gaon	Uttar Gaon	540	1
					Dhanuwa Saand	Dhanuwa Saand	444	57
					Bhasanda	Bhasanda	493	9
					Bhadeswa	Bhadeswa	643	55
					Dchawa	Dehawa	370	80
				Sisendi	Sisendi	Sisendi	754	41
					Kodra Raipur	Kodra Raipur	339	44
					Dewaria Bharosava	Dewaria Bharosava	403	56
	Meeranpur	Meeranpur			216	48		
		Meenapur	Meenapur	287	47			
		Salsamau	Salsamau	538	42			
		Bhilampur	Bhilampur	97	13			

Table D.11 Administrative Setting of the Sarojini Nagar Study Area (2/2)

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Area(ha)	Code No.*		
Lucknow	Mohanjai Ganj	Gautam Khera	Gautam Khera	Gautam Khera	216	25		
			Gobind Pur	Gobind Pur	650	28		
			Kusmaura	Kusmaura	416	43		
			Jabrauli	Jabrauli	1,000	18		
			Paraspur Thatha	Paraspur Thatha	n.a.	14		
			Baraulia	Baraulia	423	53		
			Dayalpur	Raghunath Khera	Raghunath Khera	285	40	
					Madari Khera	90	45	
				Akbar Beniganj	Akbar Beniganj	201	50	
				Virsinghpur	Virsinghpur	313	52	
		Mangtaiyya		Mangtaiyya	439	46		
		Sirs		Sirs	522	22		
				Harinam	n.a.	-		
		Dayalpur	Dayalpur	730	37			
			Bhajanmau	86	54			
			Rati	Rati	434	39		
			Hules Khera	Gaura	Gaura	1,055	103	
		Unnao	Asoha	Chaupai	Chaupai	Chaupai	523	67
					Neemtikar	Neemtikar	164	86
					Majharia	Majharia	142	81
Vilaura	Vilaura				324	65		
Dundiathar	Dundiathar				162	71		
	Gondwa			103	75			
Darehata	Darehata			Darehata Achali	89	69		
				Darehata Mahant	73	70		
				Makhdumpur	41	83		
				Gaddipur	65	82		
	Chilauli			Chilauli	218	68		
				Keelpur	70	79		
	Gomapur			Gomapur	170	74		
				Padmanpur	63	88		
	Paharpur			Paharpur	164	87		
	Lakshipur			Lakshipur	159	80		
Gyanpur	Gyanpur			Gyanpur	139	72		
				Barha	n.a.	-		
	Ograpur			Ograpur	209	92		
	Nawabganj			Gorinda	Tenduva Hirankuddi	Tenduva Hirankuddi	198	16
			Benduva		33	32		
Balahaomau		Balahaomau	242		30			
Paraura		Paraura	103		23			
Shekhpur		Shekhpur	163		59			

Remarks: *: Code No. of revenue villages correspond to those of Milan Kasara.

Note: Sarojini Nagar Study Area is composed of the following administrative components:

District	2
Block	4
Nyaya Panchayat	16
Gaon Sabha	75
Revenue Village	107
Total Area (ha)	33,145

Table D.12 Administrative Setting of the Sataon Study Area

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Code	
					Area (ha)	No.*
Rae Bareli	Sataon	Korihar	Korihar	Korihar	1,536	7
			Malikmau Chaubara	Malikmau Chaubara	395	48
			Purai	Purai	797	38
			Chandwal	Chandwal	117	16
			Hajipur	Hajipur	783	69
		Sataon	Sataon	Sataon	1,180	58
			Onai Paharpur	Onai Paharpur	386	5
			Khusrupur	Gambhirpur	80	13
				Khusrupur	106	10
				Husepur	65	68
			Konsa	Chak Nasirpur	16	15
				Konsa	2,870	6
			Bardar	Bardar	1,028	45
			Bankat	Bankat	114	46
			Nirashapur	Nirashapur	130	33
		Garhi Dula Rai	Garhi Dula Rai	n.a.	-	
		Sahjaura	Manpur	Manpur	118	47
	Hardaurpur			72	70	
	Shekhapur			123	56	
	Gauri Sataon		Gauri Sataon	76	14	
	Domapur		Domapur	198	29	
	Raula	Raula	202	50		
	Kheero	Paho	Paho	866	47	
Kheero		Baraula	195	52		
Bhitargaon		Basigava	Basigava	224	57	
		Bhitargaon	Bhitargaon	1,318	60	
		Rampur Majara	139	72		
Chandemau	Chandemau	172	27			
Naugava	Naugava	122	45			
Unnao	Hilauli	Mavai	Mavai	Mavai	2,708	23
			Sarai Mubarak	Sarai Mubarak	235	66
			Khanpur	Khanpur	211	60
				Chhibipur	53	50
			Galibpur	Galibpur	361	56
			Rajwada	Rajwada	515	65
			Indaura	Indaura	241	13
		Akohari	Akohari	Akohari	2,584	2
			Ahesa	Ahesa	636	1
		Gulariha	Gulariha	Gulariha	2,768	11
				Nari Chak	521	25
				Basari	496	8
				Lotna	526	19
				Jai Singh Khara	272	14

Remarks: *: Code No. of revenue villages correspond to those of Milan Kasara.

Note: Sataon Study Area is composed of the following administrative components:

District	2
Block	3
Nyaya Panchayat	9
Gaon Sabha	30
Revenue Village	43

Total Area (ha) 25,555

Table D.13 Administrative Setting of the Sursa Study Area (1/2)

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Code	
					Area(ha)	No.*
Hardoi	Sursa	Sursa	Sursa	Sursa	257	48
			Bahraiya	Bahraiya	271	19
			Umrapur	Umrapur	541	3
			Sarsaiya	Sarsaiya	328	31
			Turtipur	Turtipur	794	10
			Newada	Newada	150	14
			Khajurahara	Khajurahara	2,132	43
		Kasrawan	Kasrawan	Kasrawan	682	42
			Bahloli	Bahloli	195	65
			Saraiya	Saraiya	150	72
			Ghosar	Ghosar	279	62
			Fardapur	Fardapur	110	39
			Asauli	Asauli	381	40
			Tashkhera	Tashkhera	123	79
				Rajepur	131	81
			Sikandarpur	Sikandarpur	165	58
				Barbatapur	48	80
		Nanamau		37	38	
		Marhiya		48	54	
		Sathra	Sathra	Sathra	518	57
			Gurra	Gurra	27	51
			Sarra	Sarra	590	56
			Shahabuddinpur	Shahabuddinpur	646	55
			Akhnapur	Akhnapur	135	49
			Madhopur	Madhopur	180	47
			Ghamoiya	Ghamoiya	65	52
			Peng	Peng	368	53
		Kauthalia	Kauthalia	168	50	
		Bhainamau	Bhainamau	Bhainamau	430	68
			Barauwa	Barauwa	278	18
			Pachkohra	Pachkohra	331	63
			Singhwamau	Singhwamau	340	73
			Keharmau	Keharmau	n.a.	59
				Seharmau	44	71
			Abdulpur	Abdulpur	168	78
			Lalpur	Lalpur	576	70
		Mehuna Maheshpur	Mehuna Maheshpur	274	69	
		Pahutera	Bannapur	Bannapur	683	64
			Sohariya	Sohariya	853	74
			Matuwa	Matuwa	269	77
			Bhilawan	Bhilawan	324	67
		Andharra	Andharra	Andharra	693	2
			Tundwal	Tundwal	706	11
			Dahigawan	Dahigawan	219	12
			Dhinni Tasaura	Dhinni Tasaura	378	9
			Ainchamau	Ainchamau	451	4
			Tikri	Tikri	270	8
			Daheti Salkupur	Daheti Salkupur	381	17
			Dalelpur	Dalelpur	427	13
		Sauntera	Sauntera	Sauntera	927	32
Odra Pachlai	Odra Pachlai		1,062	5		
Mahura Kalan	Mahura Kalan		365	27		
Bikapur	Bikapur		634	21		
Achhramaau	Achhramaau		298	1		

Table D.13 Administrative Setting of the Sursa Study Area (2/2)

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Arca(ha)	Code No.*	
Hardoi	Sursa	Marsa	Marsa	Marsa	907	25	
			Gangapur	Gangapur	333	61	
			Harha	Harha	217	75	
				Bhawanipur	133	66	
			Hathiai	Hathiai	157	76	
			Arangapur	Arangapur	346	6	
			Kair Mair	Kair Mair	177	83	
			Bhataura	Bhataura	138	23	
			Meoni	Meoni	814	26	
			Bhadaicha	Bhadaicha	Bhadaicha	863	45
				Bausara	Bausara	461	22
		Malihamau		Malihamau	753	46	
		Odra Newalia		Odra Newalia	470	41	
		Dholia		Dholia	256	36	
		Jura		Jura	708	44	
		Deoriya		Deoriya	128	37	
		Fatihapur	Hosiapur	Hosiapur	562	33	
			Kamrauli	Kamrauli	249	7	
			Birahimpur	Bhittha	124	24	
		Ahirori	Wallipur	Wallipur	Wallipur	760	60
				Waishpur	Waishpur	59	62
					Jarera	47	34
				Anuwan	Anuwan	115	74
					Danmandi	132	37
	Karahi			Karahi	275	18	
	Khajurmai			Khajurmai	329	20	
	Punniyan			Punniyan	315	50	
	Faridapur			Faridapur	802	51	
	Pipona			Pipona	354	61	
	Daudpur			Daudpur	125	63	
Bamhnakhera	Bamhnakhera	n.a.	65				

Remarks: *: Code No. of revenue villages correspond to those of Milan Kasara.

Note: Sursa Study Area is composed of the following administrative components:

District	1
Block	2
Nyaya Panchayat	11
Gaon Sabha	76
Revenue Village	85
Total Area (ha)	32,009

Table D.14 Administrative Setting of the Purwa Study Area (1/2)

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Code		
					Area (ha)	No.*	
Unnao	Purwa	Behta Bhawani	Jajanpur	Jajanpur	96	5	
			Sijni Sohramau	Sijni Sohramau	Sijni Sohramau	262	12
		Ghinakhera		Ghinakhera	123	95	
		Rawatpur		Rawatpur	145	102	
		Adhauri		Adhauri	173	105	
		Manjhawan Sewak		Manjhawan Sewak	113	9	
		Rasulpur		Rasulpur	128	11	
		Tewaria		Tewaria	150	13	
		Bhatmau		Bhatmau	230	2	
		Muraita		Muraita	246	10	
		Garha Kola		Garha Kola	171	4	
		Afsari		Afsari	151	104	
		Chamiyani		Chamiyani	Chamiyani	1,075	3
				Seer Sahab Lal	Seer Sahab Lal	n.a.	-
			Salethu	Salethu	345	14	
			Kathar	Kathar	145	109	
			Dhirji Khera	Dhirji Khera	93	44	
			Chak Jamalpur	Chak Jamalpur	104	43	
			Achal Khera	Achal Khera	145	35	
			Ahamadabad Grunt	Ahamadabad Grunt	78	37	
			Bishun Khera	Bishun Khera	362	42	
			Tripurarapur	Tripurarapur	1,059	68	
		Tripurarapur	Tripurarapur	Tripurarapur	1,059	68	
			Kishan Khera	Kishan Khera	151	6	
			Chandi Garhi	Chandi Garhi	127	58	
			Seer Kaaley Khan	Seer Kaaley Khan	21	62	
			Bharthi Garhi	Bharthi Garhi	57	61	
			Kalyanpur	Kalyanpur	59	60	
			Tikar Kalan	Tikar Kalan	307	66	
			Tikar Khurd	Tikar Khurd	206	67	
			Beval Mansa Khera	Beval Mansa Khera	308	1	
			Maharamau	Maharamau	289	8	
		Pakra Buzurg	Lakhmande Mau	Lakhmande Mau	328	7	
			Pakra Buzurg	Pakra Buzurg	458	97	
			Panhan	Panhan	92	98	
			Purandarapur	Purandarapur	198	99	
			Baijuamau	Baijuamau	176	94	
			Ramkhera	Ramkhera	66	101	
			Mamrejpur	Mamrejpur	454	96	
		Mohiuddinpur	Raghunathpur	Raghunathpur	146	100	
			Turkaha	Turkaha	118	103	
			Mohiuddinpur	Mohiuddinpur	471	82	
			Pinjra	Pinjra	334	91	
			Asgarganj	Asgarganj	49	81	
			Darchata	Darchata	372	86	
			Topra	Topra	248	92	
			Nayagaon	Nayagaon	150	90	
Chandrasena	Chandrasena		144	85			
Muraita	Muraita		237	89			
Bhitauli	Kodra	Kodra	284	88			
	Bhitauli	Bhitauli	177	84			
	Bataumau	Bataumau	105	83			

Table D.14 Administrative Setting of the Purwa Study Area (2/2)

District	Block	Nyaya Panchayat	Gaon Sabha	Revenue Village	Area (ha)	Code No.*	
Unnao	Purwa	Bhopatpur	Bhopatpur	Bhopatpur	491	75	
				Shanker Chak	16	76	
				Aschru	Asehru	291	72
					Patti Sukhnandan	109	55
				Fatehganj	Fatehganj	160	46
					Suee Khera	n.a.	-
				Kasroar	Kasroar	556	50
				Kasba Pachim	Kasba Pachim	418	54
					Durgapur	n.a.	-
					Gulab Wari	n.a.	-
					Kasba Rama Himmat	458	56
					Kasba Bhawanipur	362	57
			Bhadnang	Bhadnang	Bhadnang	575	41
					Badey Khera	190	39
				Dela	Dela	82	79
				Basnoha	Basnoha	135	77
				Tusroar	Tusroar	221	69
					Chhulamau	169	78
					Bachholia	39	70
				Banigaon	Banigaon	754	40
				Himmatpur	Himmatpur	85	87
				Jamurpur	Jamurpur	260	93
			Mirjapur Sumahari	Simrimau	Simrimau	142	64
	Atwa	Atwa		55	38		
	Hilauli	Akohari	Jera	Jera	518	15	
			Patewala Dasi	Patewala Dasi	204	28	
	Sumelpur	Khijauli	Khijauli	Khijauli	216	4	
			Pakra Khurd	Pakra Khurd	451	7	
			Baruo	Saraiyan	149	8	
Rae Bareli	Kheero	Aindhi	Aindhi	Aindhi	384	7	
				Dandanpur	n.a.	-	
			Jeri	Jeri	407	32	
			Sheopuri	Sheopuri	223	79	

Remarks: *: Code No. of revenue villages correspond to those of Milan Kasara.

Note: Purwa Study Area is composed of the following administrative components:

District	2
Block	4
Nyaya Panchayat	12
Gaon Sabha	63
Revenue Village	84

Total Area (ha) 19,274

Table D.15 Socio-Economic Indicators of Major Blocks in Representative Areas as of 1987/88

Sl. No.	Sarojini Nagar	Mohanlal Ganj	Saton	Hilauti	Sursa	Purwa
POPULATION:						
1. Area (km ²)	212	260	235	316	323	348
2. Total Population of the Block	169027	135824	98771	94686	121674	130500
3. Population Density Per Square Km	797.3	522.4	420	300	376.7	375
4. Percentage of total Labours in Population	30.5	29.6	30.2	29.5	30.5	28.3
5. Percentage of Agriculture Labours in total Labours	75.1	84.9	86.3	96	93.3	90.5
6. Percentage of Literate Persons in Total Population	28	23.9	26.2	19.1	19.5	27.3
7. The Rate of Increasing Population Per Decades Against Total Population	32.1	15.69	23.37	10.78	22.46	1.5
8. Total No. of Junior Basic School Per Lakh Population	65.7	93.1	67.9	71.2	74.1	94.2
9. Total No. of Higher Secondary School Per Lakh Population	1.8	2.9	3	0	2.5	1.2
10. Average Population Per Branch of a Professional Bank	15367	16980	18410	26139	20219	28662
HEALTH:						
1. No. of Allopathic Hospitals/Dispensaries and Primary Health Centers Per Lakh Population	4.1	5.2	2	1	3.3	3.5
2. No. of Available Beds in Allopathic Hospitals/Dispensaries and health Centre Per Lakh Population	84	7.4	10.1	3.8	13.1	14
3. No. of Primary Health Centre Per Lakh Population	1.8	3.7	2	1	3.2	3.5
4. Development Blockwise Allopathic Clinic Center in Block						
A. No. of Hospitals and dispensaries	4	2	0	0	0	0
B. Primary Health Center	3	5	2	1	4	3
C. Available Beds in All Above	142	10	10	4	16	12
5. Development Block Wise Ayurvedic, Yunani and Homioepthic Clinic Center						
A. Ayurvedic Hospitals and Dispensaries	3	3	5	3	3	0
B. No. of Available Beds	12	33	20	8	12	0
C. No. of Doctors	3	4	5	3	4	0
D. Yunani Hospitals and Dispensaries	1	1	0	0	0	2
E. Available Beds in all Yunani Dispensaries	4	4	0	0	0	4
F. No. of Doctors Working in Yunani Dispensaries	1	1	0	0	1	2
INDUSTRIES:						
1. Cottage Industries	725	491	433	291	319	504
2. Industries Development Block Wise Running Factoties	0	0	0	0	0	0
3. Factories From Which Returns Were Receiver	76	1	0	0	0	0
4. Average Daily Workers And No. of Workers	7493	15	0	0	0	0
ANIMAL HUSBANDRY:						
1. No. of Animal Husbandry, Forestification, Plantation	0	0	0	0	0	0
2. Total Number of Animal Service Center	4	5	2	2	4	2
3. Total Number of Artificial Fertilizer Center/Sub-Center	6	7	5	2	3	2
PHYSICAL INFRASTRUCTURE:						
1. Length of Pucca Road [In Km.] Constructed by P.W.D. Per Lakh Population	77	63	70.9	30.5	44	84.44
2. Length of Pucca Road [In Km.] Constructed by P.W.D. Per Thousand Square Km.	613	327	297.7	238.4	238.4	198
3. No. of Police Stations Block-Wise	2	2	1	0	1	0
4. No. of Post Offices Block Wise	19	16	21	8	16	13
5. No. of Telephones Block Wise	0	41	29	0	0	0
6. No. of Telegraph Centers Block Wise	2	2	0	0	0	0
7. No. of Public Call Office Block Wise	2	3	6	0	2	0
8. Development Block Wise Transpon						
A. No. of Railway Stations	4	3	0	0	1	0
B. No. of Bus Stations/Bus Stops	5	9	8	1	4	4
9. No. of Electrified Villages in Block [According to Central Electric Authority Definition]	106	112	69	42	35	47
10. i- No. of Electrified Villages of the Block in which L.T. Mains is Available	93	67	54	24	25	33
ii- The Percentage of Electrified Villages to Total Residential Villages	100	100	100	61.8	43.9	47
11. No. of Private Pumpset and Tube-Wells which are Powered	1062	310	1637	349	80	348
12. Total No. of Villages	106	113	70	68	83	112
13. No. of Residential Villages	90	112	69	68	82	100
14. Total No. of Residential Houses	29998	25086	17153	18494	20871	14254
15. Total No. of Families	32644	27436	19156	19892	25636	16542
16. Total No. of Rationing Shops	29	47	17	19	52	19
17. No. of Village Development Officers	15	15	19	12	12	10
18. Number of Villages With Drinking Water Source from Wells	90	112	0	0	82	0
19. The Condition of Drinking Water Facility In Blocks						
A. Water Supply By Hand Pump In Villages [Total]	0	0	69	0	40	0
B. Effected Population	0	0	69000	0	20000	0
C. No. of Village Where Used General Utilized Source of Water Supply By Hand Pumps	0	0	0	0	0	0

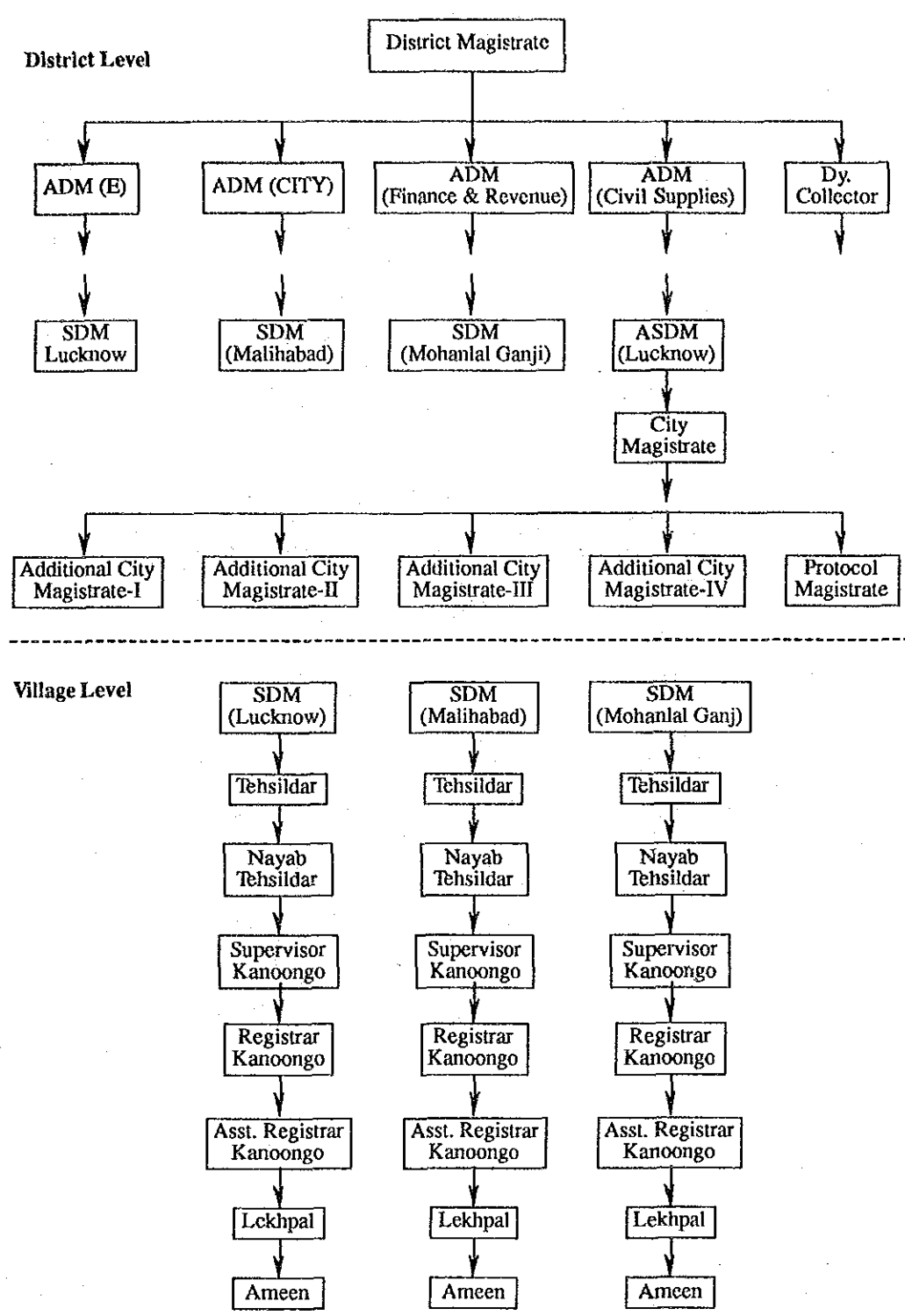
Source:- Statistics Patrika, U.P. State Planning Deptt.

Table D.16 Economic and Social Infrastructure (1988-89)

	Sarojani Nagar	Mohanlal Ganj	Sataon	Hilauli	Sursa	Purwa
1. No. of Recognised Institutions For Education In Development Block Wise						
A. Junior Basic School	111	124	67	76	91	81
B. Senior Basic School	19	15	18	26	20	18
C. High-School & Intermediate School	3	4	3		3	1
2. No. of Students In Recognised Institutions According to Class Standard.						
A. Class 1 To 5						
Total Boys	12,110	10,025	7,185	7,308	9,659	7,390
Total Girls	6,790	4,095	4,182	5,738	5,493	5,092
B. Class 6 To 8						
Total Boys	3,265	2,672	2,975	1,601	3,017	3,127
Total Girls	720	515	927	442	561	1,505
C. Class 9 To 12						
Total Boys	810	1,450	2,072		2,300	395
Total Girls	90	50	512		40	32
3. No. of Teachers In Teaching Institutes Which Are Recognised.						
A. In Junior Basic School	340	357	344	214	253	279
B. In Senior Basic School	81	61	90	55	56	75
4. No. of Allopathic Primary Health Centre.	3	5	2	1	4	3
5. No. of Ayurvedic Clinic Centre	3	3	5	3	3	
6. Loan Co-Operative Union For Agriculture (Primary) In Block Wise						
A. Total No.	13	14	8	9	14	11
B. No. of Members	12,893	7,235	15,998	8,820	15,500	9,070
C. Share Capital In Rs.	865	512	801	768	900	616
7. Distribution of Loan In The Year						
A. Short Term	2,590	886	2,280	2,175	1,450	2,131
B. Medium Term	590	114	62	1,276	206	398
C. Long Term	2,400	1,740			752	
8. Number of Co-Operative Banks Branch	1	1	1	1	1	
9. No. of Nationalized Banks Branch	11	8	2	1	1	
10. No. of Rural Area Bank			4	2	5	2
11. Number of Veterinary Hospital In Development Block Wise	3	3	3	2	2	1
12. Fisheries Area In Hac.	7		32	3		80
13. Production of Fish (QTLS.)	6	35				

SOURCE : VARIOUS ISSUES OF "SANKHYAKIYA PATRIKA", STATE PLANNING

FIGURES



NB: ADM: Additional District Magistrate
SDM: Sub-Divisional Magistrate

Fig. D.1 Administrative Organizations:
District Administration
(Mostly Typical - but Specific to Lucknow)

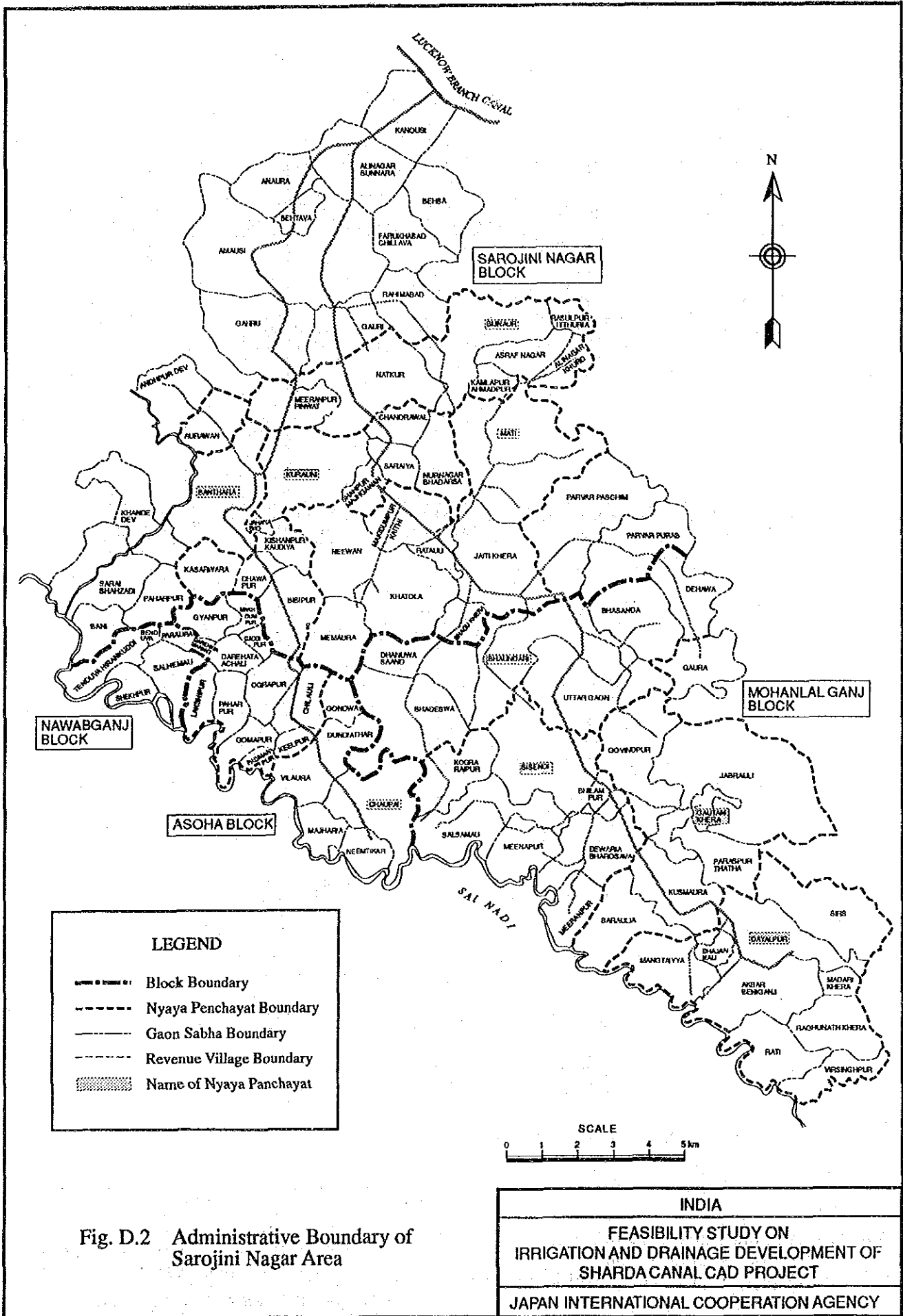


Fig. D.2 Administrative Boundary of Sarojini Nagar Area

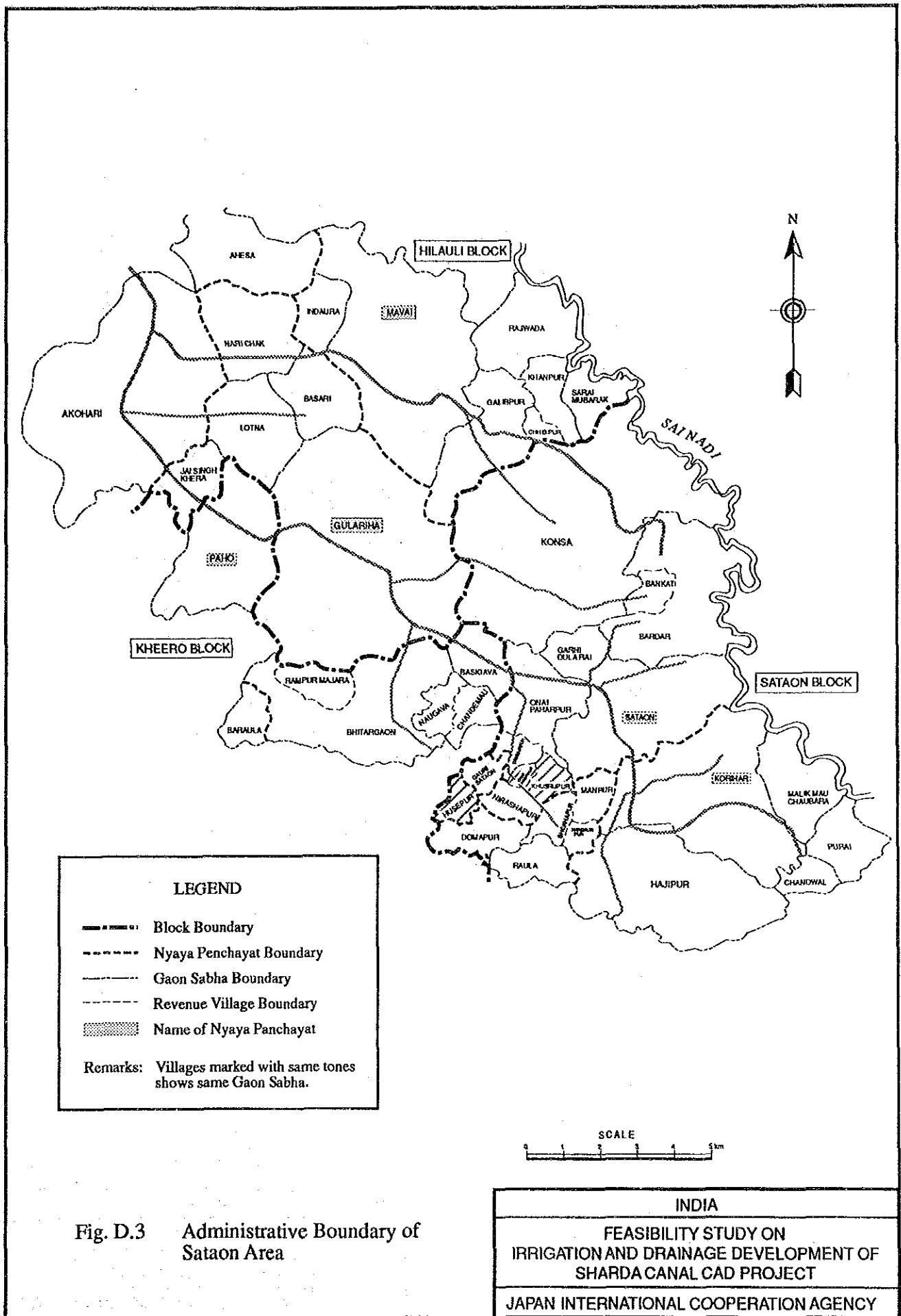
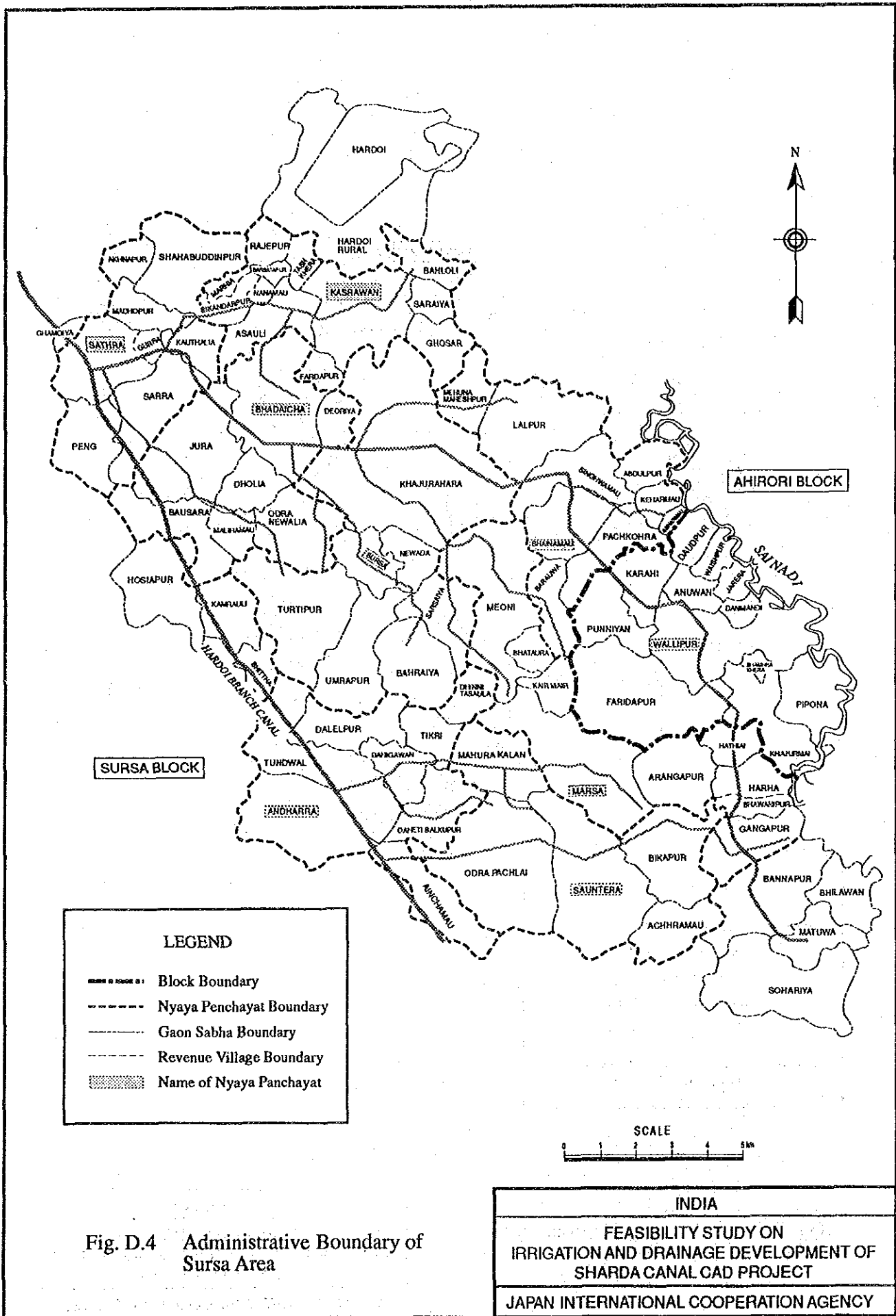
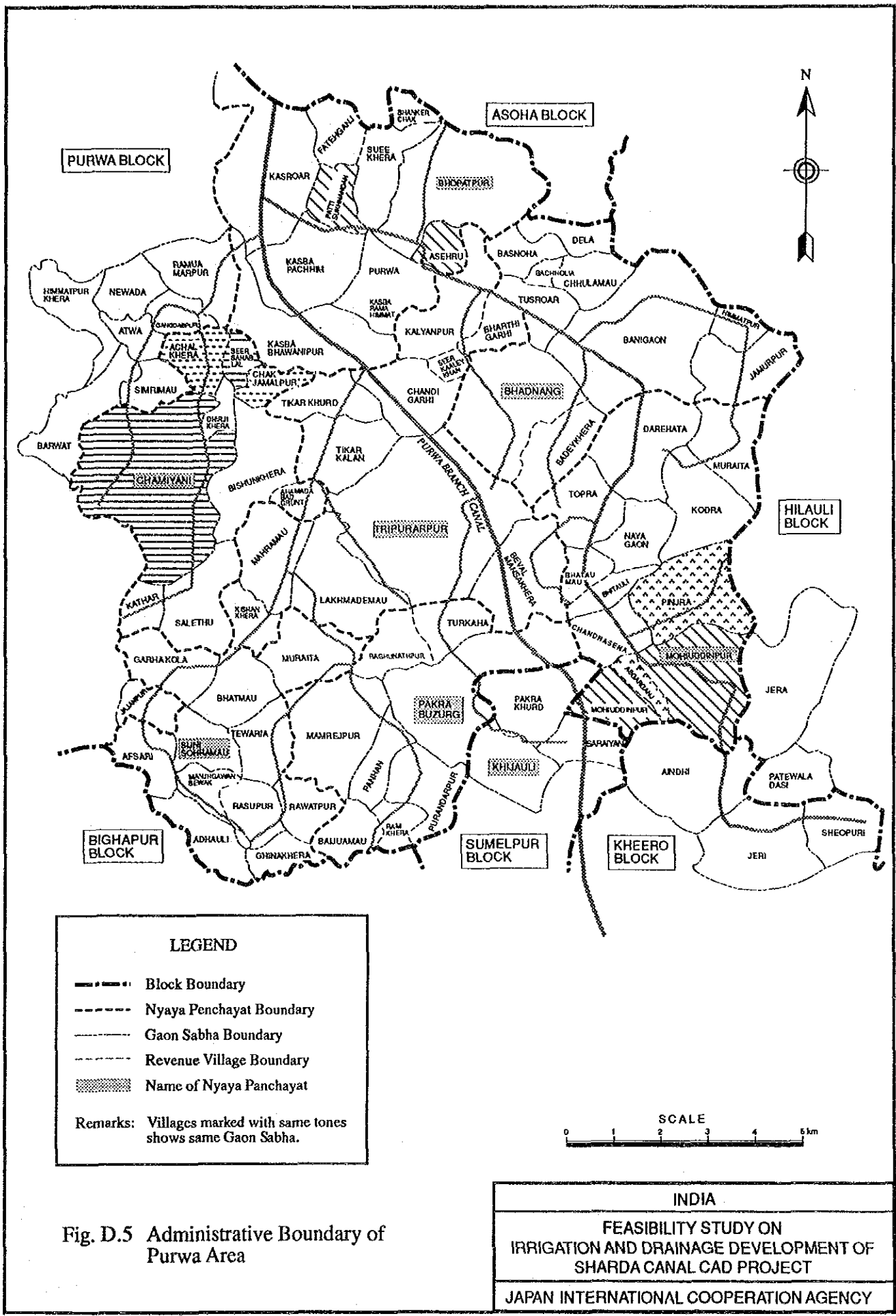


Fig. D.3 Administrative Boundary of Sataon Area





LEGEND

- +—+— Block Boundary
- - - - - Nyaya Panchayat Boundary
- Gaon Sabha Boundary
- Revenue Village Boundary
- ▨▨▨▨▨ Name of Nyaya Panchayat

Remarks: Villages marked with same tones shows same Gaon Sabha.

SCALE
0 1 2 3 4 5 km

Fig. D.5 Administrative Boundary of Purwa Area

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

ANNEX-E
AGRICULTURE

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

ANNEX E
AGRICULTURE

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ANNEX E AGRICULTURE

1. Present Agricultural Setting of Sharda Canal Command Area

1.1 Agricultural Land Use

The percentage share of each land use category in the total geographical area of the consisting districts of the Sharda Canal Command Area is shown in Table E.1 and summarized as below.

Unit: %

District	Net Sown Area	Irrig. Area	Current Fallow	Other Fallow	Culturalble Waste	Tree Garden	Pasture Lands	USAR Unculturable	Forest	Other Lands
1 Nainital (68,522 ha)	72.5	82.0	1.1	2.3	9.3	0.5	0.0	0.9	8.8	4.6
2 Pilibhit (309,372 ha)	69.8	67.8	2.5	1.3	2.4	0.5	0.1	1.6	12.5	9.2
3 Bareilly (260,465 ha)	81.4	99.9	2.4	1.5	0.7	0.3	0.1	2.7	0.1	10.8
4 Shahjahanpur (396,539 ha)	78.1	94.6	4.5	2.3	1.2	1.1	0.3	2.0	2.4	8.0
5 Kheri (364,632 ha)	75.8	68.1	5.5	1.0	0.6	0.8	0.3	1.7	4.2	10.0
6 Hardoi (598,817 ha)	64.4	62.0	11.9	4.4	4.1	2.2	0.9	3.3	1.2	7.5
7 Sitapur (567,164 ha)	72.8	40.2	8.7	3.0	1.7	1.2	0.1	1.4	0.9	10.1
8 Lucknow (215,840 ha)	60.8	99.9	10.2	5.2	4.2	2.3	1.5	4.7	3.0	8.1
9 Unnao (458,519 ha)	62.6	71.0	8.8	5.9	3.9	1.7	0.8	4.5	3.4	8.4
10 Rae Bareli (149,762 ha)	61.5	99.0	8.0	5.5	5.8	4.3	0.4	5.1	0.5	8.9
11 Barabanki (30,074 ha)	64.9	64.8	8.2	6.7	4.2	3.3	0.7	1.3	1.3	9.4
Total (3,419,706 ha)	70.0	72.1	7.3	3.3	2.7	1.5	0.5	2.7	3.1	8.9

Source: Reporting Area According to the Cadastral Survey

70% of the total area of the Sharda Canal Command (3.42 million ha) is net cultivated land, of which approximately 72% is irrigated. Total fallow area shares more than 10% of the total area. Tree/garden land and pasture land occupies only 2% in total. Barren but arable land and usar/uncultivable land occupies small area of about 3% each. Forest accounts for no more than 3%.

The following tendency are seen from the above table:

- a) "Net cultivated area" and "Irrigated area" in the southern area are lower
- b) "Fallow" and "Barren but arable land" occupy larger extent in the southern area
- c) "Usar/uncultivable land" occupies 1% to 3% of the total area in the northern districts, while 3% to 5% in the southern districts including Hardoi, Lucknow, Unnao and Rae Bareli.

Land use in the Hardoi Branch Command Area (1,593,000ha) shows almost the same percentage as that of the Sharda Canal Command. "Net cultivated area" occupies 64% (1,023,000ha), of which "Irrigated area" is 76% (779,000ha). "Fallow land" is 14% (218,000ha) of the total area, "Garden and tree land" occupies 3% (45,000ha) in total, while "Usar/uncultivable land" and "Barren but arable land" account for 3.9% and 3.6% respectively, which are a little bit higher percentage than those of the Sharda Canal Command.

1.2 Cultivated Crops

Two croppings a year is common practice in the Sharda Command Area. Cropped area and irrigated area of cultivated crops in each cropping season in the Area by blocks are shown on Tables E.2 and E.3, and summarized below.

Cropping of Kharif Crops

District	Kharif Total		Paddy		Other Cereals		Pulses		Oilseeds		Others	
	Total (ha)	Irrig. (ha)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)
Nainital	41,539	25,037	97.4	99.6	2.0	0.3	0.3	0.1	0.2	0.0	0.2	0.0
Pilibhit	128,093	106,037	92.2	99.5	2.1	0.2	4.3	0.3	1.1	0.0	0.4	0.0
Bareilly	125,294	70,433	77.5	99.8	13.6	0.1	3.2	0.1	5.6	0.0	0.0	0.0
Shahjahanpur	168,446	103,277	78.2	99.2	11.1	0.4	8.6	0.4	2.0	0.0	0.0	0.0
Kheri	118,563	60,619	78.6	99.1	6.5	0.4	9.9	0.4	4.9	0.1	0.1	0.0
Hardoi	168,075	32,997	26.7	82.0	48.1	10.2	18.9	4.7	6.2	2.6	0.1	0.5
Barabanki	14,172	4,070	83.1	86.7	7.8	2.1	9.0	11.2	0.1	0.0	0.0	0.0
Sitapur	210,749	24,467	58.2	90.1	20.2	0.2	15.4	7.8	5.9	0.4	0.3	1.4
Lucknow	59,002	27,266	56.0	92.6	23.6	1.5	19.3	5.8	1.1	0.1	0.0	0.0
Unnao	178,616	75,926	53.8	98.4	31.3	0.8	11.5	0.8	3.4	0.0	0.0	0.0
Rae Bareli	44,151	19,484	50.8	93.7	20.5	0.2	25.4	6.0	3.2	0.1	0.1	0.0
Total	1,256,700	549,613	64.6	97.2	19.9	1.0	11.5	1.5	3.9	0.2	0.1	0.1

Farmers start cultivating "Kharif" crops usually in June when intense rainfall is observed. As irrigation water is not sufficient in general, especially in lower reach of the Command Area, they sometimes suffer from delay of planting time when monsoon starts late.

Paddy is a predominant Kharif crop in all districts but the Hardoi district where other cereals like maize is rather important. Paddy area accounts for more than 75% of the total Kharif cropped area in upper reach districts of the Sharda Canal System while 50 to 60% in lower reach districts. Pulses including black/green gram and pignon pea are relatively important in lower reach districts. Hardoi district is characterized by its low cropping intensity of paddy. Other crops are sorghum, millet, groundnuts, sesame, etc.

Irrigation rate varies among districts, ranging from 11.6% for Sitapur to 82.8% for Pilibhit. Important irrigated crop is by far paddy which require much water than other crops.

Cropping of Rabi Crops

District	Rabi Total		Wheat		Barley		Pulses		Oilseeds		Potatoes	
	Total (ha)	Irrig. (ha)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)	Total (%)	Irrig. (%)
Nainital	38,249	29,850	86.4	98.9	0.5	0.1	8.5	0.6	4.3	0.3	0.2	0.1
Pilibhit	140,359	124,845	88.4	95.2	0.3	0.1	6.1	0.5	4.4	3.3	0.8	0.9
Bareilly	129,682	103,592	80.6	94.4	0.8	0.2	13.7	1.4	2.9	1.6	1.9	2.4
Shahjahanpur	213,879	183,109	81.8	93.0	1.4	0.6	11.8	1.8	3.6	2.9	1.5	1.7
Kheri	149,836	118,421	81.2	92.6	1.8	0.6	10.3	0.8	6.0	5.1	0.7	0.9
Hardoi	293,025	239,004	76.0	90.0	5.2	2.2	12.1	1.9	3.8	2.5	2.8	3.5
Barabanki	12,723	11,973	85.1	90.2	2.4	0.6	4.2	1.3	1.4	0.6	6.8	7.3
Sitapur	234,161	137,234	75.3	93.5	5.5	1.3	14.3	1.8	3.4	1.1	1.4	2.3
Lucknow	87,372	75,787	79.5	88.6	3.2	1.2	10.0	2.1	1.0	0.8	6.3	7.3
Unnao	200,562	157,334	75.7	91.3	8.2	3.2	11.6	1.8	2.6	1.2	1.9	2.5
Rae Bareli	65,263	51,476	76.9	94.2	8.7	2.9	10.8	1.5	2.0	1.5	1.6	0.0
Total	1,565,111	1,232,625	79.2	92.4	3.9	1.3	11.4	1.5	3.5	2.3	2.0	2.4

"Rabi" crop cultivation starts in November after harvesting "Kharif" crops. Sowing time, however, is delayed due to stagnant water in areas where drainage condition is bad. Late sowing often results in getting less amount of products because of infavorable temperature in maturing periods.

Wheat is a predominant crop in Rabi season. It accounts for about 80% of the total Rabi cropped area. Barley is relatively important in the lower reach of the Command Area, which may reflects the extent of the Usar area. Next important crop is pulses such as gram,

lentils and pea. Potatoes are also cropped mainly in the lower reach of the Area. Major oilseed crops cultivated are mustard, rapeseeds and linseed.

Overall irrigation rate in Rabi season is 79% for the whole Area. Wheat is predominantly irrigated among the cultivated crops.

Zaid crops are cultivated in a season between Rabi and Kharif. Being hot and dry, however, crop species and area are limited. Irrigation is prerequisite to grow crops in this season. Cultivated crops are sunflower, potatoes, vegetables, etc.

(Unit: ha)

District	Total		Sugarcane	
	Arable Land	Total	Share(%)	Irrigated (%)
Nainital	45,698	7,318	16.0	54.9
Pilibhit	173,756	47,453	27.3	78.9
Bareilly	163,980	34,881	21.2	87.5
Shahjahanpur	243,808	32,093	13.2	93.9
Kheri	204,661	77,287	37.8	70.6
Hardoi	327,087	23,420	7.2	79.9
Barabanki	15,651	1,013	6.5	88.5
Sitapur	280,959	61,640	21.9	42.7
Lucknow	88,225	667	0.7	92.8
Unnao	279,118	3,173	1.1	92.5
Rae Bareli	66,481	2,770	4.2	98.2
Total	1,889,424	291,715	15.4	71.6

Source: State Ministry of Agriculture, 1987.

Sugarcane is an important perennial crop in the Area. The share of sugarcane cropped area in the total cropped area is about 15%, ranging from 1% for Lucknow to 38% for Kheri. Sugarcane area shares higher percentage of the total cropped area in upper reach of the Area while low in lower reach area.

Main cultivated crops in the upper reach area of the Sharda Canal Command are predominantly paddy for Kharif and wheat for Rabi. Those crops are almost irrigated. Sugarcane is also cultivated at significant level. As mentioned later, larger land holding size and higher yield of crops make farmers profitable. Higher irrigation rate may result in higher yield. On the other hand in the lower reach area, although paddy and wheat are major crops as well, their shares in the total cropped area are lower than those in the upper reach area. Irrigation rate is also lower. Other cereal crops like maize and sorghum for Kharif are more

cultivated under rainfed condition. Pulses and oilseeds are also cultivated at significant level. Sugarcane seems not important in the area.

Judging from irrigation rate and cropping area of water consuming paddy and sugarcane, upper reach area seems blessed with abundant water.

1.3 Farm Production and Farming Practice

1.3.1 Yield and Production Data

The cultivated area, crop production, unit yield per hectare in the Sharda canal command area are summarized as follows, and details are given in Tables E.4 to E.6.

Crop/Season	Cultivated Area (ha)	Production (ton)	Yield (ton/ha)
<u>Kharif</u>			
Paddy	811,584	1,666,904	2.05
Maize	122,805	131,503	1.07
Jowar	89,538	123,283	1.38
Bajra	34,138	33,116	0.97
Arhar	65,916	49,962	0.76
Urmoong	74,191	17,631	0.24
Groundnut	58,918	49,219	0.84
Soybean	36	48	1.33
<u>Rabi</u>			
Wheat	1,183,896	2,233,371	1.89
Barley	196,289	271,496	1.38
Gram	103,250	66,826	0.65
Pea	16,181	13,409	0.83
Mustard	67,159	42,382	0.63
<u>Zaid</u>			
Potatoes/vegetables	36,939	611,671	16.56
<u>Perennial</u>			
Sugarcane	267,466	14,354,159	53.67

The paddy yield of 11 districts is 2.05 tons on an average. As seen in Table E.4, paddy yield in lower reach districts of canal, such as Hardoi, Sitapur, Lucknow, Unnao and Rae Bareli districts are considerably lower than that of other 5 districts. In case of yield per hectare of wheat and barley, there are no significant difference among districts, except Shahjahanpur district which shows rather high yield in 1988-89 crop season, as presented in Table E.5. It however can be said in general, that crop yield level in the Sharda Command Area is generally low.

1.3.2 Farming Practices

In prevailing farming practices, land preparation, comprising ploughing and harrowing, is made by use of oxen-plough or 4 wheel tractors with disk plough. Puddling is made by also oxen-plough or 4 wheel tractors with multi-cultivator. Farmers holding large area and sugarcane farmers in upper reach areas tend to often use tractors. Preparation of paddy nursery is done by hand with seeding rate of 40 kg per hectare. For wheat, sowing is made by hand or by using locally made simple-seeder with seeding rate of 100 kg per hectare. The distinctive feature of the field management in the study area is to apply Zinc, at 30 days after transplanting of paddy. Zinc deficiency is commonly occurred in the area of showing higher soil pH. Most of paddy fields in the study area are covered with those soils showing higher than pH 8.0.

As a result of successful "Green Revolution" in 1950s, high yielding wheat varieties have been spread all over the India. High Yielding varieties of paddy and maize have also been introduced over the years. Yields, however, have remained low so far.

Chemical fertilizer is commonly applied to major crops such as paddy and wheat, but it is said that farmers do not know optimum doses of fertilizers. The spray of agro-chemicals is still not common practice.

Small and marginal farmers usually adopt mixed cropping, two crops cultivation at once, to avoid the risk of the failure of mono-crop cultivation due to unstable climate. Sorghum and pigeonpea, wheat and mustard, etc. are major combination.

1.3.3 Paddy Yield Survey

The yield survey of paddy was carried out in the area of Shahjahampur, Sitapur, Hardoi, Lucknow, Unnao and Rae Bareli districts, in order to know constraints to get better yield through yield diagnosis and to serve as a basis for the proposed farming practice.

48 samples were collected from 27 villages covering 6 districts under the Hardoi Branch Canal command area. Aside from getting name of varieties and examining yields, analysis were made focusing the following items:

- a. Number of hills per m²
- b. Number of panicles per hill
- c. Number of ripen grains per m²

d. Weight of 1,000 paddy grains

The results of the survey is tabulated on Table E.7. More than half of the sample farmers are adopting HYV of paddy such as Jaya, Panta-4, Sarjir-52 and Sinta. The yield level of paddy varies from 1.1 tons to 5.0 tons per hectare, and weight of 1,000 grains also shows wide ranges from 15.5 grams to 29.9 grams.

Analysis are made for traditional local variety and modern high yielding varieties separately. Yield determinant factors were examined through analysing correlation coefficient with yield. The results are as shown on Figs.E.1 to E.4. As seen from the Figs., there is clear difference in yield determinants between local varieties and high yielding varieties.

Yield is determined by the number of ripen grain per unit area and grain weight. As seen from Fig.E.1, local varieties show close co-relation between the yield and the number of grain. As grain weight shows no co-relation with the yield, present constraint to get better yield of local varieties is to secure a certain number of grain per unit area. At least 40,000 grains per m² should be secured to obtain the yield of more than 4 tons/ha. Increase of planting density, increase of effective tiller number should be tried.

High yielding varieties, on the contrary, show no clear co-relation between yield and grain number since the number of grains does not differ among the varieties. There is also no co-relation between grain weight and yield. However, high yield with more than 4 tons/ha is obtained when ripe grain percentage reaches to more than 65%. It is therefore advisable to make effort to increase ripe grain number in order to get higher yield. Top dressing at panicle initiation stage and at heading stage may lead to the good result.

1.4 Agricultural Supporting Systems

1.4.1 Post Harvest and Marketing System

Post-harvest facilities like warehouse, godown, mills, etc. have been established by the Central and State Warehouse Corporations. Every farmer keeps some part of their products for their domestic consumption. Storage capacity by institute is shown in Table E.8. Godowns of grains, especially for paddy usually have rice-mills. No information about the shortage of storage capacity has been heard so far.

Agricultural produce is marketed by various channels, including trade-in for private loans, sale to the Government agencies like the Food Corporation of India, and various local markets. An important institutional mechanism is the State Agricultural Products Mandi Parishad. This system play a role of the marketing centres with requisite infrastructure for competitive interface between buyers and sellers. The number of this system has been expanding over the years, from 165 in 1971-72 to 262 in 1989-90. The quantities transacted went up from 3.5 million metric tons in 1972-73 to about 20 million metric tons in 1988-89. Functioning of product selling is also encouraged at this marketing centres to increase competitiveness.

1.4.2 Agricultural Research and Extension

(1) Agricultural research

Agricultural research is primarily a matter of state's responsibility. State Agricultural Universities (SAUs) undertake the said research work on behalf of the State Government and receive the main part of their financial support from the state. The Indian Council of Agricultural Research (ICAR) serves as a national coordinating and supporting agency and provides assistance to SAUs.

There are three (3) state universities in the state of Uttar Pradesh; G.B.Pant University of Agriculture and Technology, Chandra Shekhar Azad University of Agriculture and Technology, and Narendra Deo University of Agriculture and Technology, each of which is assigned a contiguous service area of 15 to 22 districts of the state.

The Sharda Canal Command Area is located under the coverage area of G.B.Pant and Chandra Shekhar Azad Universities. Under the support and coordination of ICAR, these universities have undertaken various research programmes. These universities have outlying research or experimental stations to meet specific local needs, though most research is concentrated at main campus level.

Other research institute in UP includes the centrally administered Indian Institute of Sugarcane Research and Central Institute of Horticulture for Northern Plain both of which are located in Lucknow.

With the assistance of IDA, research activity has developed adequately so far, although still top-down approach to research planning tends to be dominant. Strengthening of extension activities is expected to help to solve this issue.

(2) Agricultural extension

(a) Organization and activity

On-farm level extension activity is shouldered to Village Development Officer and Assistant Development Officer (agriculture) in each Block Development Office. The Block Development Office is under the responsibility of Department of Agriculture and partially of Department of Rural Development. The organizational set-up of the Department of Agriculture is as shown in Fig.E.5.

Besides, there are extension activities by soil conservation inspectors and protection officers at the district level.

The organizational set-up for the Community Development Extension Service runs from the national level through state, district, block level to the village level and there are three main constituents of this set-up:

- (i) The direct-line staff such as State Development Commissioner, District Collector, cum District Planning Officer, Block Development Officer and Village Level Worker.
- (ii) The auxiliary or specialist staff, such as different heads of technical departments at the state and district levels and extension officers at the block level.
- (iii) Panchayati Raj system, District level (Zila Parishads), Block level (Panchayat Samiti), Village level (Village panchayat).

At the national level in the Agriculture Department, the Agricultural Commissioner, Government of India, assisted by a number of assistant commissioners and directors, with the supporting staff, is in charge of all agricultural development programmes. With in this Department, special mention may be made of the Directorate of Extension Training responsible for the training of Extension Officers, Village Level Workers, instructors of Village Level Workers Training Centers and others and Directorate of Farm Information which is concerned with the dissemination of new agricultural technology and innovations through various media.

At the state level, there is a State Development Committee provided over by the Chief Minister of the state with the other concerned ministers as its members. This Committee is responsible for the state's plan and programmes and for fixing the targets for regions and districts.

As regards the actual administrative functioning, the State Development Commissioner is the top-level executive responsible for directing, coordinating and providing overall guidance for development programmes and maintaining a two way channel of communication between the state government and the central government. He coordinates the activities of different development departments, such as agriculture, animal husbandry, cooperation, panchayat raj, health, education, irrigation, power and electricity. The head of these technical departments are responsible for planning and implementing the technical programmes and for providing the necessary technical guidance, manpower and support.

At District level, there is usually District Development or District Planning Committee presided over by the District Collector or Deputy Commissioner. The other members of this committee are the head of the departments in the district, chairman and vice-chairman of the district boards, representatives of voluntary organizations, local bodies and members of parliaments and state legislatures.

The District Collector is the key official who coordinates the activities of all the development departments at the district level. The district level technical heads of agriculture, animal husbandry, cooperation, panchayats, public health, irrigation, education and rural industries are responsible for planning and implementing the development programmes relating to their departments. Administratively, they are responsible to the district collector on the one hand and to their state heads of the development departments on the other.

At the Block Level, the district is subdivided into a number of community development blocks which are the basic operational units for development programmes. The Block Development Officer is the head of the block team, and coordinates all the activities of the development departments at the block level. He is assisted by eight (8) extension officers from different fields, namely agriculture, animal husbandry, health, cooperation, panchayats, engineering, social education and rural industries.

At the Village level, the multi-purpose village level workers is the main extension staff. He is the last extension functionary in the administrative hierarchy and is the main contact person. He is responsible for all development work at the village level, and forms connecting link between the various technical departments and the rural people. Usually, in a normal community development block, there are 10 village level workers. Their number is double in the Intensive Agricultural Development Programme blocks. On the non-official side, usually there is a panchayat in every village or for a cluster of villages, and is responsible for planning and implementing the community development programme and ensuring people's participation in them.

Village development officers usually have multi-purpose tasks, cover five to ten villages or thousand of farmers and were burdened with substantial administrative work. Many constraints on extension workers for efficient activities have been enumerated as follows:

- Insufficient number of staffs;
- Lack of mobility to reach farmers systematically and regularly;
- No practical training in relevant technology;
- Limited prospects for advancement; and
- Very few linkage with research.

(b) T&V system

Like many other developing countries, World Bank supported Training and Visit (T&V) system program has started since 1974. The aim of the T&V system is to increase farm productivity and farmers' income by simultaneously addressing constraints impeding the transfer of agricultural technology from research to the farmers and the feedback from farmers that must orient research and other government organizations to actual farm problems.

Some of the changes introduced are organizational (single line of control, exclusive responsibility; see Fig.E.6), others are operational (fixed, regular contact between farmers and extension workers, coverage, mobility, housing in the field), and still others relate to the linkage between research and extension (regular meetings and workshops of extension and research staff, systematic feedback of farmers' problems and responses to research).

As the Uttar Pradesh state has been adopting T&V system very recently, which includes some of the areas under the study, any obvious results has not come out yet. It is however expected that the above constraints on the present extension officer would be solved through the T&V system.

The key vehicle for the services is the *kisan sahayak*, whose function is to interact closely with "contact farmers (about 1,200 in each *nyay panchat*)." Our inquiries with the Agriculture Department produced no conclusive effect about the T&V, although the regional university, C.S. Azad Agricultural University, Kanpur, stated in a report that there is significant improvement in agricultural productivity because of the T&V system. Furthermore, administrative machinery exists under the CAD setup that provides other services such as soil conservation and land treatment. But these activities are also rather meager. The linkages with local agricultural research institutions is largely sought through various extension services. The local agricultural universities appoint subject matter specialists in the fields of agronomy, water management, and soil conservation and these specialists train junior staff and provide necessary guidance to the functionaires. Although a breakdown of capital outlay expenditures on extension services at the block level could not be obtained, the district level figures in the project area are as follows for the current financial year (1990-1991):

<u>District</u>	<u>Amount</u>	<u>Program Started</u>
Lucknow	Rs.1,400,000	1985-1986
Rae Bareli	Rs.3,000,000	1985-1986
Unnao	Rs.3,000,000	1986-1987
Hardoi	Rs.900,000	December 1990

From the above estimates of expenditure outlays, it is doubtful whether such meager amounts can lead to providing required extension services.

Technically and administratively, this system is under a single line of command headed by a director of agriculture (extension) in the Department of Agriculture, Uttar Pradesh. The required support is provided by research and teaching institutes, input agencies, line departments, and local bodies.

A World Bank Review (1985) on various aspects of agricultural research and extension (R&E) generally found that there is a clear need for reorganization and

upgrading of extension services but this involves a time-consuming effort and that there is need for ensuring sustainability of the effects. Some of the main conclusions are centered around the following five factors:

- Lack of clarity in the country's objectives for agriculture and in the priorities among them;
- Limited input by the country in the design of R&E components and projects, along with unclear links between R&E activities supported by the Bank and other development activities in the sector;
- Limited sector-wide or economy-wide work on issues affecting R&E;
- Institutional separation of research and extension; and
- Lack of clarity in, or agreement on, the definition of various stages in the process of technology development and transfer.

The World Bank review also suggested:

1. Research projects should emphasize:

- Manpower training, and, in particular, the training of research program leaders;
- Development of the functions of research management and research station management;
- Research on agricultural activities in low-potential areas;
- Research that helps integrate crop production and livestock activities and improves farm management; and
- Consideration of social, economic, environmental, and political factors in the design of research programs and the evaluation of their results.

2. Extension projects should emphasize:

- Formal training for higher-level extension personnel in technical agricultural subjects as well as in communications;
- Job descriptions for extension personnel that are consistent with the country's administrative procedures and the existing reward system;
- Training that relates to (i) the country's demand for skilled manpower, its training capacity, and its budgetary limitations both during and after the project's completion; (ii) the differences in the levels of technology being used by various groups of farmers, and (iii) the potential for trade-offs between the use of human resources and the communication media for extension;
- Formal professional links between research and extension; and
- The establishment of channels through which farmers, especially the less privileged among them, can influence the form and substance of extension being provided.

(c) CAD

In the Command Area Development Programmes, the staff engaged in the execution of on-farm development works was also associated with the agriculture development programme. They were also made responsible to do agronomical work in allied village for the purpose. Each soil conservation inspector is required to ensure and co-ordinate the availability of agricultural inputs in villages allotted to him. Efforts have been made to get the progressive farmers equipped with latest technical development for this purpose. However its activity has been very limited so far.

1.4.3 Credit and Insurance Services

(1) Cooperative credit structure

The cooperative movement, which has its history of at least four decades, met with varied degrees in various regions of the country. The concept of cooperative can vary significantly to accommodate cooperative credit, marketing, agro-processing and other activities including water management. The UP Cooperative Act 1965 provides a broad

framework for various activities. All the activities are regulated by the office of the registrar of cooperative at state level, supported by a hierarchy of officials. Assistant Registrar of Cooperatives is a functional executive at the district level.

The UP Cooperative Bank is the apex lending institution that provides financial resources, subject to various guidelines of the State Government as well as the GOI. Given below are some of the important loan features. It is also relevant to note that with the introduction of pass book system for all members of primary Agricultural Cooperative societies, the loan processing has become fairly simple.

(a) Short-term loan

This loan is given in two phases mainly for growing crop. First phase "A" is given for the expenditure on the fields improvements making it useful for the crop production before growing the crop. The phase "B" of short-term loan is given in the form of commodities such as fertilizer, progressive seeds and insecticides, medicines, etc. This loan is recovered from the farmers within one year from their crops. For giving the short-term loan, some financial norms have been fixed and some special facilities in financial norms have been given to mountainous region as follow:

(Unit: Rp.per acre))

Crop	Open Field		Total	Mountainous		Total
	A	B		A	B	
Food grain crop	450	750	1,200	600	600	1,200
Cash crop	600	900	1,500	750	750	1,500

The following procedure is adopted for the simplification of short-term loan distribution system. The financial value of general crops has been increased from Rp.900 to Rp.1,200 per acre and for the cash crop it has been increased from Rp.1,200 to Rp.1,500 per acre and the loan limit per number is increased from Rp.10,000 to Rp.12,000. The interest rate on crop loan is reduced from 11.5 percent to 10.0 percent. In the year 1988-89, the loan of Rp.4,249 million against the aim of Rp.4,250 million was made available to 3.5 million members. The increase rate was 29 percent as compared to previous year in which it was 16 percent. In the year 1989-90, till 1989 December the loan of Rp.2,850 million as against the sum of Rp.4,750 million was made available to 2.5 million members.

(b) Mid-term loan

The mid-term loans are given mainly for milky cattle, ox, hen, pig and goat husbandry, agricultural equipments, small irrigation works, dunlop cart, etc. for three years to five years.

(c) Long-term loan

The long-term loan is distributed for the following works, among others through the 275 branches of U.P. State Cooperative Agriculture and Village Development Bank Ltd.

- 1) Small irrigation, well, boring, pump set, rahat and tubewell,
- 2) Agriculture mechanisation, tractor, trolley, power tillage and power thresher.

(2) Loan recovery situation

The following tabulation provide divisionwise loan recovery situation in U.P. as of June 30, 1990.

Division	Total Demand	Cash Recy.	% of Cash Recy.
Kumaun Division	2,314.36	1,523.04	65.81
Jhansi Division	3,203.56	1,460.31	45.58
Moradabad Division	5,363.24	2,045.09	38.13
Agra Division	6,111.56	1,880.63	30.77
Barielly Division	5,486.31	1,607.91	29.31
Gorakhpur Division	6,713.64	1,648.17	24.55
Lucknow Division	6,326.58	1,459.51	23.07
Varanasi Division	4,526.58	840.95	18.58
Allahabad Division	3,308.93	593.43	17.93
Garhwal Division	1,514.58	268.08	17.70
Faizabad Division	4,280.34	439.01	10.02
Kanpur Division	3,785.64	267.52	7.07

Source: Uttar Pradesh Cooperative Bank Ltd. 1990

As seen above, loan recovery rate of Lucknow Division reveals rather low as 23.07 % of the total demand.

(3) Crop Insurance

The crop insurance scheme, which is voluntary in nature and based on an area approach and credit-linked scheme, was introduced in the country in April 1985 for major cereals and deficit crops. Under the scheme, all farmers availing crop loans from cooperative credit institutions, regional rural banks, and commercial banks are eligible for insurance coverage. The sum insured is equal to the crop loan disbursed, subject to a maximum of Rs.10,000 per farmer. The premium payable is 2 percent of the sum insured for wheat, paddy, and millets land, and 1 percent for oilseeds and pulses. Risk premiums and claims under the scheme is shared between the GOI and respective state governments in the ratio 2 to 1. Besides, 50 percent of the premium payable by small and marginal farmers is subsidized equally between the GOI and the state government.

The GOI has introduced a new comprehensive crop insurance scheme since Kharif, 1985. The scheme as proposed by the GOI was implemented in toto in Uttar Pradesh. After three years functioning of the scheme in the state, the position was reviewed and it was found that the scheme in the present format is not beneficial to the cultivators in the state (Narain, 1990). In the three years (1986-1988), a sum of Rs.43.9 million claims were paid against Rs.81.0 million premium received from the cultivators. Further, looking into detailed data revealed that the cultivators in some major portion of Western Uttar Pradesh District, Hill districts, and Gorakhpur and Ghaazipur districts did not benefit from the scheme. After the three-year period the scheme was further revised in the year 1988-1989, which effected the cultivators adversely. The major points of revision were:

- The sum insured was downward revised from 150 percent of the loan to 100 percent; and
- The total sum insured was limited to 100 percent of the loan taken or Rs. 10,000, whichever was less.

A critical review of the functioning of the scheme revealed the following shortcomings (Narain, 1990):

- The effective unit for implementing the scheme in the state is the *tehsil*. On an average, an area of about 1,000 square kilometers is covered under a *tehsil*. This unit of area for working out actual/guaranteed yield is too big and generally crop losses due to natural calamities such as floods, hailstorms, drought, excess rains, and diseases do not get reflected adequately, mainly because these calamities are

local in nature. Thus either the cultivator does not get full benefit of the scheme or claims given are too meager as compared to actual loss.

- In the revised proposal, since the limit of sum insured has been restricted to 100 percent of the loan or Rs. 10,000, whichever is less, the available benefit to farmers in case of crop losses is very inadequate. This situation becomes more prominent if total cost of cultivation is taken into account.
- The indemnity limit, which has been fixed for determining the guaranteed yield, is based on moving average of the past 3-5 years. There are many areas in the state where definite irrigation potential is available, and with the help of special programs efforts are made to increase productivity. In such areas a scheme is not beneficial to farmers. It becomes extremely difficult to convince farmers to make efforts to increase productivity on one hand and to guarantee a lower productivity on the other hand. Farmers maintain doubts about new technology and introduction of improved seeds and other inputs as well as on the crop insurance scheme.

Among the measure required for evolving an insurance scheme are the following:

- Administering the scheme at block or lower levels (rather than *tehsil* level) so that the primary objective is not lost in the aggregating assessments of coverage, claims, and settlements over large areas.
- The guaranteed yield levels should be more precisely assessed considering resource provisions (such as irrigation);
- A large number of crops (especially the ones grown by small and marginal farmers) should be covered; and
- The scheme may be recast on an economic region/revenue division basis, rather than for the whole country and whole state.

1.4.4 Supply of Input

(1) Seed supply

Until 1984 seed distribution was dominantly done by G.B.Pant University of Agriculture and Technology. After the supply rate to total demanded quantity of the university abruptly declined in 1985, overall seed supply rate has remained low so far (see Table E.9). Two other state agricultural universities, State owned seed corporation and National Seed Corporation are the source of certified seed distribution.

Crop-wise demand and supply of seeds in the past years are as shown in Table E.10. The seed supply of wheat and pulses are far below to meet the demand.

In order to ensure the adequate amount of certified seed distribution, the Government of India issued a new seed development policy as summarized below:

- 1) to encourage seed production on commercial lines in order to supplement the governmental efforts;
- 2) to seek possibility on exporting quality seed after meeting domestic requirement;
- 3) to allow import of certain amount of seeds of coarse cereals, pulses and oilseeds under some conditions; and
- 4) to permit National Seed Corporation and State Seed and Tarai Development Corporation to import seeds of coarse cereals, pulses and oilseeds.

Stable and timely distribution of certified seeds deserves high priority attention. Seed distribution is a matter of cooperative function at present. In future, however, the role of private sector may become of importance.

(2) Supply of fertilizer

Marketing of fertilizer is in the hands of private traders, cooperatives and the national cooperative federation IFFCO (Indian Farmers Fertilizer Cooperative). The past consumption of fertilizer in the U.P. State by marketing source is as shown in Table E.11. The share of IFFCO in marketing amount of fertilizer has been between 12.0% and 16.0%.

Through the field observation, most farmers use chemicals. No complaint has been heard about the availability of fertilizers. It is judged, therefore, that supply amount of fertilizer is sufficient.

1.5 Rural Cooperative Institutions

Various agriculture-oriented rural cooperative institutions have been formed since 1951 when the All India Rural Credit Survey Committee formulated national policy on cooperatives. Reflecting past credit-oriented cooperative development, a large number of credit cooperatives still exist. In spite of the government efforts, however, cooperative development has not been well diversified.

The organizational setting of the Central Cooperative Department and state level cooperatives is shown in Figs E.7 and E.8, respectively.

In Uttar Pradesh state, the following institutions have been established.

- Apex	12
- Primary agricultural credit societies	8,597
- District cooperative bank	57
- Marketing societies	268
- Seed stores	2,256

The present activities of the above cooperatives are briefly explained below:

(1) District Cooperative Bank

- To provide short-term, mid-term and consumption loans to the societies;
- To facilitate supervision and control to the societies from time to time;
- To provide necessary help for proper management of the societies; and
- To organize meetings for the development of societies.

(2) Uttar Pradesh Cooperative Bank

- To make necessary coordination with Cooperative Department, state government, National Agricultural and Rural Development Bank (NABARD), National Cooperative Development Corporation (NCDC) as a head bank; and
- To provide necessary help for construction of house and store to society through World Bank scheme.

- (3) Cooperative Agriculture Training Institute, Lucknow
 - To provide free training to the secretaries and managing directors of the societies; and
 - To organize meetings and other functions to encourage the development activities of society.
- (4) Uttar Pradesh Consumer Cooperative Union
 - To provide facilities for supply of commodities for daily use to consumers in addition to loan lending facility; and
 - To purchase the commodities for daily use at a proper rate and deliver them to societies for distribution.
- (5) Uttar Pradesh Cooperative Federation (PCF)
 - To distribute fertilizers to the society through Kribhco and IFFCO;
 - To provide storage and transportation facility; and
 - To distribute sugar to the society.
- (6) National Agricultural and Rural Development Bank (NABARD)
 - To finance the societies through head cooperative banks and district cooperative banks; and
 - To develop new loan schemes and try to implement the schemes.
- (7) National Cooperative Development Corporation (NCDCD)
 - To provide loan facilities for construction works and processing units; and
 - To provide advice/training to officers and employees of societies.

The number of cooperative banks, loan cooperative union, nationalized banks' branch and rural area bank, and distribution of loan in major study area-constituting blocks are as shown in Table E.12.

In order to strengthen the cooperative institution, following requirements have been suggested.

- (a) Lesser governmental intervention in terms of fixation of norms for rental charges in respect of various storage facilities;

- (b) Need for capital subsidy for the provision of such infrastructure as warehouse, cold storage and agro-processing units;
- (c) Need to encourage multi-purpose cooperative institutions;
- (d) Need to provide realistic levels of managerial or supervisory compensation to the office bearers;
- (e) Integrating agricultural credit and marketing functions at the PACs level;
- (f) Timely auditing of the PACs financial balance sheets and management.

(8) Water Users Association under CAD Programme

The best institutional form sponsored by the GOI and the Uttar Pradesh state government possessing potential for enhancing agricultural productivity and farm incomes is the Command Area Development Programme, currently in operation for the Sharda Canal region. Given the framework for devising and implementing an integrated area development approach, the Command Area Development Authority of the Sharda Canal can be geared to meet the required objectives and goals. A main bottleneck in expeditious implementation is lack of financial resources leading to a tangible impact. These issues are examined later in the report. It is also relevant to note that the Command Area approach evolved by the government emphasizes the role of water user organizations in the region — an untapped resource for further development.

The Government of Uttar Pradesh adapted provision of the Panchayat Raj Act (that governs local government institutions in rural regions at the village and block level) to lend strength to water user organizations. These have been formed at the turnout level in Sharda Canal CAD region, with the objectives of effective implementation of on-farm development works expeditiously and with the active participation of operational beneficiaries.

Given below are the general features of the system, called "Water Management Committees" (Jal Prabandhak Samithis). Every village will have one water management committee. The committee will consist of the following members:

- (a) Chairman in Central
- (b) Chairman in UP
- (c) Chair-persons
- (d) Three farmers, with lowest holdings in the turnout command area
- (e) Three farmers belonging to the scheduled caste, with lowest holdings
- (f) Lekhpal
- (g) Agri-extension (T&V)
- (h) Panchayat in charge

Soil Conservation Inspector (SCI) nominated by the chairman of committee works as the ex-official secretary of the water management committee. As soon as the committee is elected, the list of elected members is communicated to the concerned officers/officials of the concerned Development Departments, together with the list of beneficiary farmers to obtain their active participation in the implementation of the project. These would mainly consist of CDO/DDO, BDO, DAO, AE (M1), District Assistant, Registrar, Cooperative Societies, Cane Societies, Horticulture, Irrigation and Forest Department at the District and Block levels.

On the basis of the topographical survey field drains and water control structures would be proposed in the turnout command, with a view to provide irrigation to each and every field as also to drain excess rain or irrigation water of the turnout command. Full and active participation of the beneficiaries and water management committee is sought to be enlisted at every stage. Proposed on-farm development works and cost estimates prepared would be presented in the second meeting of the water management committee for discussion and approval. If objection are arised in the meeting and they are found to be technically sound, suitable changes are made in the Plan Map and estimates would be revised accordingly.

The on-farm development work is executed as per the norms fixed by water management committee. Programme Executive, Project Supervisor, Project Officer, and Deputy Project Director would ensure the technical aspects to be taken care of while executing the work. Regular monitoring at CADA HQ level would be done. The measurements and verification of the works executed is done by the field staff as per instruction and or guideline issued by headquarter. On completion of on-farm development works, accounts would be completed and recovery statements as required, are prepared. Thereafter, turnout would be handed over to the village committee (Gram Sabha), along with the relevant records and maps for the utilization and future maintenance and upkeep of the works executed. The repairs and maintenance of the works executed by the water management committee in turnout command would be done by the water management committee. However, the repairs to the canal and turnout pipe will be carried out by the Irrigation Department.

2. Present Agricultural Setting of the Representative Areas

2.1 Cultivated Crops

2.1.1 Cropping Pattern in Representative Areas

Cultivated crops in each representative area by composing villages and by cropping seasons are shown on Tables E.13 to E.16. Canal Command Area (CCA) belonging villages are extracted in each representative area, and cultivated crops in those villages are enumerated with area as below:

Season Crops	Sarojini Nagar CCA: 14,862 ha		Sataon CCA: 12,874 ha		Sursa CCA: 17,313 ha		Purwa CCA: 12,252 ha		Total CCA: 57,301 ha	
	Cropping Area in ha	Rate (%)	Cropping Area in ha	Rate (%)	Cropping Area in ha	Rate (%)	Cropping Area in ha	Rate (%)	Cropping Area in ha	Rate (%)
Kharif	9,224	100.0	7,007	100.0	9,834	100.0	6,480	100.0	32,545	100.0
Paddy	6,296	68.2	3,820	54.5	3,714	37.8	4,826	74.5	18,656	57.3
Maize	136	1.5	1	0.0	2,684	27.3	99	1.5	2,920	9.0
Sorghum	1,375	14.9	1,678	23.9	1,658	16.9	781	12.1	5,492	16.9
Millet	152	1.6	81	1.2	-	-	-	-	233	0.7
Black/Green Gram	412	4.5	374	5.3	754	7.7	255	3.9	1,795	5.5
Groundnut	93	1.0	119	1.7	394	4.0	-	-	606	1.9
Pigeonpea	490	5.3	797	11.4	324	3.3	226	3.5	1,837	5.6
Others	270	2.9	139	2.0	306	3.1	293	4.5	1,008	3.1
Rabi	9,275	100.0	9,006	100.0	13,280	100.0	6,735	100.0	38,296	100.0
Wheat	7,513	81.0	6,391	71.0	10,639	80.1	5,427	80.6	29,970	78.3
Barley	188	2.0	690	7.7	417	3.1	631	9.4	1,926	5.0
Potatoes	291	3.1	185	2.1	230	1.7	83	1.2	789	2.1
Pea	163	1.8	254	2.8	94	0.7	100	1.5	611	1.6
Mustard	80	0.9	107	1.2	152	1.1	-	-	339	0.9
Gram	517	5.6	655	7.3	1,212	9.1	139	2.1	2,523	6.6
Others	523	5.6	694	7.7	536	4.0	355	5.3	2,108	5.5
Perennial										
Sugarcane	13		267		960		158		1,398	

Main Kharif crop is paddy with cropping intensity of 38% to 75%, followed by sorghum and maize. Pulses such as black/green gram and pigeonpea are also planted at significant rate. Kharif crops are more diversified in Sursa while paddy is predominant in Purwa. In Rabi, wheat is predominantly planted in any of the Representative Area. Barley is the next important crop in Purwa and Sataon while gram is rather important in Sursa. Sugarcane is planted more in Sursa.

Present cropping pattern is illustrated in Fig.E.9.

2.1.2 Land Use Characteristics by Soil

In order to know the relationship between cultivated crops and soils and to serve it as a basis on formulating cropping pattern, cultivated area is summed up by crops in each category of soils. The results are shown on Table E.17 to E.20.

In general, paddy is cultivated less in upland in Kharif season. Instead other cereals like sorghum and maize are more cultivated. There is no distinct features in cropping rate among other soil types except Sataon where paddy is predominant in lowland and wheat is least cropped in mid-low land.

Those difference in cropping rate among soil types may attribute to water environment. For example, many of upland soils require much water for paddy cultivation while lowland in Sataon may be inundated through Kharif season so that only paddy can survive. Irrigation and drainage development will change this situation drastically.

2.2 Yield and Production

Present yield of crops and estimated production in each representative areas are as shown below:

Crop	Unit: ton/ha			
	Sarojini Nagar	Sataon	Sursa	Purwa
<u>Kharif</u>				
Paddy 1/	2.08	2.17	2.57	2.29
Maize	0.7	1.0	1.3	0.9
Sorghum	1.5	1.1	1.5	1.1
Groundnut	0.5	0.5	0.7	0.9
Pegionpea	1.2	0.8	0.7	1.2
<u>Rabi</u>				
Wheat 1/	2.04	2.35	2.33	1.73
Mustard	0.6	0.6	0.7	0.6
Gram	0.9	0.4	0.9	0.7
Potatoes	16.0	9.0	17.0	17.0
<u>Perennial</u>				
Sugarcane 1/	26.0	26.0	26.0	26.0

Remarks: 1/: from JICA Farm Economy Survey.

Estimated crop production in respective representative areas are estimated as shown below:

Unit: ton

Crop	Sarojini Nagar	Sataon	Sursa	Purwa	Total
Kharif					
Paddy 1/	13,100	8,290	9,550	11,050	41,990
Maize	100	-	3,490	90	3,680
Sorghum	2,070	1,850	2,490	860	7,270
Groundnut	50	60	280	-	390
Pegionpea	590	640	230	270	1,730
Rabi					
Wheat 1/	15,330	15,020	24,790	9,390	64,530
Mustard	50	65	110	-	225
Gram	470	260	1090	100	1,920
Potatoes	4,660	1,670	3,910	1,410	11,650
Perennial					
Sugarcane 1/	340	6,940	24,960	4,110	36,350

Remarks: 1/ from JICA Farm Economy Survey.

2.3 Farming Practices

Paddy: Seedlings of paddy is generally grown in flood type of nursery bed with a seed rate of about 50 kg per hectare. There are two transplanting time in the representative area. Transplanting of early paddy is practiced from the mid June till the mid July. Paddy varieties which are transplanted till the middle of June are short mature variety and late paddy which are transplanted at the period from the mid June to the mid July belongs to the long maturity varieties. Type of paddy, name of variety, time of transplanting, duration (days) of maturity are as below.

Type of paddy	Name of variety	Time of transplanting	Duration of (days) of maturity
Early paddy	1 Satet - 4	1 June to 15 June	110 - 115
	2 Govind	1 June to 15 June	105 - 110
	3 Monhar	1 June to 15 June	115 - 120
	4 Kaveri	1 June to 15 June	110 - 120
	5 Indrasan	1 June to 15 June	110 - 120
Late paddy	1 Sarju - 52	15 June to 15 July	130 - 135
	2 Pant - 4	15 June to 15 July	125 - 130
	3 IR - 36	15 June to 15 July	120 - 130
	4 Mansoori	15 June to 15 July	140 - 150
	5 Usar-Ta - 1	15 June to 15 July	140 - 145
	6 Seeta	15 June to 15 July	135 - 140
	7 Jaya	15 June to 15 July	135 - 140

As the reason for preferential cropping of late paddy, it is considered that 1) dependance of farmers on monsoon rain, 2) mostly the late paddy varieties could be expected high yield and 3) late varieties are success in user land.

In paddy cultivation, 40 kg of nitrogenous and 10 kg of phosphoric fertilizers are used however, potassic fertilizers application is seen nothing. zincsulphate is usually used at 30 days after transplanting in the area where Zinc deficiency is appeared. 10% BHC, endsulfan etc., are applied for insect-pest control however, timing and quantity of application are inadequate due mainly to agricultural inputs supply and distribution problems.

Most important stages to supply irrigation water for paddy cultivation are nursery, transplanting, maximum tillering, panicle initiation, flowering and soft dough or milky stages. The irrigation water should be supplied in proper and timely with a right quantity with the growth stage of paddy mentioned above. Proper irrigation can not operate at the farmers field level due to out of gear between farmer's planting schedule and canal operation schedule at present.

Sorghum: Popularly known as jowar is one of the most important food and fodder crop of rainfed farming. The land preparation with plough or blade harrows with least application of farmyard manure is begun in May. Before monsoon rains come, Sed is sown by sed drill in rows, 30 mc to 40 mc apart with a seed rate fo 12 to 15 kg per hectare. Variety is mostly applied local one. 20 to 30 kg of area and 10 to 20 kg of S.P. are usually used. Interculture cum weeding is made by bullock - drawn implements. It is often observed mixed cropping of jowar with pegionpea with a ratio of 3:1 in number of rows on the field.

Maize: Maize is sown in rows, 60 to 75 can apart, whereas the plant in the row are spaced at 20 to 25 can. Sowing in rows is generally done with drill or by dropping behind plough with a seed rate of 17 to 20 kg for grain food, 30 to 40 kg per hectare for fodder crop. Hybrid varieties such as Ganga-Z, Ganga-5 etc., are spreaded certain extent but yield level is not so high at present.

Groundnut: Groundnut is rised mostly as a rainfed for kharif. Sowing is carried out from the end of May to the end of June, depending on the monsoon rains. Groundnut cultivation in the representative area, Sursa, in Hardoi Block, is predominant. Ploughing is practiced two and three time and the soil is pulverized well to obtain a good tilth.

There are two type of groundnut varieties. They are Type-62, Type-28 as early maturity and Chitra and Chandra as semi-early maturity. Sowing of groundnut is begun with seed rate of 95 to 100 kg for early variety and 70 to 75 kg per hectare for semi early variety from the last week of June to the first week of July. Planting depth of groundnut is usually kept at 4 to 5 cm behind ploughing with the distance of 30 cm x 15 cm for Type-62 and Type-28, 30 cm x 10 cm for Chitra and Chandra.

It can be said that chemical fertilizers and agro-chemicals do not use for groundnut production in Sursar area. Only small quantity of D.A.P., and Mancozebe for TIKKa diseases control are applied by the eager farmers at present.

Wheat: Land clearing is usually begun in the paddy field after harvested of paddy. Plough and harrow the wheat field to reduce weed and to obtain good tilth. What varieties prevailing in the representative area are Up-2003, Up-368, HD 2282 etc. Sowing is generally started at the first week of November to the middle of December with a seed rate of 100 kg per hectare and 18 to 22 cm distance from line to line and to obtain 400 to 500 panicles of wheat per m² as the final target.

There is no different in fertilizer doses between marginal farmers and large farmer 80 kg nitrogenous and 40 kg phosphatic fertilizers per hectare are used. Half quantity of nitrogenous and field quantity of phosphoric fertilizers are applied as the basal. Remaining nitrogenous fertilizer are used for top dressing.

As like previous mentioned about mixed cropping of jowar with Pegionpea, it is also observed the mixed cropping of wheat and mustard with a rato of wheat 9: mustard 1 in number of hill. In the mixed cropping area, a break out of black beetles and plant louse are always found, however, farmers do not provide any countermeasure to protect damage from these insects.

Source of irrigation is mainly canal and the private tubewells or pumpsets. In case of canal irrigation, water does not supplied in the farmer's field in timely due to out of gear between canal operation schedule and planting schedule of wheat. This is the same problem in the case of irrigation for paddy.

The reaping work is made by hand. Threshing is carried out by local-made out-threshers. Harvest of wheat is comruplicate finished up till the middle of May in the representative area.

Pegionpea: This pulses is well known as red-gram or arhar. Variety of pegionpea applied prevailing are three varieties: 1) extra early variety is 120 days 2) early variety takes 150 days, 3) late variety need for more than 170 days in duration of maturity (days). The preparation of land is the same as for wheat, except that the soil is not completed.

The pure crop is sown with a seed rate of 15 kg per hectare in broadcasting, or in rows, whereas the mixed crop is almost always sown in lines, one row of pegionpea being planted after every three or four rows of the main crop such as jowar or bejra.

The mixed crop receives the interculture usual for the main crop. The pegionpea plant make slow growth until the main crop is harvested. Therefore, the intervening soil is ploughed up or harrowed to encourage the growth of pegionpea. Fertilizers and agricultural chemicals are applied a little in the representative area.

Black gram: This crop is called as urd and is highly prized int he representative area. Crop rotation, mixed cultivation method and take caring are quite the same that of pegionpea and green gram (Moong).

Marginal farmers with minimal capital and land cannot hire labor from outside while larger farmers usually hire sufficient number of farmers and do not cultivate themselves.

As far as main crops of paddy, wheat and sugarcane are concerned, farmers commonly use sufficient amount of chemical fertilizer to attain better yield although the use of agro-chemicals is still not popular. Despite of sufficient amount of chemical fertilizer application, however, yield level of those crops generally remains low. Yield response to nitrogen fertilizer dosage is not clear, which suggests that the yield of these crops are limited by other factors; i.e. low farming technology, water condition, micro-nutrient deficiencies, etc.

Farm economy survey reveals farmers' feeling on major reasons of low yields of paddy and wheat as follows:

- Water shortage
- Soil salinity/alkalinity
- Pest and diseases
- Lack of knowledge

The extension directorate of Chandra Azad University of Agriculture and Technology pointed out some constraints on agricultural production in the Lucknow division. They are enumerated by crop as shown in Table E.21.

2.4 Farm Budget

Based on the results of Farm Economy Survey and collected data, farm budget analysis by land holding size and by Representative Area under present condition is made. They are shown on Tables E.22 to E.25, and summarized as below:

Crop	Sarojini Nagar		Sataon		Sursa		Purwa	
	Area (ha)	Net Benefit (Rs.)	Area (ha)	Net Benefit (Rs.)	Area (ha)	Net Benefit (Rs.)	Area (ha)	Net Benefit (Rs.)
Marginal Farmer								
Kharif	0.54	2,082	0.38	910	0.48	1,627	0.56	2,090
Rabi	0.58	2,065	0.58	1,868	0.53	2,028	0.56	1,785
Perennial					0.04	150		
Total		4,147		2,778		3,805		3,875
Small Farmer								
Kharif	1.09	4,185	0.62	1,811	0.85	2,720	1.11	3,520
Rabi	1.21	4,936	0.88	2,612	1.09	4,409	1.03	3,041
Perennial					0.07	406		
Total		9,121		4,423		7,535		6,561
Semi-medium Farmer								
Kharif	1.53	4,558	1.18	2,725	1.84	4,838	2.55	4,596
Rabi	1.79	5,854	1.69	6,108	1.97	6,612	2.58	5,922
Perennial					0.17	793		
Total		10,412		8,833		11,243		10,518
Medium Farmer								
Kharif	2.53	9,636	2.34	4,531	2.88	7,579	4.05	12,250
Rabi	3.96	14,280	3.30	10,071	4.92	15,089	4.44	11,550
Perennial					0.25	923		
Total		23,916		14,602		23,591		23,750

As seen from above, marginal farmers get minimal profit from the farm product. Considering that great portion of their produce is for their home consumption, their farm income in real term must be almost none. On the other hand, medium to large farmers get sufficient profit by selling surplus produce.

2.5 Agricultural Supporting Services

2.5.1 Agricultural Research

As mentioned in Chapter 1, agricultural research is shouldered to State Agricultural University. All of the Representative Areas are under the coverage of the Chandra Shekhar Azad University of Agriculture and Technology. In coordination with extension department, site-specific research has been made based on the identified constraints on agricultural production as shown on Table E.21.

2.5.2 Agricultural Extension

"T&V extension system" has been introduced in U.P. since 1985-86. Three districts of Lucknow, Rae Bareilly and Unnao has already been covered under this system, although the covered area has not been extended widely so far.

The key features of T&V system include the following seven elements.

- Professionalism
- Single line of command
- Concentration of efforts
- Time bound work
- Field and farmer's orientation
- Regular and continuous training
- Research and extension linkages

Several constraints to smooth implementation of T&V extension have been identified. Examples are that extension workers do not have uniform basic experiences and qualification, that extension workers' visiting to contact farmers are not made as scheduled, that equipments such as vehicle and motorcycles which have been provided for "T&V purposes" are often used for other purposes, etc. Still several steps to be cleared exist to realize the satisfactory results.

2.5.3 Post-harvest and Marketing System

Post-harvest facilities like warehouse, godown, mills, etc. have been established by the Central and State Warehouse Corporations. Every farmer keeps some part of their

products for their domestic consumption. Godowns of grains, especially for paddy usually have rice-mills. No information about the shortage of storage capacity has been got so far.

Marketing channel from farm to marketing place or storage facilities is connected by either private sectors or public sectors. The results of the farm economy survey conducted in this study period shows different bodies bear marketing activities from area to area. For example, private sector dominates marketing in Sataon Study Area while government channel deals mainly with it in Sursa Study Area.

The existing institutional marketing net-work functioning in the respective Study Areas as well as other parts of the state is primarily contributed by (a) Krishi Utpadan Mandi Parishad, (b) private marketing group in addition to cooperative marketing societies usually located at tehsil level (one society per tehsil on an average).

The organization chart of the Mandi Parishad is given in Fig.E.10. Out of the existing 262 main Mandis (major marketing centres) spread all over the state, only 149 possess necessary infrastructure facilities, not including cold storage facilities. There are also 371 sub-mandis. The following shows the mandis which are located in and around the respective Study Areas:

District	Main Mandis	Sub-Mandis
Lucknow	Banthara	Mohanlal Ganj, Gosain Ganj
Rae Bareli	Rae Bareli	Gurbakhshganj, Harchandpur, Munsiganj, and Kandaura
	Lalganj	Kheero, Unchahar, Sareni, Laxmanpur, Dinganj, Mahrajganj
Hardoi	Hardoi	Baghaulti
	Madhoganj	Bilgram, Mallanwa
Unnao	Purwa	Maurawan

The amount of handled commodities by each Mandi Parishad in 1990 is as shown in Table E.26.

In spite of marketing facilities' having been established, the limitations of the networks are such that many of the small and marginal farmers are unable to take advantage of the systems, not only because of very meagre marketable surplus but also because of geographical distance and transportation bottle-necks involved in their access to the physical systems.

In general a productive marketing system involves the following:

- (1) Information flow (present and prospective supplies, stocks, prices, cost and marketing margins);
- (2) Institutional arrangements (legal system, grades, weights and measures, enforceable contracts);
- (3) Infrastructure (roads, warehouses, telecommunications, vehicles, agro-processing plants);
- (4) Organizations (governments, cooperatives, private firms); and
- (5) Enterpreneurial activity (stockholding and risk bearing capacity, financial resources, personal contracts and credibility)

It is reported that establishment of infrastructures like roads, and private sector's participation are the key factors for successful implementation of marketing projects.

At this moment each Study Area has almost none of the above basis for marketing development, being located in relatively backward areas.

2.6 Institutional Development

2.6.1 Water Users' Association in Canal Irrigation System

With the formulation of command area development programs sponsored by the GOI, a beginning was also sought to be made to revitalize, initiate, and encourage formation of water user associations to complement the proposed activities of the government organizations, especially under the irrigation and command area departments. A recent communication (1990) from the Planning Commission of the GOI requires the various state governments to ensure farmers' participation in irrigation water management. The last 15 years' experience in this regard remains somewhat subdued as there are only a handful of experiences that might be worth mentioning but may not be adequate to allow for their replicability within the same command system or across other systems. A recent experience of a water management society in an adjacent region in Uttar Pradesh is documented in detail in the next section.

Several attempts have been made to involve water users, more generally the existing water users as well as potential new users (with the possibility of perennial conflict in some of the systems). In this context, an appreciation of any reasonable behavior on the part of water users would be helpful in order to realize the role and the limitations and efforts to draw upon the support of the water users for their own benefit. A meaningful hypothesis in this

context would assume that enthusiasm of farmers in participating in collective water user growth would follow an inverted "U" curve in relation to the expected reliability for water delivery. However, the above phenomenon need not be universal as it could only constitute a necessary ingredient but not be sufficient for the formation and effective functioning of a water user organization. This becomes much more evident when we examine the study in the next section. At this point, it may be necessary to explain the hypothesis. The fact that there is little incentive for farmers (like those in the high reaches of the canal systems) to work as a group to ensure the supply of canal waters under the existing system as they tend to enjoy more than their proportionate share of water for their farms. Similarly, in the areas where the probability of receiving irrigation water is very low (like in tail ends of canal systems in Uttar Pradesh), there is little to achieve as there is hardly any water to be received. It is also clear from the above that the incentive to form and function of water user groups is simply built on the marginality principle: incremental costs of such efforts should be less in relation to incremental benefits of the same to the water user groups.

The discussion above does not throw light on the intra-group problems of group behavior and effective functioning. These are discussed below. It is not enough to have the common objective of reaping the benefits of group formation to enable group unity, as it could also entail preparedness of the individual members to incur necessary financial as well as nonfinancial costs that might be required for the effective functioning of the group. The "free rider" problem is not uncommon: some members would rather expect the remaining others to incur such costs that might benefit the group as a whole, and prevalence of such behavior could eventually disintegrate the whole group into an ineffective or defunct organization. Some of these issues are built on anthropological parameters, making it difficult for calibration and replicability of any "successful model." Hence the need for action research leading to adaptive planned development of institutions.

2.6.2 Basarahiya Water Management Cooperative Society: Case Study

Inspired by the experiences in the Gujarat state, the administration under Sarada Sahayak CAD in Uttar Pradesh decided to develop a select area near Lucknow on the pattern of the Mohini Water Management Cooperative Society. The water management cooperative at Basarahiya was launched as a registered society primarily for the purpose of efficient and equitable distribution of canal waters for irrigated agriculture. The society was launched in June 1989, started with five *kulabas* irrigating an area of 290 hectares. The corresponding numbers expanded to a total of 11 *kulabas* and 528 hectares of agricultural land by May 1990. The total number of members went up from an initial 55 to 460 during the intervening period;

each member contributes a membership fee of Rs.2 and a share capital in terms of Rs.50 per shares.

The socioeconomic structure of the existing members tends to suggest relative homogeneity of the farm size group as well as the traditional caste groups in the villages covered by the above command area. It is not to suggest that there are no major political disagreements amongst the members involved.

An increasing irrigation trend is clear when viewed in conjunction with the fact that 48 new private tubewells have come up in the relevant area during the last three years. The tables also indicate the expanding trend of cropped area under different major crops during the same period.

Although it was difficult to obtain a consistent set of financial indicators regarding various items of revenue and expenditure from the society, it may be concluded that the relative productivity of the unit has been on the increase. However, this is not without its public costs. The government offered substantial financial and technical assistance to bring out a model for possible successful implementation and replicability in many other areas of Uttar Pradesh.

The bulk sale of canal water by volumetric method is done by the Department of Irrigation and the purchase is the society. Subsequently, the society, with the approval of the government, fixes irrigation water rates for different crops. The largest single activity generating "profit" for the society is the business of selling water. One of the most attractive nonfinancial performance features of the system is the equitability of distribution of water among farmers under each of the *kulabas*.

The direct and indirect subsidy is involved in the society through the government aid of Rs.122,000, and subsidized loan at the rate of 5 percent interest to the tune of Rs.100,000. In addition to the above, the salary compensation for one assistant soil conservator amounting to Rs.27,000 per annum is also paid by the government (through CADA). Whereas the aid amount is a one-time grant, the remaining tends to recur every year. The annuity value of the above factor (assuming nil recovery of capital) comprises the sum total annual subsidy amounts to about Rs.60,000. This suggests an annual production or maintenance subsidy of Rs.120 per hectare. This is very significant and the question remains whether the society can possess financial viability without such subsidies. The answer would be yes, if the society is allowed to fix its own water rates for different groups. Even in such a situation the farmers generally will be able to draw equitable water supply with a high degree of reliability

compared to the canal irrigation water supplies that are obtained in many other parts of the irrigation system.

An important policy issue that acts in favor of the Basarahiya-type system is the fact that irrigation water rates are collected by the government at the society level rather than at the level of individual farmers, thus affecting economy in the administrative costs of collection of water charges. In addition, compared to the average payment rate of about less than 10 percent in much of the canal irrigation system, the irrigation dues are fully paid in this system.

The replicability for the Basarahiya system requires the following considerations:

1. The need to reduce direct and indirect capital, managerial or other subsidies for such cooperative units;
2. The need to increase the area served by each society so as to enhance financial viability;
3. The need to reduce the government involvement except for financial discipline and such control;
4. The need to prompt marketing and credit functioning incorporated under the same water management cooperative.

SWOT Analysis

An application of a standard management method of SWOT analysis will be relevant in the present situation as well.

Strength

1. The relative homogeneity of the group of farmers in this society;
2. Geographic proximity to administrative decision makers in Lucknow;
3. The willingness of the government to provide easy credit or subsidies for strengthening the working of the society;

4. Location of the area around the mid-reaches of the Sarada Sahayak canal system, thus enabling a somewhat reliable supply of irrigation water from the canal system.

Weaknesses

1. Making profit out of subsidy capital;
2. Continued dependence on governmental machinery;
3. Limited cohesion of the group view in terms of political alignment; the later dictated compromise of collective measure improvements;
4. Limited perspective for an integrated agro-economic development which could combine efficient management of agricultural inputs and outputs.

Opportunities

1. The society can take advantage of the existing institution under the cooperative set up for promotion of many more activities that generate avenues and complement the ongoing agricultural production system;
2. The financial surpluses generated under the existing arrangements can be more effectively channelized generating to additional avenues, rather than an approach that currently advocates building godowns, office premises or other conveniences;
3. The possibility of undertaking more of the high-yielding varieties for crop production and seed multiplication;
4. The possibility of starting small-scale industrial units that can cater to agro-processing and marketing.

Threats

1. Any additional division of opinion amongst the members for political or other reasons can disrupt the cooperative movements;

2. The possibility of the government revising its continued support in the form of capital subsidy or other assistance;
3. In the absence of a stand-by system of provision of water by tubewell or other sources, serious disruption in the canal distributory water supply can lead to an unstable water management situation and pose problems of continued group activity (in relation to the inverted U hypothesis).

2.6.3 Agro-Management Societies

The discussion in the previous section suggests that with appropriate modifications, continuous monitoring and evaluation, action research and diagnosis, there exists a reasonable basis for stabilizing water cooperative societies. The question arises whether such societies could confine themselves only to the distribution of canal water and coordinate water supplies by other sources (when the water availability on an area basis, irrespective of sources of water, is accepted as a relevant norm for equitable water distribution), or whether such societies could also diversify into provision of other critical agricultural inputs and also cater to post-harvest requirements of farm products (such as marketing, storage, processing, and so forth). Financial viability of institutions requires such a multi-purpose cooperative approach, even if such a development is sought over a period of five years or more.

The existence of vintage systems (not all of which imply any perfection of institutions) is not necessarily an asset in the context of devising new institutions. There exists, as discussed earlier in this report, a host of cooperative and government organizations that address some of the complementary or potentially supportive institutions involved in the agricultural input and output markets. These institutions met with varying success in meeting their objectives of existence. An integrated cooperative society network, centered around the concept of water management cooperatives, called Agro-Management Society, becomes relevant in this context. The logistics of this system, proposed for project development, are provided in the next chapter.

2.7 Constraints and Prospects for Future Agricultural Development

Various issues with regards to agricultural technology have been raised. Those are as shown on Table E.21, and summarized below:

- (1) Water control
- (2) Crop cultivation technique
- (3) Fertilizer application
- (4) Soil problem
- (5) Plant protection
- (6) The use of certified seeds

As for water control, irrigation and drainage development including on-farm development will only be a solution. Also soil improvement will be made by such measures as irrigation and drainage development and soil amendment application.

Crop cultivation technique, fertilizer application and plant protection are a matter of agricultural extension. Effective extension work is a must for realization of potential crop yields.

The supply of certified seeds should be assured. Production of such seeds should be increased.

3. Agricultural Development Plan

3.1 Objectives and Strategy for Development

3.1.1 Overview of the Draft Eighth Five Year Development Plan of the Uttar Pradesh State

On the basis of the National Document on the Draft Eighth Five Year Plan, the State Government of Uttar Pradesh also set forth the target growth in the next five years (1991-95) as follows:

- (a) Overall average annual growth rate is targetted at 6%
- (b) Sectoral targets are:
 - 4.2% for agriculture and animal husbandry;
 - 12% for manufacturing; and
 - 6% for remaining sectors.

The goals of crop production sub-sector, animal husbandry sub-sector and other social development sectors is summarized and shown in Table E.27.

3.1.2 Objectives and Strategies of the State Five Year Plan

In order to acheive the goals of growth and equity, the following main objectives are designed:

- Higher average growth rate of 6% for the State against the targeted growth rate of 5.5% only for the country;
- Significant reduction in population below poverty line by the end of the plan, reducing the percentage population below poverty line from 45.3% to 30-32% in 1994-95; and
- Creating new jobs for about 50 lakh persons and a significant reduction in severely under-employed persons in agriculture.

The third point of the above objectives links with other two ones. Creation of employment opportunity will results in increase of income which leads to alleviation of poverty. Economic activity will be enhanced through increase of income. Inrease of agriculture production should be one of the main thrust both to increase of income and to get rid of poverty. Being characterized by the smaller land holding size especially in eastern and central regions, however, it is not much expected for the Uttar Pradesh State to attain higher

growth only in agriculture production sector. As shown in the figures in goals of the Plan, manufacture which maybe mainly agro-related one, and service sectors are expected more to play a leading role to attain overall growth rate of 6%.

Subject to the over-all goals for growth with redistribution and removal of poverty and unemployment, the major objectives of State's Eighth Five Year Plan are as follows:

- (1) To raise income of rural poor;
- (2) To improve quality of life in rural areas;
- (3) To ensure that reasonable share in public facilities is available to poor people;
- (4) To maximize productivity in agriculture along with diversification and mixed farming in small and marginal holdings and in areas of low productivity;
- (5) To bring down population growth to 1.8 per cent per annum;
- (6) To achieve a faster growth in manufacturing sector and promotion of industries which have larger potentialities of employment and ancilliatization;
- (7) To consolidate gains from and to improve efficiency and productivity of past investment and of the existing assets;
- (8) To promote faster development of backward areas in order to reduce intra-state disparities in levels of development;
- (9) To undertake special measures for the overall economic and social development of the weaker sections of the society, particularly of scheduled castes/schedules tribes, and of women and children; and
- (10) To strengthen panchayati raji 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.

Over all strategies to each objective, strategies which will be pursued in the Plan to achieve objectives and to which sectoral strategies should fit are shown in Table E.28.

It should be noted that the basic objective of the Plan is to ensure that the needs of ordinary people and the 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 infrastructure base. 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 ameninties as quickly as possible".

3.1.3 Basic Concept for Agricultural Development

Small/marginal farmers who are in subsistence level and below poverty line, should be given priority. Equitable development and improvement of the quality of rural life have been aimed at in the past Five Year Plan. These approach will be continued in the successive Eighth Five Year Plan. Increase of productivity in terms of unit yield will only be a solution for alleviation of poverty unless diversification of industry is worked out. The number of farmers who are below poverty line will be reduced to maximum extent.

Large farmers are, however, expected to play a leading role on crop diversification which will lead to agro-processing and thereby creation of employment opportunity. Those farmers will be paid attention as well.

Women will be put priority for human resources development considering their core role in agriculture production. Some education programme should be established as a part of human resources development.

3.1.4 Objectives and Strategies for the Agricultural Development

(1) Development Objectives

In light with the objectives and goals of the State Eighth Five Year Plan (Draft) which are shown on Table E.28 and also with present agricultural situation in the area, following agricultural development objectives are set:

- (a) To increase farm income through increased production
- (b) To diversify crops from cereal oriented production to protein and oil production in order to improve nutritious condition of the people as well as to save foreign currency.

(2) Strategies

In order to realize the above objectives, following strategies are set so as to remove present constraints on agricultural production:

- (a) To assure reliable irrigation water;
- (b) To facilitate drainage networks;
- (c) To propose new cropping pattern; and

- (d) To facilitate agricultural extension services including farming practices as well as women's education.

3.2 Anticipated Crop Yield

The unit yield of crops under future with and without project conditions is estimated. The target yields of paddy and wheat under without project condition are estimated based on the farm economy survey and on available statistics. They are as shown below:

Crops	Present Condition	Future Condition	
		Irrigated Condition	Un-irrigated Condition
Unit: ton/ha			
<u>Kharif</u>			
Paddy	2.08-2.57	4.0	3.0
Sorghum	1.1-1.5	-	2.0
Maize	0.7-1.3	-	2.0
Pulses	0.7-1.2	2.0	1.3
Oilseeds	0.5-0.9	1.3	0.9
<u>Rabi</u>			
Wheat	1.73-2.35	3.5	2.5
Pulses	0.4-0.9	2.0	1.2
Oilseeds	0.6-0.7	1.0	0.8
Potatoes	9.0-17.0	18.0	17.0

Those of other crops are estimated based on the present farming technology level and on the existing experiment data. For achieving the target yields, optimum application of farm input is essential along with proper water management. Agriculture extension services is another need to attain the target yields. The target yields of crops will be realized in 5 years after the completion of irrigation and drainage facilities.

3.3 Proposed Cropping Pattern

Proposed cropping pattern is determined according to the following procedures.

- (1) Analysing the Present Cropping Pattern
- (2) Examination of Farmers Preferences
- (3) Examination of Suitable Crops under Various Soil Conditions
- (4) Government Policy on Crop Production
- (5) Selection of Crops to be Irrigated
- (6) Water Balance Study

- (7) Energy Balance Study between Supply and Demand
- (8) Determination of Cropping Pattern by Land Size Classes

(1) Present Cropping Pattern

As seen in the section 2.1.1, main crops in Kharif are staple cereal crops such as paddy, maize and sorghum, followed by pulses and sugarcane. Of these crops, paddy is dominantly irrigated while in Sursa sugarcane is also main irrigated crop. On the other hand in Rabi, wheat is by far cultivated and also irrigated. Potatoes and other vegetables are also irrigated. Protein crops like gram and pea, and oilseed crop of mustard are also cultivated although area is small. These present cropping pattern will be taken into account for determining future cropping pattern.

(2) Examination of Farmers Preferences

Cereal crops is dominantly cultivated both in Kharif and Rabi, no less than 75% of cropped area. Another around 10% of cropped area is devoted to pulses, protein crops, followed by oilseed crops, vegetables, forage crops, etc. with minimal areas.

As irrigation practice is done mainly for cereal crops, farmers' preference of cultivation is considered to be cereal crops. Farmers with marginal and small holding in size, especially prefer cereals such as paddy and wheat.

(3) Suitability Crops under Various Soil Conditions

As a result of soil study, 15 soil series are classified in the Area. They are broadly classified according to land systems, into 5 categories; (i) upland, (ii) mid-up land, (iii) mid land, (iv) mid-low land, and (v) low land. Areal distribution of these soils by representative areas are as shown below:

Unit: %

Representative Area	Upland	Mid-up land	Mid land	Lid-low land	Lowland	CCA(ha)
Sarajini Nagar	21.5	58.5	14.8	3.1	2.2	14,862
Sataon	60.6	37.0	-	0.4	1.9	12,874
Sursa	10.0	61.6	10.1	8.9	9.4	17,313
Purwa	20.9	58.0	7.9	4.5	8.7	12,252

Physico-chemical characteristics and suitable crops of these soils are briefly described below:

Upland soils are of sand to clay-loam in texture with high drainability and permeability. Soil pH shows almost neutral to weak alkaline. Although upland crops like maize, sorghum are main crops in these soils, paddy also is cultivated in some areas. The land suitability is ranked highest.

Mid-up land is of fine soil textures of silt to clay, and the drainability is moderate. Though strongly alkaline soils are partly seen with Kankar (consolidated body composed mainly of calcium carbonate), which limits the crop growth, the productivity is expected to be improved much through drainage improvement measures.

Midland is of clayey texture with imperfect drainability. Soil pH shows strongly alkaline. Paddy is mainly cultivated in this area at present. However, other crops can be grown after drainage condition is improved.

Mid-low land is of clayey, imperfectly drained and extremely alkaline. These soils are almost not suitable for crop cultivation, although paddy or wheat are cultivated partly by marginal farmers who do not have choice.

Lowland is characterized by heavy clay with poor drainage condition. It tends to be water-logged. Only paddy will be cultivated in Kharif in this land while wheat may be cultivated in areas where water is drained.

From the above consideration, except for a part of upland, Mid-low land and Lowland, any kind of crops will be cultivated though crop water requirement varies by soils.

(4) Government Policy on Crop Production

The national and state government has taken a policy on increased crop production on protein and oilseeds to improve nutrition status of people as well as to save foreign currency. Although farmers prefer to cultivating cereals, diversification of a part of excessive amount of cereal products will be considered.

(5) Selection of Crops to be Irrigated

Presently irrigated crops are by far paddy in Kharif season followed by upland cereals like maize and sorghum with limited areas. Wheat is dominantly irrigated in Rabi followed by very limited area of cash crops such as potatoes, vegetables, forage crops, etc. Sugarcane is an important irrigated permanent crop in Sursa. In Zaid are mainly cash crops which are mostly irrigated, however cultivated areas are very limited. These currently irrigated crops will basically be selected as future irrigated crops, since present irrigated crops are considered as priority crops under limited water condition. However, oilseed crops and/or protein crops which are currently promoted to grow under the national/state development plan, will also be introduced for improving the nutrition condition. Oil-seed crops to be introduced may be sunflower, safflower, mustard, rapeseed and groundnut.

Selected Crops to be Irrigated

Kharif: Paddy, Pulses, and Oilseed Crops
Rabi: Wheat, Pulses, Oilseed Crops, Potatoe, Forage Crops
Permanent: Sugarcane

(6) Water Availability

Irrigation Department has set cropwise proposed irrigation area for each of branch canal as follows:

Name of Branch	Kharif				Rabi		Total	% of CCA	
	Sugar cane	Paddy	Other Kharif	Total	% of CCA	Rabi			% of CCA
Hardoi Branch	21,803	108,865	43,606	174,274	22	189,443	26	363,717	47
(A) Lucknow Branch	8,412	42,060	16,824	67,296	23	70,100	23	137,396	48
(B) Asiwani Branch	2,496	12,345	4,938	19,752	23	20,576	24	40,328	48
(C) Unnao Branch	2,404	12,019	4,808	19,231	23	20,032	24	39,263	48
(D) Purwa Branch	2,250	11,250	4,500	18,000	24	18,746	24	36,746	48

Based on the above proposed cropping, paddy and sugarcane cultivation will be irrigated not more than 75% of PIA.

(7) Energy Balance Study between Supply and Demand

Cropping intensity of proposed irrigated crops will be determined considering the energy requirement to attain self-sufficiency of the small/marginal farmers as many as possible. Staple cereal crops shall be put priority since they are the main energy source of carbohydrates which will account for about 65% of total energy requirement.

(8) Determination of Cropping Pattern by Land Holding Size

Cropping pattern will be determined by land holding size. As seen before, land holding size per farm family is generally very small, which obliges farmers to remain subsistence level and under poverty line. Staple food crops of paddy and wheat will be mainly considered for marginal/small farmers, considering minimum energy requirement of cereal crops according to family size. Diversification of crops will be proposed for larger land holding farmers who are expected to produce excessive amount of cereals, after assuring the self-sufficiency and contribution to urban people and other states. Target crops to be newly introduced will be oil-seed crops.

3.3.1 Energy Balance Study

(1) Family Size and Expected Irrigated Areas by Size Classes

In order to propose an appropriate cropping pattern taking into account the above conditions above, energy requirement of the farmers is estimated on the following manner.

At first, model family size by land size categories are determined based on the results of the farm economy survey as follows:

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa	Average
Marginal (less than 1ha)	6.2	7.2	6.7	6.4	6.6
Small (1 to 2 ha)	8.3	8.1	7.9	7.9	8.0
Semi Medium (2 to 4 ha)	11.0	10.5	10.3	9.4	10.3
Medium and Large (4 ha and above)	11.2	12.8	10.9	13.8	11.9

Secondly, average land holding size by size classes at full development stage is also determined as follows.

Unit: ha

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Margnial (less than 1ha)	0.58(35%)	0.58(41%)	0.53(29%)	0.56(35%)
Small (1 to 2 ha)	1.43(30%)	1.44(26%)	1.41(26%)	1.42(27%)
Semi Medium (2 to 4 ha)	2.76(23%)	2.91(21%)	2.67(26%)	3.00(23%)
Medium and Large (4 ha and above)	5.57(12%)	6.34(12%)	5.57(19%)	5.48(15%)

Remarks: Parenthesized figures show the rate of areal distribution of each land holding size to total land holding area.

Proposed irrigable area is determined at 25% of land as shown below:

Unit: ha

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Margnial (less than 1ha)	0.145	0.145	0.133	0.14
Small (1 to 2 ha)	0.358	0.36	0.35	0.355
Semi Medium (2 to 4 ha)	0.69	0.73	0.668	0.75
Medium and Large (4 ha and above)	1.393	1.585	1.393	1.37

(2) Energy Requirement

Poverty line in India has been set based on per capita energy requirement, which is 2,400kcal in rural area. The poverty line is considered to be cleared when farm family would produce required amount of energy. On the basis of the data on past cereal contribution to the total energy consumption, future energy requirement by cereal is set at 65% of total energy requirement of 2,400kcal. Multiplying this requirement by average family size, energy requirement from cereals by land sizes are as shown below:

Energy requirement from cereals = 2,400kcal/day/capita x 0.65 x Family size

Unit: kcal

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Margnial (less than 1ha)	9,672	11,232	10,452	9,984
Small (1 to 2 ha)	12,948	12,636	12,324	12,324
Semi Medium (2 to 4 ha)	17,160	16,380	16,068	14,664
Medium and Large (4 ha and above)	17,472	19,968	17,004	21,528

(3) Possible Cereal Production or Energy Supply by Land Size

Based on the target yield of recommended cereal and industrial crops shown below, possible cereal energy supply is calculated.

Paddy:	4.0ton/ha(unhusked rice)
Wheat:	3.5ton/ha
Sugarcane:	30.0ton/ha

Edible portion of harvest is calculated at:

Paddy:	1.92ton/ha(20% of loss and 60% of milling efficiency)
Wheat:	2.66ton/ha(20% of loss and 95% of milling efficiency)
Sugarcane:	2.1 - 2.4ton/ha(7 - 8% of sugar contents)

Based upon the combustion energy of carbohydrate of 3.5kcal/g, and assuming that cultivated crops are paddy in kharif and wheat in rabi, respectively, possible energy supply per farm family by land size is estimated at:

Size Class	Unit: kcal			
	Sarojini Nagar	Sataon	Sursa	Purwa
Marginal (less than 1ha)	6,368	6,368	5,819	6,148
Small (1 to 2 ha)	15,700	15,810	15,371	15,591
Semi Medium (2 to 4 ha)	30,303	31,950	29,315	32,938
Medium and Large (4 ha and above)	61,156	69,610	61,156	60,167

(4) Energy Balance

The balance between energy requirement and possible energy supply then is as shown below:

Size Class	Unit: kcal/family/day			
	Sarojini Nagar	Sataon	Sursa	Purwa
Marginal (less than 1ha)	-3,304	-4,864	-4,633	-3,836
Small (1 to 2 ha)	2,752	3,174	3,047	3,267
Semi Medium (2 to 4 ha)	13,143	15,570	13,247	18,274
Medium and Large (4 ha and above)	43,684	49,642	44,152	38,639

Combustion energy is converted into carbohydrates as below:

Unit: kg/family/year

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Marginal (less than 1ha)	-345	-507	-483	-400
Small (1 to 2 ha)	287	331	318	341
Semi Medium (2 to 4 ha)	1,371	1,624	1,381	1,906
Medium and Large (4 ha and above)	4,556	5,177	4,604	4,029

(5) Basic Idea for Determining Cropping Pattern

As seen from the above, marginal farmers will not be able to produce necessary energy only from irrigated cereals for supporting family. On the other hand, small farmers will be able to get sufficient harvest to supply required amount of energy to all family members although the expected excess of cereals will not be much. Semi-medium size farmers will be able to produce excessive amount, equivalent to 60 to 70% of total requirement while medium and large farmers are expected to produce excessive harvest more than 2 times as much as required amount of cereals.

Not being able to be self-sufficient only in the canal-water-supplied area, marginal farmers will cultivate other cereal crops to supplement carbohydrates, and protein/oil crops in the remaining area, depending upon rainwater or groundwater.

Small farmers, who will be able to produce self-sufficient cereal crops in canal-water-supplied area, will grow protein/oil crops to assure other energy source than carbohydrates, other cereals and vegetables for marketing and other crops for feeding domestic animals in the remaining area.

As they will produce excessive amount of cereal crops in the canal-water-supplied area, semi-medium farmers will diversify some area for oil-seed crops or market a part of excessive cereals. They will also be able to cultivate various crops in non-canal-water supplied area.

Medium and large farmers, as they will produce more than required amount of cereals, would market excessive amount as well as diversify them with oil-seed crops as the government is promoting.

From the above, semi-medium, medium and large farmers would diversify crops with oil-seed crops to contribute the government policy on oil crops promotion. In Sursa area, however, currently irrigated sugarcane area with some 500ha would remain, taking into account of the importance of sugar industry on the regional economy. In this case, being carbohydrates, sugarcane will be considered as an alternative crops of cereal crops.

3.3.2 Determination of Cropping Pattern in Canal-water-supply Area

It is judged that semi-medium, medium and large farmers would be able to produce necessary amount of cereals to support their family in canal-water-supply area if targeted yield of crops are assured. A part of excessive amount of cereals will be diversified according to the following procedures:

- (1) Estimation of Excessive Amount of Products
 - (2) Determination of Cropping Pattern for Canal-Water-Supply Area
- (1) Estimation of Excessive Amount of Products

First of all, producer population is calculated by multiplying farm area ratio in each land size class by the number of family members. Then the number of beneficiaries is estimated by dividing excessive amount of cereals to be produced by semi-medium, medium and large farmers by per capita daily required amount of energy from cereals (65% of total required energy). The results are as shown below:

Number of family members per unit area

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Marginal (less than 1ha)	2.17	3.50	1.94	2.24
Small (1 to 2 ha)	2.49	2.11	2.05	2.13
Semi Medium (2 to 4 ha)	2.53	2.21	2.68	2.16
Medium and Large (4 ha and above)	1.34	1.54	2.07	2.07
Total	8.53	9.36	8.74	8.60

Excessive energy per unit area

Unit: kcal

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Marginal (less than 1ha)	0	0	0	0
Small (1 to 2 ha)	826	825	792	882
Semi Medium (2 to 4 ha)	3,023	3,270	3,444	4,203
Medium and Large (4 ha and above)	5,242	5,957	8,389	5,796

Number of beneficiaries per unit area

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Marginal (less than 1ha)	0	0	0	0
Small (1 to 2 ha)	0.52	0.52	0.50	0.56
Semi Medium (2 to 4 ha)	1.93	2.07	2.20	2.69
Medium and Large (4 ha and above)	3.36	3.81	5.37	3.71
Total	5.81	6.40	8.07	6.96

(2) Determination of Cropping Pattern under Irrigated Condition

A part of excessive amount of cereals can be diversified. The ratio of required cereal amount for self-sufficiency of farmers to the possible potential cereal production is some 56% based on the following calculation.

$$\text{Number of family member}/(\text{Number of family member} + \text{Number of beneficiaries}) \\ = 35.23/(35.23+27.24) = 0.56 \text{ (see tables in P.51 and P.52 of this text)}$$

It is therefore necessary to cultivate cereal crops with 56% of irrigated area to meet self-sufficiency of carbohydrates for farmers. Considering 20% more cereals production for food security purpose, about 68% of total irrigated area will be devoted to cereal production.

The remaining 32% will be cultivated with pulses, oilseeds, vegetables, etc. Sugarcane is proposed in Sursa with an area of 10% of total irrigated area at the sacrifice of the same area for cereal cultivation.

Proposed cropping patterns in canal-water-supply area by Representative Areas are determined as shown in Fig.E.11 and summarized as follows:

Proposed Crop Intensity and Irrigation Areas

Crops	Sarojini Nagar		Sataon		Sursa		Purwa	
	Intensity (%)	Area (ha)	Intensity (%)	Area (ha)	Intensity (%)	Area (ha)	Intensity (%)	Area (ha)
Kharif	100	3,567	100	3,090	90	3,740	900	2,941
Paddy	68	2,426	68	2,101	58	2,410	68	2,000
Pulses	22	785	22	680	22	914	22	647
Oilseeds	10	357	10	309	10	398	10	294
Rabi	100	3,716	100	3,219	90	3,895	100	3,063
Wheat	68	2,527	68	2,190	58	2,510	68	2,083
Pulses	15	557	15	483	15	649	15	459
Oilseeds	5	186	5	161	5	216	5	153
Potatoes/ Vegetables	6	223	6	193	6	260	6	184
Forage crops	6	223	6	193	6	260	6	184
Permanent Sugarcane	-	-	-	-	10	433	-	-

3.3.3 Determination of Cropping Pattern under Non-canal-water-supply Area

As mentioned before, marginal farmers will not be able to attain self-sufficiency in carbohydrates only in canal-water-supply area. They will have to grow cereal crops also in non-canal-water-supply area, depending upon the rainwater and/or groundwater.

Deficit energy in carbohydrates of marginal farmers are calculated on paddy and wheat basis, respectively, and shown below:

Unit: kg/family/year

	Sarojini Nagar	Sataon	Sursa	Purwa
Paddy basis deficit amount	717	1,054	1,005	832
Wheat basis deficit amount	452	664	633	524

Applying present yield, area requirement to supplement deficit for paddy and wheat, respectively, is calculated as below:

Unit: ha

	Sarojini Nagar	Sataon	Sursa	Purwa
Required area for paddy	0.37	0.51	0.38	0.36
Required area for wheat	0.24	0.30	0.27	0.30
Non-canal-water-supply area	0.43	0.30	0.39	0.42

From the above table, average size of marginal farmers are considered to be self-sufficient in carbohydrates by cultivating paddy and wheat in non-canal-water-supply area.

Present cropping pattern will basically be followed in the remaining area. However, sorghum and maize, important upland crops and materials for traditional staple food of "chapati" as well, will also be cultivated at the rate of 20% of the remaining area. On the other hand, rape and mustard, vegetables and feed crops will be planted at a rate of 5%, respectively.

Cropping pattern in non-canal-water-supply area, then is determined as shown in Fig.E.12 and summarized below:

Crops	Sarojini Nagar	Sataon	Sursa	Purwa
Kharif				
Paddy	50%	50%	50%	50%
Sorghum	10%	15%	5%	20%
Maize	5%	-	15%	-
Pulses	20%	20%	20%	20%
Oilseeds	15%	15%	10%	10%
Rabi				
Wheat	65%	65%	65%	65%
Pulses	15%	15%	15%	15%
Oilseeds	10%	10%	10%	10%
Potatoes/Vegetables	5%	5%	5%	5%
Fodder Crops	5%	5%	5%	5%

3.4 Proposed Farming Practice

In order to attain target yields, new farming practices of crops are proposed. Basically proposed farming practices follow the recommendable farming practices by Chandra Shekhar Azad University of Agriculture and Technology, except agro-chemicals many of which recommended commodities have been banned for their toxicity. Proposed farming practice of crops is briefly explained below and also shown on Tables E.29 to E.37:

(1) Paddy

There are three categories of paddy varieties according to the growth period: early maturing varieties (100 to 120 days of growth period), medium maturing varieties (120 to 140 days) and late maturing varieties (140 days and more):

Nursery

In May, nursery preparation should be made. Fine textured fertile soil should be selected with irrigation and drainage facilities. 30 to 50 kg of seed according to the grain size should be sown on 600 to 800 sq.meter of nursery for one hectare of paddy field. 14.5kg of urea and 7kg of triple superphosphate should be applied on nursery bed before sowing seeds. To prevent iron deficiency and zinc deficiency, 300g of zinc sulfate and 2.5% of iron sulphate should also be applied.

Seed should be soaked for 24 hours and dried for 36 to 40 hours in shade for germination, and then broadcasted at the rate of 70 grams per sq.meter. During first week of sowing, water should be available permanently in the field. After first week regular and light irrigations should be given.

Transplanting

Before transplant, basal fertilizer should be applied at puddling. The dosage of fertilizer should be, depending on varieties, 30 to 60 kgN/ha, 30 to 60 kgP₂O₅/ha and 30 to 60 kgK₂O/ha.

Seedlings at the age of 21 to 25 days for dwarf varieties and 30 to 35 days for deshi varieties should be used for transplanting. Medium maturing varieties should be transplanted between last week of June to 15th of July while early maturing varieties should be transplanted by the third week of June. In case of late maturing varieties, transplanting should be done by the end of July. Planting density should be 2 plants per hill with 20cm in row and 10cm in plant to 4 plants per hill with 15cm in row and 10cm in plant, depending upon the field and/or variety conditions. Supplement planting should be done immediately.

Direct Sowing

Direct sowing should be completed by first week of July. Seeding rate should be 75 to 80 kg/ha, and be sown in row with the distance of 20cm.

Weeding

First weeding should be done after one week of transplanting or 20 days after the transplanting. Second weeding should be 40 to 50 days after transplanting.

Top Dressing

Additional fertilizer at a rate of 30 to 60 kgN/ha should be applied at the panicle initiation stage, about 2 weeks before heading.

Water Management

Paddy should be irrigated at the following critical growth stages

- Seedling stage
- Flowering stage
- Panicle initiation stage
- Soft dough or milky stage

Plant Protection

The insects or diseases to be protected are as follows:

- (1) insects: stem borer, root borers
- (2) diseases: blast, brown spot, blight, stem rot, root rot

(2) Wheat

Land Preparation

Prepare the field at proper good moisture with the help of Disc plough followed by harrowing. In case soil moisture is deficient pre-irrigation is necessary.

Seeding

Seeding rate is about 100kg/ha. First week to 25th of November would be the best time for sowing. Seed should be treated with Thiram at a rate of 2.5g/kg seed. Seeding should be done with row distance of 22cm.

Fertilizer Application

Depending on soil condition, 80 to 120kgN/ha, 60kgP₂O₅/ha and 40kgK₂O should be applied. Half of the nitrogen should be applied at the time of first irrigation. To prevent zinc deficiency, 5kg of zinc sulfate with 2% solution of urea dissolved in 800 liters of water should be sprayed.

Water Management

First irrigation should be given at crown root initiation stage, i.e. 20 to 25 days after sowing. Half amount of nitrogen should be topdressed at this time. The other critical stages are: tillering stage, jointing stage, boot leaf stage, flowering stage, and milky stage.

Plant Protection

The insects or diseases to be protected are as follows:

- (1) insects: termites, aphids, hopper, weevil
- (2) diseases: blight, rust,

(3) Groundnut

Soil Selection

Sandy loam or loamy soils with good drainage are suitable.

Plant spacing and seed rate:

Depending upon varieties, plant spacing varies from 30x10cm to 45x20cm with the seed rate of 65 to 100 kg per hectare.

Fertilizer application

15kgN/ha, 30kgP₂O₅/ha, and 45kgK₂O/ha should be applied as basal fertilizer. Besides, 200kg of gypsum and 4kg of borax per hectare should be applied. Half amount of gypsum should be applied at basal, and the rest and borax should be applied three weeks after sowing.

Seed treatment

1kg of kernal seed should be treated with 2.5g of thiram. Rhizobium culture should be applied to stimulate symbiotic nitrogen fixation, after treating with thiram.

Weed management

Two weedings and hoeing are recommended. First weeding and hoeing should be done 15 to 20 days after sowing. Second weeding and hoeing should be done at 30 to 35 days after sowing.

Plant Protection

The insects or diseases to be protected are as follows:

- (1) insects: white grubs
- (2) diseases: rust

(4) Mustard

Fertilizer Application

In irrigated condition, 120kgN/ha, 40kgP₂O₅/ha and 40kgK₂O/ha should be applied. Half amount of nitrogen and full phosphate and potassium should be applied as basal and rest of nitrogen as top dressing at first irrigation.

Seeding

Seeding should be made at a seed rate of about 5 to 6 kg during the first fortnight of October, with planting density of 45x15cm.

Water management

First irrigation should be done 30 days after sowing. Another two irrigation: at flowering stage and pod formation stage should be required.

Plant Protection

The insects or diseases to be protected are as follows:

- (1) Insect: saw-fly, aphid, painted bug
- (2) Diseases: rust diseases, blight,
- (5) Pea

Seeding

In mid-october to mid-November, 75 to 100kg/ha of seed should be sown with row spacing of 30 to 45 cm.

Fertilizer application

10 to 15kgN/ha and 40kgP₂O₅/ha should be applied as basal fertilizer.

Water Management

First irrigation should be done at flowering stage.

Plant Protection

The insects or diseases to be protected are as follows:

- (1) insect Termite, cut-worm, stem-borer, semi-looper
- (2) diseases powdery mildew
- (6) Green gram

Seeding

From last week of July to the first week of August, 12kg of seed per ha should be sown with a spacing distance of 30 to 45cm.

Fertilizer application

15kgN/ha and 40kgP₂O₅/ha should be applied as a basal fertilizer. Rhizobium culture should be inoculated before seeding.

Weed management

First weeding or hoeing should be done 20 to 25 days after sowing.

Water management

Irrigation should be done at early growth stage and flowering stage.

(7) Potatoes

Seed preparation

Select out 4 to 5 cm size seeds or 50g seed. Sprouts should be 2 to 3cm long before planting.

Fertilizer application

150kgN/ha, 100kgP₂O₅/ha and 100kgK₂O/ha should be applied as basal fertilizer before seeding.

Seeding

For early varieties, between 15 Sep. and 20 Sep. For main crops between 15 Oct. and 25 Oct. with a seeding rate of 42 quintal/ha. Planting density should be 60x20cm.

Plant protection

The insects or diseases to be protected are as follows:

- (1) insects: cut worm,
- (2) diseases: late blight

(8) Sugarcane

Seeding

There are two seasons for planting: October and March. In both cases, cane is planted at a rate of 50 to 60 quintals/ha, with a spacing of 90 cm in row and 30 cm in line.

Fertilizer application

30 to 40kgN/ha should be applied as basal fertilizer. In spring planted sugarcane, 20 to 30 kgP₂O₅/ha should be added.

Plant Protection

The insects or diseases to be protected are as follows:

- (1) insects: borers, white fly
- (2) diseases: pyrilla

3.5 Expected Production

Irrigation and drainage development is expected to increase net cultivated area. The expected incremental production of crops in the project area is shown on Table E.38 and also as follows:

Crops	<u>Without Project Condition</u>		<u>With Project Condition</u>		Incremental Production (ton)
	Cultivated Area (ha)	Production (ton)	Cultivated Area (ha)	Production (ton)	
<u>Kharif</u>					
Paddy	18,700	42,000	30,710	101,000	59,000
Sorghum	5,500	7,300	5,120	10,200	2,900
Maize	2,900	3,700	2,540	5,100	1,400
Pulses	3,600	2,200	11,700	15,900	13,700
Oilseeds	600	400	6,800	6,700	6,300
<u>Rabi</u>					
Wheat	30,000	64,500	37,200	102,400	37,900
Pulses	3,150	2,200	8,600	12,000	9,800
Oilseeds	350	230	5,000	4,150	3,980
Potatoes	800	11,600	3,000	55,900	44,300

3.6 Farm Budget Analysis

As seen above, farm production is expected to increase after the implementation of the project. Farm income, then, will also increase. Adopting commodity price at 1990 harvesting season, farm budget under with project condition is estimated per ha basis. They are shown on Tables E.39 to E.42, and summarized as below:

Unit: Rupees

Size Class	Sarojini Nagar	Sataon	Sursa	Purwa
Kharif	5,494	5,360	5,204	5,521
Rabi	5,344	5,176	4,908	5,032
Perennial			833	
Total	10,838	10,536	10,945	10,553

In any Representative Area, per ha basis farm budgets show more than Rs.10,000 of net benefit. As compared with the present condition, this benefit is 20% to 150% higher value. Farmers' living standard is expected to be improve.

3.7 Agricultural Supporting Services

Agricultural supporting services should be strengthened in order to attain the target yields. Training of farmers including women, linkage between research and extension should be put priority. Supply of certified seeds, marketing and processing should also be considered for the future development of farmers associations.

3.7.1 Training, Research and Extension

Training of farmers including women as well as project staffs should be done. The level of present farming technology is not considered high. This may attribute to farmers' low education level, among others lady farmers as mentioned in the section 2.2.3 of the Annex C "Socio-Economy", which result in making extension rather difficult. Some education program to farmers should then be planned aiming at making extension work easy as well as at preventing farmers from being cheated by merchant.

In extension programme, there are mainly two courses; (i) irrigation course including water management and maintenance of field channels, and (ii) agricultue course including farming practice and soil improvement.

The following knowledge should be transferred to farmers

(i) Irrigation course

a) water management

- crop - water relation
- water requirement
- necessity of "Osrabandi"
- water distribution schedule
- role of farmers
- irrigation fee

b) maintenance of field channels

- necessity of maintenance of field channels
- maintenance schedule
- role of farmers
- share of farmers

(ii) Agriculture course

a) farming practice

- seed selection
- seeding
- fertilizer requirement
- application of fertilizer
- weed control
- pest control
- irrigation
- harvest
- storage
- marketing
- processing

b) soil improvement

- problem soils
- how to solve problems
- drainage
- soil amendment

In the course of extension, site specific problems may be raised by farmers. Extension workers should take note those question/problem and bring them to research institutes. The linkage between research and extension should then be strengthened.

3.7.2 Special Education Programme

Improvement of literacy rate is a must to effect extension work. Demonstration of farming technique is a necessary way for extension, but is not sufficient. Documentation or manual should be prepared for farmers to follow the instruction. In light with the low education level of farmers, some education programme to improve literacy rate should be facilitated.

Education programme will be made in the form of circulating class; i.e. visiting village by village, considering women's very busy situation. This programme will be done in combination with extension programme.

3.8 Plan to Actualize Osrabandi

3.8.1 Organizing Farmers' Association on Water Management

Farmers themselves would be the key factor for successful implementation of "Osrabandi". After establishing or completing the on-farm development works and thereby assuring reliable water, next issue would be how to manage water and maintain field channels. It is farmers that should be responsible for those roles, considering that water management works and maintenance works of field channels require large number of

manpower and that governmental agency would not be able to handle with those works by itself only due to lack of staffs as well as budgets. Farmers should be organized to deal with the above works as those works would directly benefit farmers themselves.

The following would be required for smooth execution of "Osrabandi".

- to make water distribution plan
- to determine cropping pattern
- to formulate water management plan
- to execute water management according to the plan
- to maintain field channel

The following societies should be organized in one chak in order to fulfill the above requirement

- a water management groups in each sub-chak
- a water management society in one chak
- an water management committee in one minor canal

A water management group would be minimum organization composed of all beneficial farmers in the respective sub-chaks, responsible for the determination of cropping pattern and for execution of water management and maintenance work on field channel. The group would be assisted by the CAD Authority. Water charge or irrigation fee would be collected by the group.

A water management society would consist of the representatives of each water management group. The society would function as a coordinating body among sub-chaks, and be responsible for the determination of water distribution schedule in the chak based on the determined cropping pattern, for the determination of water management schedule, for the supervision of water management works and of maintenance work on field channel. The society would be assisted by the Irrigation Department as well as the CAD Authority.

A water management committee would consist of the representatives of chaks commanded by one minor canal. The committee would function as a counter organization to the Irrigation Department as well as a coordinating body among societies, and be responsible for the supervision of water management works and of maintenance works on field channels.

3.8.2 Pilot Trial for Water Management

In order to execute water management by farmer beneficiaries efficiently, some training should be done. A pilot trial utilizing one model chak will be proposed. The model chak will also function as demonstration, training and extension farm.

A pilot trial would be planned in the model chak with an area of 40 to 50 ha consisting of 7 sub-chaks. 7 water management groups and a water management society will be organized with the assistance of CAD Authority. Based on the water distribution schedule informed by the Irrigation Department, cropping pattern will be determined by each group. The water management society will determine water distribution plan within the chak based on the cropping pattern in sub-chaks. The water distribution will be one week basis: one day per one sub-chak. Within one sub-chak, detailed water distribution plan will be made on hour basis. A gate keeper who is responsible for the outlet gate operation will be appointed by the group.

3.9 Institutional Improvement Plan

An ever-increasing provision of agricultural inputs at the general level, and at substantial social cost, does not guarantee productivity commensurate with the financial and social returns required of investment. Substantial institutional reforms may be necessary. However, it would be unrealistic to believe that the institutional network would easily endorse major reforms. It may, therefore, be beneficial to modify some of the existing system with reforms that do not call for any major legislative enactment, but require only institutional and organizational rearrangements. At the grassroots level, reforms should be centered around the farm producer. There is also an increasing need to restore a greater sense of economic democracy at the grassroots level. Endorsing economic democracy at the grassroots level requires restoration, and development of an institutionalized support mechanism for a farm producer cooperative. These cooperatives exist to promote efficient resource utilization and at the same time save themselves, as well as the system, from excessive transaction costs, including administrative costs.

The proposed model, to be called Agro-Management Society (AMS), would operate in a command area of 1,000 to 2,000 hectares, each with an average membership size of about 500 farmers. The respective society will be an elected cooperative body, to be registered under the Uttar Pradesh Cooperative Societies Act of 1965. The working of the society will be closely guided by the new organizational set up proposed at the project level. The society itself, in addition to elected officers, consists of five committees: (i) water distribution and

management (including kulaba-wise subcommittees), (ii) crop loans and agricultural credit, (iii) crop production inputs — seed, fertilizers, insecticides and extension services, (iv) marketing and storage, and (v) agro-processing. Each of these committees will be assisted by young graduates in appropriate fields trained at local educational institutions. The compensation to be paid to these apprentices will be approximately Rs.600 per month and their terms will be renewable yearly. The compensation for such additional technical and semitechnical staff will be partially met by the sale of water, inputs, and the provision of services to the farmers by the society. However, there is a possibility of an unbridged gap between revenue and expenditure. A moderate grant or subsidy of about Rs.30 per hectare is likely to meet such a gap on an annual basis.

The AMS will have three levels of farmers and committees to overview, supervise, and control the irrigation management system. The committees will operate at the project level, minor canal level, and AMS or water management society level. The committees will obviously be comprised of both head end and tail end farmers. This will provide the necessary feedback mechanism to the irrigation managers. In addition, it will encourage demand-based rather than supply-based irrigation water deliveries. An equitable water distribution, like rotational water supply, will also be effected by these committees with the technical assistance of the Irrigation Department and the new apprentices at the AMS level. A Memorandum of Undertaking (MOU), similar to those of the central public sector, may be needed to be worked out between parties involved including the various farmers' committees, the Irrigation Department, and especially the appropriate irrigation units and the AMS. Although this will be a radical departure from the existing practice, it should provide greater interaction, association, and understanding between the water users and the irrigation system functionaries. It is possible that the new system would require about three years to stabilize further initial calibration. The proposed organizational network at the project management level will evolve separately. Fig.E.13.

TABLES

Table E.1 Present Land Use by Block in Sharda Command Area (1/3)

Name of District	No.	Name of Block	(A) Geographical Area		(B) Lands of Net Area Sown		(C) Irrigated Area		(D) Current Fallow Lands		(E) Other Fallow Lands		(F) Culturable Waste Lands		(G) Tree-garden Lands		(H) Pasture Lands		(I) Usr & Unculturable Lands		(J) Forest Lands		(K) (K/A) Other Lands					
			ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%	ha	%		
NAINITAL	1.01	SITARGANI	68,522	72.5	49,692	72.5	40,735	82.0	727	1.1	1,577	2.3	6,379	9.3	316	0.5	1	0.0	643	0.9	6,059	8.8	3,128	4.6	3,327	10.0	1,325	4.6
	1.02	KHATIMA	33,210	68.0	22,598	68.0	18,625	82.4	578	1.7	955	2.9	3,755	11.2	180	0.5	0	0.0	311	0.9	3,327	10.0	1,325	4.6	3,327	10.0	1,325	4.6
			35,312	76.7	27,094	76.7	22,110	81.6	149	0.4	632	1.8	2,644	7.5	136	0.4	0	0.0	332	0.9	2,732	7.7	1,603	4.5	2,732	7.7	1,603	4.5
			309,372	69.8	216,020	69.8	146,474	67.8	7,799	2.5	4,089	1.3	7,419	2.4	1,671	0.5	270	0.1	5,098	1.6	38,617	12.5	28,389	9.2	28,389	9.2	28,389	9.2
			121,574	60.1	73,065	60.1	54,525	74.6	2,138	1.8	1,166	1.0	4,387	3.6	901	0.7	35	0.0	1,229	1.0	28,537	23.5	10,116	8.3	10,116	8.3		
			29,645	82.8	24,539	82.8	16,313	66.5	350	1.2	252	0.9	403	1.4	260	0.9	20	0.1	476	1.6	149	0.5	3,196	10.5	3,196	10.5		
			40,984	82.2	33,686	82.2	25,261	75.0	709	1.7	535	1.3	510	1.2	82	0.2	13	0.0	999	2.4	137	0.3	4,313	10.5	4,313	10.5		
PILIBHIT	2.03	AMARIA	22,969	77.0	17,677	77.0	12,397	70.1	533	2.3	437	1.9	668	2.9	91	0.4	6	0.0	787	3.4	0	0.0	2,770	12.1	2,770	12.1		
	2.04	LAKHURIKHER	31,845	68.0	21,666	68.0	10,430	48.1	928	2.9	468	1.5	624	2.0	97	0.3	49	0.2	435	1.4	5,035	15.8	2,543	8.0	2,543	8.0		
	2.05	BARKHERA	35,954	71.0	25,511	71.0	16,873	66.1	1,545	4.3	586	1.6	395	1.1	117	0.3	60	0.2	216	0.6	4,757	13.2	2,767	7.7	2,767	7.7		
	2.06	BILSANDA	26,401	75.3	19,876	75.3	10,675	53.7	1,596	6.0	645	2.4	432	1.6	123	0.5	87	0.3	956	3.6	2	0.0	2,684	10.2	2,684	10.2		
	2.07	BISARPUR	260,465	81.4	211,960	81.4	211,750	99.9	6,324	2.4	3,786	1.5	1,878	0.7	863	0.3	278	0.1	7,084	2.7	222	0.1	28,070	10.8	28,070	10.8		
			32,985	28,521	100.0	341	1.0	135	0.4	129	0.4	83	0.3	36	0.1	0	0.0	298	1.1	0	0.0	2,865	10.9	2,865	10.9			
			26,309	22,852	100.0	95	0.4	80	0.3	145	0.5	148	0.5	58	0.2	7	0.0	424	1.6	0	0.0	3,255	11.9	3,255	11.9			
BAREILLY	3.01	NAWABGANJ	27,295	83.8	22,882	83.8	22,882	100.0	376	1.4	145	0.5	148	0.5	58	0.2	7	0.0	424	1.6	0	0.0	3,255	11.9	3,255	11.9		
	3.02	RICHGHA	20,056	77.2	15,478	77.2	15,478	100.0	778	3.9	360	1.8	326	1.6	63	0.3	92	0.5	481	2.4	0	0.0	2,478	12.4	2,478	12.4		
	3.03	SHERGARH	19,661	86.4	16,990	86.4	16,990	100.0	324	1.6	187	1.0	109	0.6	36	0.2	37	0.2	241	1.2	0	0.0	1,737	8.8	1,737	8.8		
	3.04	FATEHGANJ	20,805	65.9	13,707	65.9	13,507	98.5	656	3.2	352	1.7	133	0.6	63	0.3	29	0.1	3,224	15.5	78	0.4	2,563	12.3	2,563	12.3		
	3.05	BHOJIPURA	20,495	81.2	20,495	100.0	20,495	100.0	572	2.3	363	1.4	155	0.6	80	0.3	27	0.1	486	1.9	0	0.0	3,060	12.1	3,060	12.1		
	3.06	KYARA	32,234	76.3	24,596	76.3	24,596	100.0	1,509	4.7	1,141	3.5	251	0.8	158	0.5	1215	3.8	141	0.4	3,223	10.1	3,223	10.1				
	3.07	BITHARI	24,198	83.1	20,118	83.1	20,118	100.0	584	2.4	243	1.0	193	0.8	85	0.4	22	0.1	203	0.8	0	0.0	2,750	11.4	2,750	11.4		
SHAHJAHANPUR	4.01	KHUTAR	31,684	83.1	26,321	83.1	26,321	100.0	1,089	3.4	780	2.5	351	1.1	183	0.6	6	0.0	203	0.6	1	0.0	2,750	8.7	2,750	8.7		
	4.02	BANDA	396,539	78.1	293,216	78.1	293,216	94.6	17,943	4.5	9,178	2.3	4,713	1.2	4,453	1.1	1,220	0.3	8,044	2.0	9,343	2.4	31,801	8.0	31,801	8.0		
	4.03	PAYAYAN	46,545	69.3	32,270	69.3	15,642	48.5	1,742	3.7	794	1.7	501	1.1	1,132	2.4	88	0.2	277	0.6	6,573	14.1	3,168	6.8	3,168	6.8		
	4.04	SINDHAUL	46,891	82.4	38,653	82.4	38,653	100.0	867	1.8	813	1.7	325	0.7	544	1.2	71	0.2	238	0.5	2,246	4.8	2,246	4.8				
	4.05	NGOHI	30,601	80.7	24,680	80.7	24,680	100.0	1,599	5.2	455	1.5	330	1.1	348	1.1	70	0.2	251	0.8	463	1.5	2,405	7.9	2,405	7.9		
	4.06	KATARA	29,168	80.4	23,464	80.4	23,464	100.0	1,288	4.4	365	1.3	720	2.5	290	1.0	59	0.2	344	1.2	8	0.0	2,630	9.0	2,630	9.0		
	4.07	BHAWALKHER	25,449	84.9	21,610	84.9	21,610	100.0	588	2.3	274	1.1	222	0.9	172	0.7	44	0.2	239	0.9	0	0.0	2,300	9.0	2,300	9.0		
KHERI	5.01	BIJU	24,955	80.2	20,018	80.2	20,018	100.0	767	3.1	381	1.5	187	0.7	329	1.3	10	0.0	408	1.6	0	0.0	2,855	11.4	2,855	11.4		
	5.02	PHULBEHAR	31,928	76.4	24,380	76.4	24,380	100.0	1,841	5.8	1,178	3.7	478	1.5	285	0.9	269	0.8	499	1.6	24	0.1	2,974	9.3	2,974	9.3		
	5.03	BANKAGANI	34,790	72.8	25,328	72.8	25,328	100.0	2,542	7.3	1,714	4.9	793	2.3	233	0.7	263	0.8	860	2.5	10	0.0	3,047	8.8	3,047	8.8		
	5.04	LAKHIMPUR	32,745	78.4	25,668	78.4	25,668	100.0	2,028	6.2	1,750	5.3	375	1.1	302	0.9	156	0.5	203	0.6	10	0.0	2,253	6.9	2,253	6.9		
	5.05	BEHAM	24,580	82.7	20,331	82.7	20,331	100.0	1,465	6.0	1,195	0.8	72	0.3	164	0.7	45	0.2	438	1.8	3	0.0	1,866	7.6	1,866	7.6		
	5.06	MUMBAHI	29,493	85.7	25,262	85.7	25,262	100.0	575	1.9	705	2.4	150	0.5	196	0.7	63	0.2	417	1.4	0	0.0	2,125	7.2	2,125	7.2		
	5.07	KUMBHA	59,394	71.5	28,180	71.5	28,180	100.0	2,641	6.7	554	1.4	560	1.4	458	1.2	81	0.2	3,870	9.8	6	0.0	3,044	7.7	3,044	7.7		
SHAHJAHANPUR	5.08	MITAULI	364,632	75.8	188,232	75.8	188,232	68.1	20,057	5.5	3,481	1.0	2,329	0.6	3,014	0.8	1,101	0.3	6,224	1.7	15,479	4.2	36,565	10.0	36,565	10.0		
	5.09	PARAGAWAN	59,083	60.9	36,009	60.9	36,009	59.2	3,020	5.1	329	0.6	751	1.3	603	1.0	33	0.1	1,292	2.2	8,509	14.4	8,537	14.4	8,537	14.4		
	5.10	PHULBEHAR	40,504	76.8	16,960	76.8	16,960	54.5	2,480	6.1	466	1.2	149	0.4	92	0.2	114	0.3	603	1.5	1,231	3.0	4,256	10.5	4,256	10.5		
	5.11	BANKAGANI	33,852	78.8	26,665	78.8	26,665	75.1	1,580	4.7	240	0.7	176	0.5	112	0.3	58	0.2	404	1.6	1,523	4.5	3,180	9.4	3,180	9.4		
	5.12	LAKHIMPUR	38,535	77.2	29,736	77.2	29,736	63.1	2,618	6.8	254	0.7	148	0.4	112	0.3	58	0.2	604	1.6	25	0.1	4,980	12.9	4,980	12.9		
	5.13	BEHAM	28,999	79.7	23,106	79.7	23,106	59.3	1,492	5.1	191	0.7	148	0.4	112	0.3	58	0.2	404	1.6	147	0.5	3,062	10.6	3,062	10.6		
	5.14	MUMBAHI	42,653	79.2	33,530	79.2	33,530	84.5	1,537	3.6	540	1.3	180	0.4	302	0.5	205	0.5	555	1.9	147	0.5	3,062	10.6	3,062	10.6		
5.15	KUMBHA	36,488	79.2	28,888	79.2	28,888	77.8	1,160	3.2	420	1.2	153	0.4	553	1.5	74	0.2	763	2.1	1,347	3.2	2,577	6.0	2,577	6.0			
SHAHJAHANPUR	5.16	MITAULI	37,148	77.8	28,883	77.8	28,883	73.9	2,386	6.4	423	1.1	235	0.6	442	1.2	260	0.7	675	1.8	756	2.0	3,088	8.3	3,088	8.3		
	5.17	PARAGAWAN	47,370	77.3	36,632	77.3	36,632	65.0	3,784	8.0	618	1.3	339	0.7	657	1.3	258	0.5	780	1.6	567	1.2	3,755	7.9	3,755	7.9		