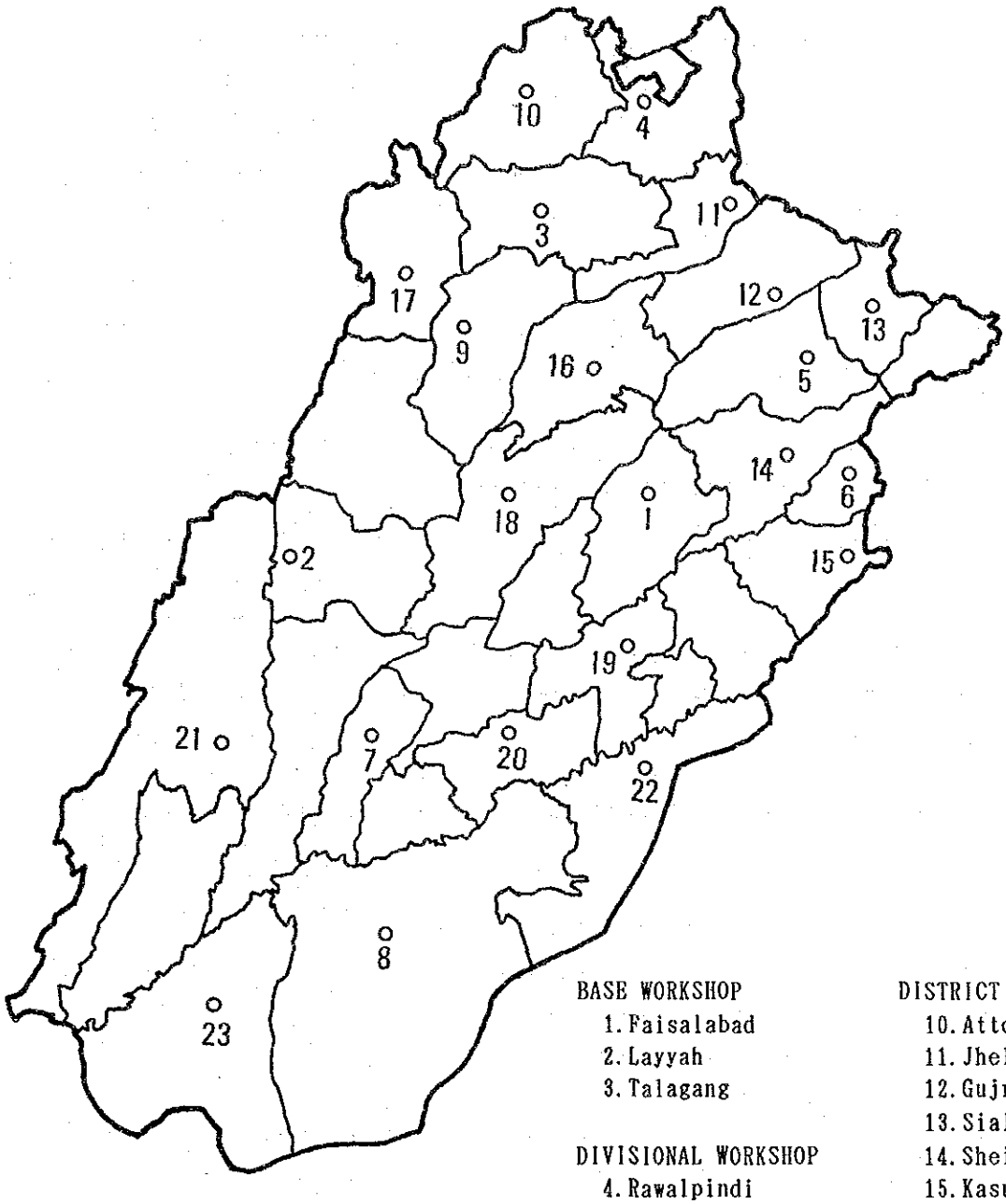


BASE WORKSHOP
1. Faisalabad
2. Layyah
3. Talagang

DIVISIONAL WORKSHOP
4. Rawalpindi
5. Gujranwala
6. Lahore
7. Multan
8. Bahawalpur
9. Qaidabad

DISTRICT WORKSHOP
10. Attok
11. Jhelum
12. Gujrat
13. Sialkot
14. Sheikhupura
15. Kasur
16. Sargodha
17. Mianwali
18. Jhang
19. Sahiwal
20. Vehari
21. D. G. Khan
22. Bahawalnagar
23. Khanpur

Fig 3-4 LOCATION OF WORKSHOPS

The base workshop of the Directorate-I is located at Faisalabad District, and that of the Directorate-II at Layyah in D.G. Khan Division with the largest machine population and in Talagang where the agricultural land development project was executed for the first time by the DGAF. Each Base Workshop is managed by an Assistant Agricultural Engineer (AAE, W/S) with 100 to 150 staff, and is equipped with an automatic undercarriage welder and large special purpose machines required for heavy repair services. (See Fig. 3-2)

The Divisional Workshop is managed by an Assistant Agricultural Engineer (AAE, W/S) under the control of Divisional Office and has 60 to 100 staff, and is equipped for heavy repairs of bulldozer same as the Base Workshop.

The District Workshop under the control of an Assistant Agricultural Engineer (AAE, Field) with 20 to 40 staff carries out the monthly check-up of bulldozers and finds out the causes of troubles. It is capable of simple works like dismounting and mounting of engine.

The overall workshop capacity as observed above is considered to be sufficient to assure the maintenance and management of the equipment which will be newly introduced.

Apart from workshops, daily maintenance of equipment is carried out at site by the following team:

1) One operator for one bulldozer (fixed)
2) One maintenance staff for one bulldozer (fixed)
3) One repair mechanic for five (5) bulldozers
4) One electrician for ten (10) bulldozers

The operator and maintenance staff have on average 15 and 7 years of experience respectively, and are each responsible for a specified machine.

Table 3-11 List of Equipment of Lahore Divisional Workshop

Type	Origin	Year Procured	Present Condition
Slotter Machine	USSR	1971	Operable
Milling Machine	"	1971	"
Lathe 4'	Pak	1971	"
Lathe 6'	"	1971	"
Lathe 10'	"	1971	"
Crankshaft Grinder	USA	1971	Unserviceable
Drill 1-1/2'	Pak	1971	Operable
Electric Drill Small	Pak	1977	"
Radial Drill	USSR	1969	Under Repair
Bench Drill	"	1981	Operable
FT Pump Tester	UK	1971	"
FT Pump Tester	Japan	1988	"
Tool Grinder	China	1976	"
Bench Tool Grinder	USSR	1981	"
Head Seat Refacer	"	1981	Under Repair
Elec. Wel. Transformer	China	1971	Operable
Eelec. Wel. Generator	Pak	1977	"
Air Compressor	"	1973	Under Repair
Hydraulic Link Press	USSR	1983	"

Table 3-12 Staff Component of Lahore and Multan Divisional Workshops

No	Description	Lahore	Multan
		Nos.	Nos.
	Senior Staff		
1	Agriculture Engineer	(1)	(1)
2	Asst. Agr. Engineer	1	1
3	Forman	1	1
4	Sub-engineer	1	-
5	S. Cleak	1	1
	Sub-total	4	3
	Junior Staff		
6	Mechanic	9	15
7	Turner	7	7
8	Moulder	2	2
9	Welder	3	3
10	Blacksmith	2	3
11	Carpenter	1	19
12	Spray Painter	1	1
13	Electrician	1	2
14	Filter	5	3
15	Upholster	1	1
16	Hammerman	1	2
17	Tinsmith	1	1
18	Driver	2	1
19	Helper	17	9
20	Water Carrier	1	1
21	Junior Clerk	4	1
22	Office Borer	1	1
23	Mali/Baildar	5	1
24	Sweeper	1	12
25	Chowkidar	0	2
	Sub-total	65	87
Total		69	90

Source: Dept. of Agriculture, Punjab 1992

Note: "Agricultural Engineer" of Divisional Office is in charge of general supervision of Divisional Workshop, while Assist. Agriculture Engineer, Field assigned to Divisional Workshop is immediately responsible for its day-to-day management.

CHAPTER 4. THE PROJECT

CHAPTER 4. THE PROJECT

4.1 Objective of the Project

The government of Pakistan stipulates, as the objectives in priority of the Seventh Five-Year Plan (1988/89~1992/93), the increased production of food crops for achieving the self-sufficiency in foodstuff of the fast growing population, and of export crops and import substitution crops for reducing trade deficit.

Punjab Province has a cultivating area corresponding to 70% of the country's total and produces wheat and rice, the staple foods, accounting for 73% and 46% of the country's total respectively, and also cotton, principal export product, corresponding 87% of the country's total.

Punjab Province accounts for 70% of Pakistan's total cultivating area, 73% of total wheat production and 46% of total rice production, both staple food crops, and 87% of the total production of cotton, principal export item. With the objective of increasing these agricultural products, Punjab Province has established a plan to develop newly about 200,000 ha of land, out of 1,800,000 ha arable land of private holding, in 5 years 1992/93~1996/97. (See Tables 4-1 & 4-2)

The Department of Agriculture of Punjab Province has procured since 1975/76 1,040 units of bulldozer and assisted farmers in developing the agricultural land of their holding by leasing bulldozers to them. As the result of the project, 1.84 million ha of agricultural land has been developed. Of the total number of bulldozers introduced for the land development project, 440 units have been procured in three phases, 1985/86, 1986/87, 1989/90, with the KR-II of the Japanese Government, and have contributed to the development of 550,000 ha of agricultural land.

However, all the bulldozers procured by Punjab Province, except for those procured with the KR-II of the Japanese Government, have reached the end of their economic lives and are classified as unserviceable. And those procured with the KR-II of the Japanese Government have become unserviceable by as much as 24% and the remaining units will reach, within few years, the end of their economic lives.

Punjab Province estimates that there will be a shortage of 300 units of bulldozer for carrying out the above land development project starting in 1992/93.

The objective of the present project is thus defined for Punjab Province to supplement 300 units of bulldozer required for the implementation of the priority project for agricultural land development.

Table 4-1 Agriculture Land, Punjab

(Unit: 1,000 ha)

Division	District		Cultivated area	Culturable waste land
1. Faisalabad	1	Faisalabad	477	57
	2	Jhang	711	81
	3	T.T. Singh	260	31
	Sub total		1,448	169 (11.7%)
2. Sargodha	4	Sargodha	497	37
	5	Khushab	468	34
	6	Mianwali	254	47
	7	Bhakkar	707	47
	Sub total		1,926	165 (8.6%)
3. Gujranwala	8	Gujranwala	495	44
	9	Sialkot/Narowall	442	10
	10	Gujrat	452	18
	Sub total		1,389	72 (5.2%)
4. Lahore	11	Lahore	125	10
	12	Kasur	288	45
	13	Sheikhupura	492	42
	14	Okara	341	42
	Sub total		1,246	139 (11.2%)
5. Rawalpindi	15	Rawalpindi	265	43
	16	Jhelum	128	61
	17	Chakwal	318	38
	18	Attock	302	39
	Sub total		1,013	181 (17.9%)
6. Multan	19	Multan/Lodhran	578	39
	20	Khanewal	351	13
	21	Sahiwal/Pakpattan	510	29
	22	Vehari	380	24
	Sub total		1,819	105 (5.8%)
7. D.G. Khan	23	D.G. Khan	305	127
	24	Layyah	376	202
	25	Muzaffargarh	407	256
	26	Rajanpur	334	245
	Sub total		1,422	830 (58.4%)
8. Bahawalpur	27	Bahawalpur	379	26
	28	Bahawalnagar	546	55
	29	R.Y. Khan	600	45
	Sub total		1,522	126 (8.3%)
Total			11,788	1,787 (15.2%)

Source: Dept. of Agriculture, Punjab 1992

Table 4-2 District-wise Development Schedule

(Unit: 1,000 ha)

Division	District		Year					
			92/93	93/94	94/95	95/96	96/97	Total(percent)
1. Faisalabad	1	Faisalabad	0.26	1.30	1.24	1.17	1.17	5.14
	2	Jhang	0.42	2.10	2.00	1.89	1.89	8.30
	3	T.T. Singh	0.23	1.15	1.09	1.03	1.03	4.53
		Sub total	0.91	4.55	4.33	4.09	4.09	17.97 (9.1%)
2. Sargodha	4	Sargodha	0.29	1.45	1.38	1.31	1.31	5.74
	5	Khushab	0.29	1.45	1.38	1.31	1.31	5.74
	6	Mianwali	0.26	1.30	1.24	1.17	1.17	5.14
	7	Bhakkar	0.32	1.60	1.52	1.44	1.44	6.32
		Sub total	1.16	5.80	5.52	5.23	5.23	22.94 (11.7%)
3. Gujranwala	8	Gujranwala	0.32	1.60	1.52	1.44	1.44	6.32
	9	Sialkot/Narowali	0.32	1.60	1.52	1.44	1.44	6.32
	10	Gujrat	0.26	1.30	1.24	1.17	1.17	5.14
		Sub total	0.90	4.50	4.28	4.05	4.05	17.78 (9.0%)
4. Lahore	11	Lahore	0.23	1.15	1.09	1.03	1.03	4.53
	12	Kasur	0.32	1.60	1.52	1.44	1.44	6.32
	13	Sheikhupura	0.29	1.45	1.38	1.31	1.31	5.74
	14	Okara	0.23	1.15	1.09	1.03	1.03	4.53
		Sub total	1.07	5.35	5.08	4.81	4.81	21.12 (10.7%)
5. Rawalpindi	15	Rawalpindi	0.26	1.30	1.24	1.17	1.17	5.14
	16	Jhelum	0.26	1.30	1.24	1.17	1.17	5.14
	17	Chakwal	0.26	1.30	1.24	1.17	1.17	5.14
	18	Attock	0.26	1.30	1.24	1.17	1.17	5.14
		Sub total	1.04	5.20	4.96	4.68	4.68	20.56 (10.5%)
6. Multan	19	Multan/Lodhran	0.32	1.60	1.52	1.44	1.44	6.32
	20	Khanewal	0.26	1.30	1.24	1.17	1.17	5.14
	21	Sahiwal/Pakpattan	0.49	2.15	2.04	1.93	1.93	8.54
	22	Vehari	0.32	1.60	1.52	1.44	1.44	6.32
		Sub total	1.39	6.65	6.32	5.98	5.98	26.32 (13.4%)
7. D.G. Khan	23	D.G. Khan	0.49	2.15	2.04	1.93	1.93	8.54
	24	Layyah	0.56	2.80	2.66	2.52	2.52	11.06
	25	Muzaffargarh	0.52	2.60	2.47	2.34	2.34	10.27
	26	Rajanpur	0.56	2.80	2.66	2.52	2.52	11.06
		Sub total	2.13	10.35	9.83	9.31	9.31	40.93 (20.8%)
8. Bahawalpur	27	Bahawalpur	0.49	2.45	2.33	2.21	2.21	9.69
	28	Bahawalnagar	0.49	2.45	2.33	2.21	2.21	9.69
	29	R.Y. Khan	0.49	2.45	2.33	2.21	2.21	9.69
		Sub total	1.47	7.35	6.99	6.63	6.63	29.07 (14.8%)
Total (percent)			10.07 (5.0%)	49.75 (25.3%)	47.31 (24.1%)	44.78 (22.8%)	44.78 (22.8%)	196.69 (100%) (100%)

Source: Dept. of Agriculture, Punjab 1992

4.2 Review of the Content of the Project

4.2.1 Rationality and Necessity of the Project

(1) Content of the request

The content of the request for a grant aid submitted by the Department of Agriculture of Punjab Province to the Japanese Government was as follows:

Equipment	Quantity
1) Medium size bulldozer (110~130 HP)	200 units
2) Small size bulldozer (80~90 HP)	100 unis
3) Spare parts	20% of the equipment value
4) Transporter	10 units
5) Spare parts	10% of the equipment value

Thirty-two (32) districts (29 at the time of request) of the Province are divided into three groups by priority according to their development possibility, development effect, development history and quantity of development equipment introduced. However, as a result of the discussion about the content of the request during the Basic Design Study, Punjab Province expressed its desire to execute the land resource development project in two phases taking into account the size of the project.

Actually it has been ascertained that the request for the supply of the equipment for the land resource development is divided into two phases as follows:

Table 4-3 Proposal

Equipment	1st phase	2nd phase	Total
1) Midium size Bulldozer (110~130 HP)	100	100	200
2) Small size Bulldozer (80~90 HP)	50	50	100
3) Spare parts	20% of the equipment value	20% of the equipment value	20% of the equipment value
4) Transporter	5	5	10
5) Spare parts	10% of the equipment value	10% of the equipment value	10% of the equipment value

(2) Content of the land resource development project

1) Objective area of land resource development and development objective

The Department of Agriculture of Punjab Province has set the annual development programme for each district and intends to develop 196,690 ha of agricultural land in total in Punjab Province in five years, starting from 10,070 ha per year in 1992/93 and reaching 44,780 ha per year. (See Table 4-2)

The Department of Agriculture of Punjab Province has ranked 32 districts following the order of priority and divided them into 3 groups (A, B, C) by the order of priority. (See Table 4-4) On the other hand, for the reason of project scale, it expresses an intention of executing the project in two phases. The group-B of medium priority is divided further in sub-groups B_1 and B_2. Then group-A and group-B_1 are joined to form the first stage project area of the highest priority, and the equipment that has been requested will be used for the development of agricultural land in this area.

Table 4-4 District-wise priority order for development

District	Priority order	Classification	
Dera Ghazi Khan	1	A	A
Muzaffargarh	2		
Rajanpur	3		
Layyah	4		
Bahawalpur	5		
Bahawalnagar	6		
Rahim Yar Khan	7		
Faisalabad	8	B	B_1
Multan	9		
Lodhran	10		
Pakpattan	11		
Jhang	12		
Bhakkar	13		B_2
Gujranwala	14		
Sheikhunpura	15		
Kasur	16		
Okara	17		
Rawalpindi	18		
Jhelum	19		
Chakwal	20		
Attock	21		
Khanewal	22	C	C
Sahiwal	23		
Vehari	24		
T.T. Singh	25		
Sargodha	26		
Khushab	27		
Gujrat	28		
Lahore	29		
Sialkot	30		
Narowal	31		
Mianwali	32		

The development target for the first stage project area has been taken out from the Land Resource Development Programme of the whole Punjab Province which was prepared earlier by the Government of the Punjab (hereafter called as General Programme) as shown in the Table 4-2: This part of the General Programme will be called hereafter Land Resource Development Project or the Project).

Table 4-5 indicates the objective area of the Land Resource Development Project. The objective area is located in 12 districts of 4 divisions of the southern half of Punjab Province and covers all of D.G Khan Division and Barawalpure Division, two-thirds of Faisalabad Division and a half of Multan Division. The development target in these four divisions is 95,000

ha, of which D.G Kahan Division accounts for 43%, Bahawalpul 30.5%, Faisalabad 14.1% and Multan 12.6% respectively.

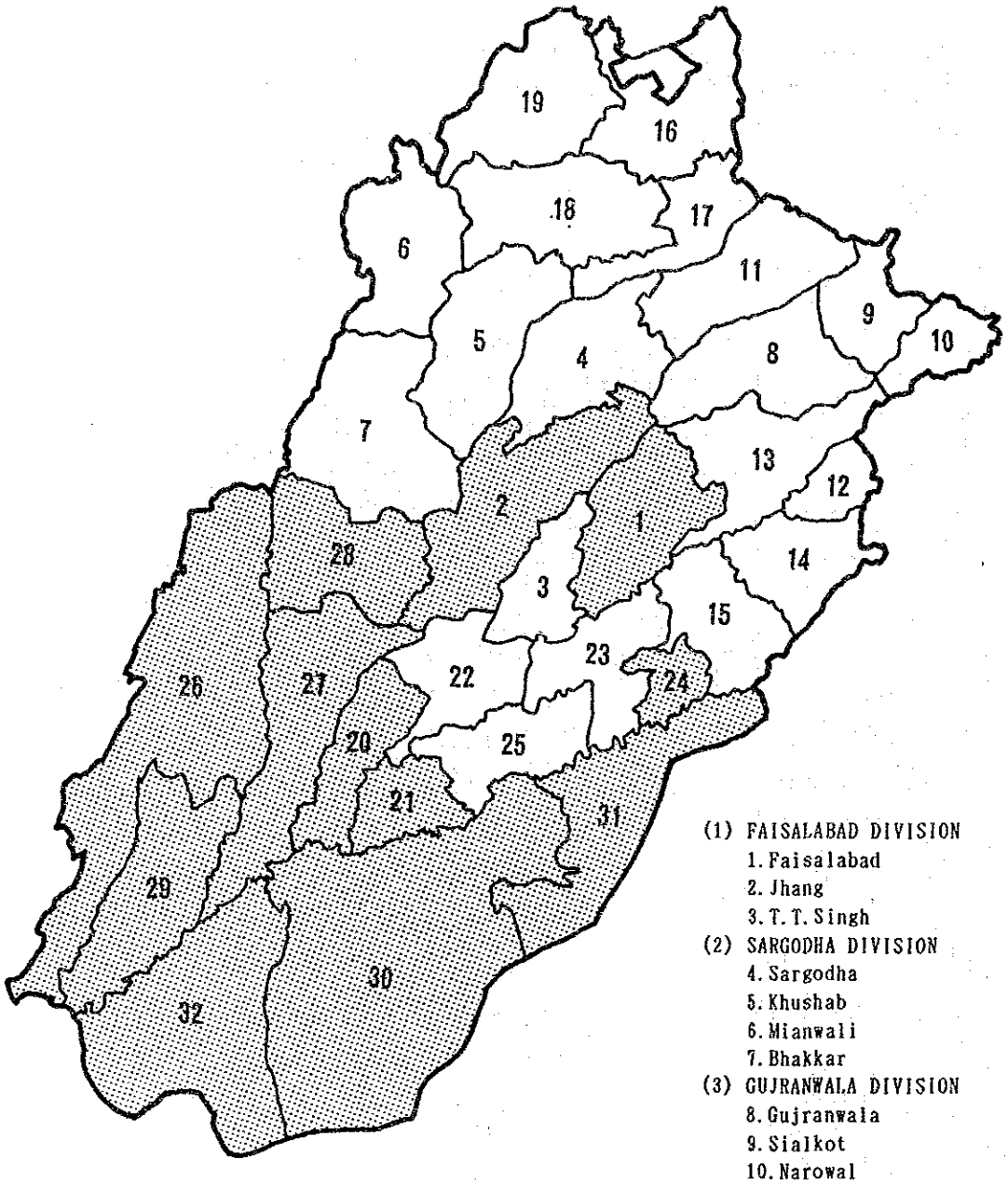
In this chapter, the content of the request on the Project will be studied in relation to the General Programme.

Table 4-5 The Project-District-wise development plan

(Unit: 1,000 ha)

Division	District		Yearly Schedule					
			92/93	93/94	94/95	95/96	96/97	Total (Percent)
Faisalabad	1	Faisalabad	0.26	1.30	1.24	1.17	1.17	5.14
	2	Jhang	0.42	2.10	2.00	1.89	1.89	8.30
		Sub Total	0.68	3.40	3.24	3.06	3.06	13.44 (14.1%)
Multan	19-1	Multan	0.16	0.80	0.76	0.72	0.72	3.16
	19-2	Lodhran	0.16	0.80	0.76	0.72	0.72	3.16
	21-2	Pakpattan	0.32	1.43	1.36	1.29	1.29	5.69
		Sub Total	0.64	3.03	2.88	2.73	2.73	12.01 (12.6%)
D.G. Khan	23	D.G. Khan	0.49	2.15	2.04	1.93	1.93	8.54
	24	Muzaffargarh	0.56	2.80	2.66	2.52	2.52	11.06
	25	Layyah	0.52	2.60	2.47	2.34	2.34	10.27
	26	Rajanpur	0.56	2.80	2.66	2.52	2.52	11.06
		Sub Total	2.13	10.35	9.83	9.31	9.31	40.93 (42.9%)
Bahawalpur	27	Bahawalpur	0.49	2.45	2.33	2.21	2.21	9.69
	28	Bahawalnagar	0.49	2.45	2.33	2.21	2.21	9.69
	29	R.Y. Khan	0.49	2.45	2.33	2.21	2.21	9.69
		Sub Total	1.47	7.35	6.99	6.63	6.63	20.07 (30.5%)
The Project			4.92	24.13	22.94	21.73	21.73	95.45 (100%)
Proposed plan			10.07	49.75	47.31	44.78	44.78	196.69

Source: Dept. of Agriculture, Punjab 1992



(1) FAISALABAD DIVISION
1. Faisalabad
2. Jhang
3. T. T. Singh

(2) SARGODHA DIVISION
4. Sargodha
5. Khushab
6. Mianwali
7. Bhakkar

(3) GUJRANWALA DIVISION
8. Gujranwala
9. Sialkot
10. Narowal
11. Gujrat

(4) LAHORE DIVISION
12. Lahore
13. Sheikhupura
14. Kasur
15. Okara

(5) RAWALPINDI DIVISION
16. Rawalpindi
17. Jhelum
18. Chakwal
19. Attock

(6) MULTAN DIVISION
20. Multan
21. Lodhran
22. Khanewal
23. Sahiwal
24. Pakpattan
25. Vehari

(7) D.G. KHAN DIVISION
26. D.G. Khan
27. Muzaffargarh
28. Layyah
29. Rajanpur

(8) BAHAWALPUR DIVISION
30. Bahawalpur
31. Bahawalnagar
32. R.Y. Khan

Fig 4-1 PROJECT AREA

2) Land reclamation capacity of the land resource development equipment

Based on the analysis of the past record of operation time, the DGAF of Punjab Province has set an economic life of medium and small size Japanese bulldozers (80~90 HP & 110~130 HP) at 7 years and the total operation time at 11,000 hrs: economic life of machine means the limit of use of machine, beyond which the operation cost of machine becomes cheaper if old machine is replaced with a new one. The economic life is set longer than in Japan, but it is quite understandable as the intensity and efficiency of work are lower than in Japan. The standard life of bulldozer in Japan is shown as reference below.

Size of Bulldozer	Life (Year)	Normal working hours per year (hr)	Working hours in the life (hr)
9 ton, 86 HP	5	850	4,250
11 ton, 108 HP	6	900	5,400
15 ton, 150 HP	6	900	5,400

The distribution of annual operation time and the development area during 11,000 hrs of economic life of bulldozer are set by the DGAF as the average data given in table 4-6 and are indicated in PC-1 Proforma (Project Implementation Plan). According to the Table, the hourly development area assigned to a medium or small size bulldozer is 810 m^2 on average (890.4 ÷ 11,000 hrs = 809.4 m^2/h) and the total development area in 7 years as 890 ha.

Table 4-6 Bulldozer

Year	Hours to be worked (hr) (percent)	Area to be reclaimed (ha)	Accumulated operating hours (hr) (percent)
1	400 (3.6%)	32.4	400 (3.6%)
2	2,000 (18.1%)	161.9	2,400 (21.8%)
3	1,900 (17.3%)	153.8	4,300 (39.1%)
4	1,800 (16.4%)	145.7	6,100 (55.5%)
5	1,800 (16.4%)	145.7	7,900 (71.8%)
6	1,600 (14.5%)	129.5	9,500 (86.4%)
7	1,500 (13.6%)	121.4	11,000(100.0%)
Total	11,000 (100.0%)	890.4	-

Source: PC-I Dec. 1990
Dept. of Agriculture, Punjab

During the field survey, a production capacity test was done with a medium size bulldozer (rented by the DGAF of Punjab Province) at a land reclamation site in the suburb of Rawalpindi. As a result, the developed area per hour is judged to be 800 m^2/hr on average. Therefore, 810 m^2 per hour on average of land reclamation capacity set by the DGAF for a medium and small size Japanese bulldozer as above can be considered as well justified.

Table 4-7 Field Performance Test

Date	:	15/7/1992
Location	:	Rawalpindi
Type of work	:	Development
Type of equipment	:	Medium size Bulldozer
Blade width	:	2.87 m

Test No.	No.1	No.2	No.3	Av erage
Working distance (m)	46	43	47	43.5
Actual working width (m)	0.96	1.20	0.85	1.0
Speed range	F1-R1	F1-R1	F1-R1	F1-R1
Time for work	1'33"	1'22"	1'38"	1'31"
Time for reverse	1'22"	1'15"	1'29"	1'22"
Gear change (2 times)	6"	6"	6"	6"
Cycle time	-	-	-	2'59"

Actual working distance: 43.5m - 5m ≈ 40m

Performance per hour:

$$\frac{\text{Actual working distance(40m) x Actual working width(1m) x 60}}{\text{Cycle time (3')}}$$

$= 800\ m^2$

Observation: (1) The work is slightly heavy that normal work in Punjab
(2) Using 80% slottle of full load

While, Table 4-8 indicates the area of the agricultural land developed in Punjab Province during 1985/86~1991/92 with the equipment procured with the KR-II of the Japanese government. The operation time of the bulldozers procured in three phases with the KR-II (1985/86, 1986/87, 1989/90) were

2,077 hrs in 1985/86~1989/90 and 1,534 hrs in 1990/91~1991/92. On the other hand the bulldozers procured in 1979/80 with Yen Credit have substantially 9 years of economic life and 13,200 hrs of average operation time. They are in the 8th and the 9th year of use, while their life should have terminated normally in 1985/86. This means that the life of these bulldozers is practically two years longer than the standard and their operating time 2,200 hrs longer than those procured with the KR-II. The longer life might be attributed to the difference in design of the products. The operation time of these bulldozers is estimated at 1.200 hrs in the 8th year and 1,000 hrs in the 9th year, and is inscribed in the year of 1986/87 and 1987/88 respectively.

It is estimated from the above that during 1985/86~1989/90 the operation time of bulldozer was 3,546,000 hrs, developed area 813 ha and hourly development area 900 m^2, and during 1990/91~1991/92 the operation time 1,534,000 hrs, developed area 150 ha and hourly development area 980 m^2: the average development area per hour is estimated at 920 m^2. This is however a rough estimation. Taking into account the accuracy of statistic values and of expected operating time, 800 m^2/hr set by the Department of Agriculture of Punjab Province proves to be quite reasonable.

Table 4-8 Yearly operating hours of Bulldozers under KR-II

Year	Bulldozers under KR-II Operating hours (1,000 hr)				Bulldozer* Operating hours	Total (1,000 hrs)	Estimated develop-ment area (1,000 ha)	Perfor-mance per unit (m^2/hr)
	Procured in 1985/86 (106 units)	Procured in 1986/87 (194 units)	Procured in 1989/90 (140 units)	Total	Procured in 1979/80 (397 units)			
1985/86	(1) 42.4			42.4	(7) 595.5	637.9		
1986/87	(2) 212.0	(1) 77.6		289.6	(8) 476.4	766.0		
1987/88	(3) 201.4	(2) 388.0		589.4	(9) 397.0	986.4		
1988/89	(4) 190.8	(3) 368.6		559.4		55.4		
1989/90	(5) 190.8	(4) 349.2	(1) 56.0	596.0		596.0		
Sub-total				2,076.8	1,468.9	3,545.7	317.98	897
1990/91	(6) 169.6	(5) 349.2	(2) 280.0	798.8		798.8		
1991/92	(7) 159.0	(6) 310.4	(3) 266.0	735.4		735.4		
Sub-total				1,534.2		1,534.2	150.6	982
Total	1,166.0	1,843.0	602.0	3,611.0 (71.1%)	1,468.9 (28.9%)	5,079.9 (100.0%)	468.59	922

Note: 1) Bulldozers under KR-II: 7 years life & 11,000 working hours in life
2) Bulldozers under Yen Credit: 9 years life & 13,200 working hours in life (based on the actual date
3) Refer Table 3-6 for estimated development area

(3) Characteristics of the project area

The area where the project is to be implemented in priority in the General Programme has the following characteristics.

1) Rainfall

As Fig. 4-2 shows, the Project area is the least rainfall area in Punjab Province. It is generally arid or semi-arid zone with precipitation below 150 mm, except for a small area in the northern part (Faisalabad) where the annual precipitation exceeds 200 mm.

(Unit: mm)

Location	Height (above sea level)	1985	1986	1987
Faisalabad	184m	235	344	363
Multan	123m	158	219	108
Bahawalpur	117m	100	207	107

Source: Statistical Pocket Book of Pakistan

2) Temperature

The average maximum temperature is 30-33℃, and the average minimum temperature is 16~18℃.

(Unit: mm)

Location	Height (above sea level)	1985		1986		1987	
		Max average	Min. average	Max. average	Min. average	Max. average	Min. average
Faisalabad	184m	31.4	17.0	30.3	16.5	31.5	17.0
Multan	123m	33.3	17.8	32.1	17.6	33.1	18.3
Bahawalpur	117m	32.9	18.0	31.9	17.5	33.1	18.4

Source: Statistical Pocket Book of Pakistan 1988

3) Soil and land use

As Fig. 4-3 shows, the project area is located in the flood plain at the confluence of 5 rivers (means Punjab), and its soil contains old alluvial clay and sandy soil. As the Fig. shows, 50% of the total area is cultivated, 40% natural pasture and the remaining 10% unexploited.

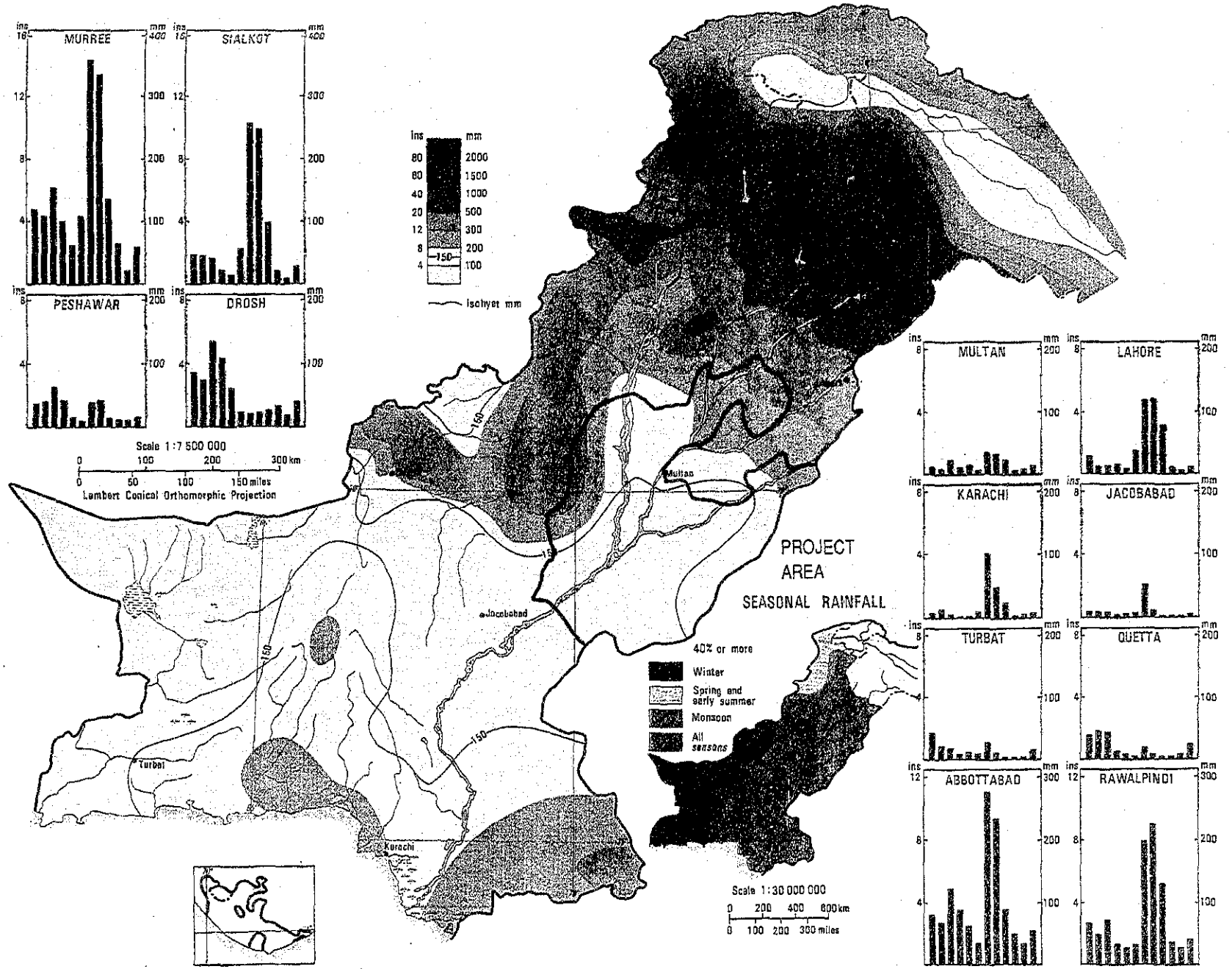


Fig. 4-2 MEAN ANNUAL RAINFALL

Source : Collins • Longman Atlases

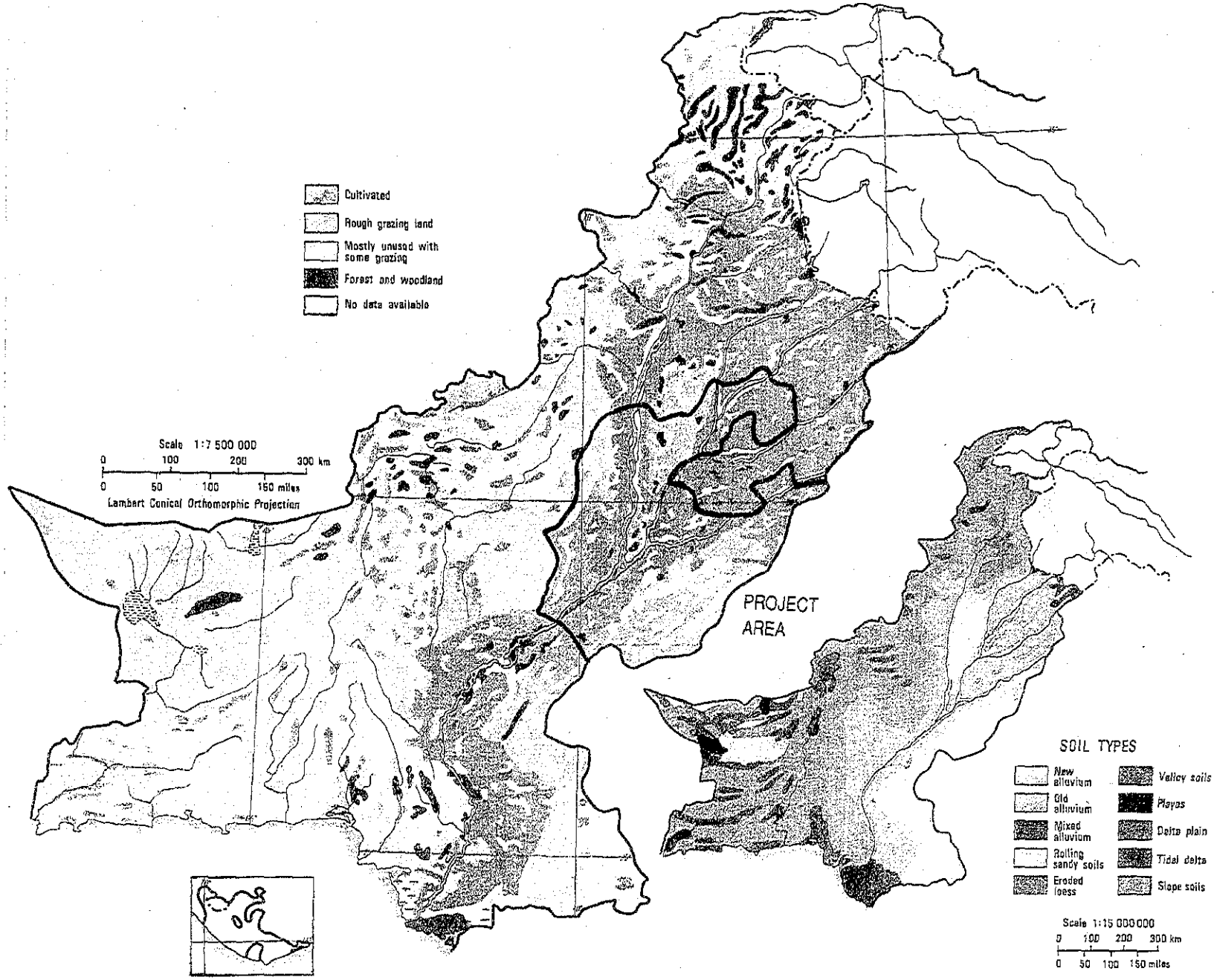


Fig. 4-3 LAND USE

Source : Collins • Longman Atlases

4) Agricultural land

Table 4-9 shows the agricultural land in each district of Punjab Province. The agricultural land area in the project area is 6,385,000 ha, equal to 47% of Punjab Province's total, 13,515,000 ha (cultivated land 11,728,999 ha and cultivable wasteland 1,787,000 ha). The cultivated area accounts for 44% of Punjab Province's total, whereas the uncultivated wasteland area accounts for 65% of the Province's total. This means that the project area has a higher potential for the agricultural land development compared with the northern region of Punjab Province.

5) As Table 4-10 shows, the planted area in the project area accounts for 44% of Punjab Province's total. The area planted to wheat, staple food, accounts for 46% of the Province's total, whereas the area planted to rice accounts for only 19% of the Province's total.

On the other hand the area planted to cotton is approximately 1,470,000 ha or 70% of the Province's total, which means that the project area constitutes one of the largest cotton producing area.

These facts are reflected in the crops production shown in Table 4-11. The wheat production in the Project area (1989/90), 260,000 tons, represents 46% of the Province's total, 560,000 tons, and rice production, 240,000 tons, represents 19% of the Province's total, whereas cotton production, 1.48 million tons, accounts for 72% of the total. The project area extending over almost the southern half of Punjab Province is widely covered with alluvial clay, the most suitable soil for cotton cultivation in the whole territory of Pakistan, and gives a yield of 1.7 tons/ha, which is nearly double of the average yield in the northern half of the Province: 1 ton/ha.

6) Agriculture

According to Table 4-12, the population of Punjab Province is 47,000,000, of which 34,000,000, equal to 70%, is estimated to be agricultural active population. Number of farmers is 2,705,000, and family of a farmer is, on the average, 13.

Table 4-9 Agriculture Land, Punjab (Projct Area/Others)

(Unit: 1,000 ha)

No.	District	Total	Cultivating area	Culturable waste
1	Faisalabad	534	477	57
2	Jhang	792	711	81
19	Multan/Lodhran	617	578	39
21	Sahiwal/Pakpattan	539	510	29
23	D.G. Khan	432	305	127
24	Muzaffargarh	663	407	256
25	Layyah	578	376	202
26	Rajanpur	579	334	245
27	Bahawalpur	405	379	26
28	Bahawalnagar	601	546	55
29	R. Y. Khan	645	600	45
Sub-total for project area		6,385	5,223	1,262
3	T.T. Singh	291	260	31
4	Sargodha	534	497	37
5	Khushab	502	468	34
6	Mianwali	301	254	47
7	Bhakkar	754	707	47
8	Gujranwala	539	495	44
9	Sialkot/Narowal	452	442	10
10	Gujrat	470	452	18
11	Lahore	135	125	10
12	Sheikhupura	534	492	42
13	Kasur	333	288	45
14	Okara	383	341	42
15	Rawalpindi (Islamabad)	308 (77)	265 (48)	43 (20)
16	Jhelum	189	128	61
17	Chakwal	356	318	38
18	Attock	341	302	39
20	Khanewal	364	351	13
22	Vehari	404	380	24
Total for all Punjab (Islamabad)		13,575 (77)	11,788 (48)	1,787 (29)

Source: Punjab Development Statistic 1988

Table 4-10 Crop-wise Cultivating Area, Punjab

(Unit: 1,000 ha)

No.	District	Wheat	Rice	Sugar Cane	Cotton	Maize	Others	Total
1	Faisalabad	260	25	78	47	50	19	479
2	Jhang	318	47	37	82	32	82	598
19	Multan/Lodhran	310	5	5	323	19	23	685
21	Sahiwal/ Pakpattan	286	40	28	187	21	30	592
23	D.G. Khan	121	19	1	39	1	58	239
24	Muzaffargarh	252	15	8	123	5	53	457
25	Layyah	180	-	9	16	1	22	430
26	Rajanpur	111	19	5	63	1	48	247
27	Bahawalpur	216	12	13	184	4	43	472
28	Bahawalnagar	246	39	34	151	6	65	541
29	R. Y. Khan	282	18	28	255	7	42	632
Sub-total for project area		2,582	239	246	1,470	147	486	5,372
3	T.T. Singh	140	15	31	48	25	15	274
4	Sargodha	212	38	39	23	25	36	373
5	Khushab	80	15	5	1	2	282	385
6	Mianwali	128	1	3	7	1	127	267
7	Bhakkar	130	-	12	8	1	545	696
8	Gujranwala	292	267	11	1	5	51	627
9	Sialkot/Narowal	273	207	12	1	6	87	586
10	Gujrat	229	81	34	4	8	123	479
11	Lahore	57	38	2	1	7	6	111
12	Sheikhupura	255	214	22	3	15	28	537
13	Kasur	173	61	34	18	8	30	324
14	Okara	205	79	20	48	10	27	389
15	Rawalpindi	135	-	-	-	49	87	271
16	Jhelum	55	1	1	1	1	51	110
17	Chakwal	135	-	-	1	1	95	232
18	Attock	162	-	1	-	12	76	251
20	Khanewal	192	9	10	164	13	16	404
22	Vehari	219	9	12	229	9	15	493
Total for all Punjab		5,654	1,274	495	2,028	345	2,385	12,181

Source: Punjab Agriculture Status 1991

Table 4-11 Yield of Main Crops (1989/90)

		Wheat		Rice		Sugar Cane		Cotton	
No.	District	C.A.	Y	C.A.	Y	C.A.	Y	C.A.	Y
1	Faisalabad	260.20	1.95	25.09	1.22	78.30	39.66	47.76	1.38
2	Jhang	318.08	1.94	47.75	1.17	37.00	39.20	82.96	1.51
19	Multan/Lodhran	310.79	1.88	5.67	1.43	4.80	36.96	323.74	2.21
21	Sahiwal/ Pakpattan	286.92	2.42	40.05	1.40	28.80	39.27	187.37	1.76
23	D.G. Khan	121.81	1.99	19.02	1.14	1.10	29.28	39.25	1.60
24	Muzaffargarh	252.11	1.81	15.38	1.52	8.70	34.43	123.02	1.50
25	Layyah	180.49	1.63	-	-	9.00	28.92	16.19	1.37
26	Rajanpur	111.29	1.88	19.02	1.02	4.80	23.42	63.13	1.76
27	Bahawalpur	216.50	1.77	12.95	1.40	13.70	32.23	184.94	1.95
28	Bahawalnagar	246.86	1.70	39.25	1.01	34.80	32.28	151.35	1.57
29	R. Y. Khan	282.47	1.86	18.21	1.30	28.10	32.31	255.75	1.85
Sub-total for project area		2,727.54	-	257.77	-	280.70	-	1,524.42	-
3	T.T. Singh	140.02	2.22	15.38	1.15	31.60	37.82	48.96	1.65
4	Sargodha	212.46	2.08	38.04	1.28	39.90	39.64	23.47	0.82
5	Khushab	80.13	1.08	15.78	1.75	5.00	37.64	1.21	0.54
6	Mianwali	128.68	1.40	0.81	1.16	2.90	38.00	7.69	1.37
7	Bhakkar	130.31	1.62	-	-	12.40	30.35	8.91	1.35
8	Gujranwala	292.58	2.16	267.49	1.23	11.10	38.80	0.80	0.66
9	Sialkot/Narowal	273.97	1.73	207.20	0.88	12.70	33.14	0.41	0.37
10	Gujrat	229.05	1.58	81.75	1.17	34.40	39.01	4.05	0.53
11	Lahore	57.46	2.30	38.04	1.13	1.70	36.88	0.41	0.37
12	Sheikhupura	255.76	1.87	214.48	1.04	22.50	36.90	2.83	0.54
13	Kasur	173.61	2.11	61.11	1.17	34.50	41.48	18.21	1.09
14	Okara	205.58	2.38	79.72	1.29	20.50	41.62	48.15	1.81
15	Rawalpindi	135.16	1.23	-	-	Nominal	10.50	-	-
16	Jhelum	55.85	1.51	0.81	0.84	0.20	27.50	0.41	0.32
17	Chakwal	135.16	1.04	-	-	-	-	0.41	0.32
18	Attock	162.28	1.22	-	-	0.20	20.50	-	-
20	Khanewal	192.62	2.11	9.31	1.37	10.10	39.10	164.70	2.25
22	Vehari	219.34	1.87	9.31	1.11	12.20	33.96	229.86	2.22
Total for all Punjab		5,667.54	-	1,281.62	-	501.00	-	2,035.94	-

Note: C.A.: Cultivated area (1,000 ha)
Y : Yield (ton/ha)
Source: Punjab Agriculture Status 1991

Table 4-12 Farmers Population

No.	District	Population (1,000)	Farmers Population (1,000)	No. of farming households (1,000)	Cultivating area per household (ha)
1	Faisalabad	3,562	2,316	208	2.3
2	Jhang	1,978	1,534	133	5.3
19	Multan/Lodhran	4,080	2,979	214	2.7
21	Sahiwal/Pakpattan	2,125	1,810	218	2.3
23	D.G. Khan	943	821	120	2.5
24	Muzaffargarh	1,498	1,342	176	2.3
25	Layyah	667	604	-	-
26	Rajanpur	639	577	-	-
27	Bahawalpur	1,453	1,123	93	4.1
28	Bahawalnagar	1,374	1,129	95	5.7
29	R. Y. Khan	1,842	1,542	127	4.7
Sub-total for project area		20,161	15,777	1,384	3.3
3	T.T. Singh	1,127	941	-	-
4	Sargodha	1,907	1,404	151	3.3
5	Khushab	646	500	-	-
6	Mianwali	712	573	116	2.2
7	Bhakkar	666	569	-	-
8	Gujranwala	2,676	1,616	101	4.9
9	Sialkot/Narowal	2,711	2,146	150	2.9
10	Gujrat	2,255	1,817	137	3.3
11	Lahore	3,545	556	42	3.0
12	Sheikhupura	2,110	1,730	118	3.6
13	Kasur	1,528	1,196	87	3.3
14	Okara	1,487	1,214	-	-
15	Rawalpindi	2,121	1,106	136	1.9
16	Jhelum	1,167	955	83	1.5
17	Chakwal	-	-	-	-
18	Attock	1,144	992	103	3.0
20	Khanewal	-	-	-	-
22	Vehari	1,329	1,148	87	4.
Total for all Punjab		47,292	34,240	2,705	average (3.2)

Source: Punjab Agriculture Status 1991

The population of the Project area is 20.2 million, or 43% of the Province's total. Agricultural population of the area is 15.8 million, which accounts for 46% of the area's total. This proportion of agricultural population is 6% higher than the Province's average 72%. The average cultivating area of a farmer of the Province is 3.2 ha, and Bahawalpur Division in the project area is above the Province's average level.

7) Situation of land ownership

Table 4-13 shows the situation of land ownership. As data are not available for 8 out of 32 districts of Punjab Province and figures contain some error, only the tendency in land ownership will be examined here. The agricultural land in Punjab Province is classified in two types - state ownership and private ownership -, but can be considered mostly private ownership as the state ownership represents only 0.25%.

The types of farms on the agricultural land of private ownership are classified as owner farmers, tenant farmers and owner-cum-tenant farmers, which account for 48%, 22% and 30% respectively. In the Project area, the proportion is 45%, 22% and 32%: the proportion of owner farmers is slightly smaller and that of owner-cum-tenant farmer is slightly larger.

Table 4-13 Land Ownership, Punjab

(Unit: 1,000 ha)

No.	District	Government land		Private land		
		Official use	Tenant	Own use	Tenant	Owner/ Tenant
1	Faisalabad	-	0.4	759.2	351.9	602.3
2	Jhang	-	0.9	737.2	385.6	383.5
19	Multan/Lodhran	-	4.4	1,156.4	624.8	691.9
21	Sahiwal/Pakpattan	-	5.1	937.4	574.5	706.7
23	D.G. Khan	-	2.4	769.4	286.6	643.1
24	Muzaffargarh	-	16.9	1,229.6	339.7	698.9
25	Layyah	-	-	-	-	-
26	Rajanpur	-	-	-	-	-
27	Bahawalpur	-	0.6	426.0	214.9	249.4
28	Bahawalnagar	-	0.3	676.2	395.1	302.4
29	R. Y. Khan	-	0.5	650.1	326.3	415.9
Sub-total for project area		-	31.5	7,341.5	3,499.4	4,694.1
3	T.T. Singh	-	-	-	-	-
4	Sargodha	-	8.6	1,189.7	399.3	601.2
5	Khushab	-	-	-	-	-
6	Mianwali	-	11.4	1,021.2	435.1	1,005.6
7	Bhakkar	-	-	-	-	-
8	Gujranwala	-	0.1	554.5	199.3	394.1
9	Sialkot/Narowal	-	2.3	459.4	122.3	497.4
10	Gujrat	-	5.5	641.1	1,041.7	329.9
11	Lahore	-	1.7	328.5	45.0	98.1
12	Sheikhupura	-	0.8	466.0	268.1	340.4
13	Kasur	-	0.4	393.6	166.0	282.7
14	Okara	-	-	-	-	-
15	Rawalpindi (Islamabad)	-	0.3	609.1	24.3	176.0
16	Jhelum	-	1.2	624.0	30.5	274.5
17	Chakwal	-	-	-	-	-
18	Attock	-	12.6	685.6	143.5	392.9
20	Khanewal	-	-	-	-	-
22	Vehari	-	0.1	496.5	221.7	235.1
Total for all Punjab		(Nominal)	76.5	14,810.7	6,596.2	9,321.6

Source: Dept. of Agriculture, Punjab

(4) Procurement of Development Equipment

In this section, the capacity and quantity of the bulldozers that have been requested by the Government of the Punjab as required for the execution of both the General Programme and the Project will be examined for each district.

1) The General Programme

The implementation of the General Programme requires 300 units of medium and small size bulldozers to be procured in two phases: The first phase, 150 units and the second phase 150 units (See Table 4-14). Expected operating time of bulldozer has been calculated based on the assumption of the annual operation time distribution unit previously. The expected operating time of 185 units of operable bulldozers, which were procured in 1986/87 and 1989/90 with KR-II, out of 440 units owned by Panjub Province is calculated to be 1,229,000 hrs for the period of 5 years of 1992/93~1996/97.

The expected operating time of 185 units of bulldozer procured in 1986/87 and 1989/90 with KR-II of the Japanese Government, which are the only operable units out of 440 units presently owned by Panjub Province, has been distributed to the 5 years of 1992/93~1996/97 on the basis of the assumed annual operating time distribution. Expected operating time of these 185 bulldozers is calculated to be 1,229,000 hrs. Regarding 300 units of medium and small size bulldozers that have been requested, the expected working hour of 150 units, a half of the requested quantity has been distributed to the 5 years starting 1992/93, the first year of the General Programme, and that of remaining 150 units to the 4 years starting 1993/94.

Expected operating time of these 300 bulldozers is calculated to be 2,100,000 hrs. The total working hour expected of the 185 units procured with the KR-II and of the 300 units newly requested amounts to 3,329,000 hrs.

Then, the possible development area corresponding to the above working hour has been calculated at 800 m^2/hr of average work capacity of a medium/small size bulldozer. The total area that can be developed in 5 years of 1992/93~1996/97 amounts to 266,000 ha. This development volume largely covers the development target area for the 5 years of the General Programme shown in Table 4-14.

As explained above, the working hour of the existing bulldozers accounts for 46% of the total expected working hour, which means that the management and maintenance of those bulldozers is done fairly well.

It is concluded from the above that the request for assistance for the procurement of 300 units of bulldozers required for the implementation of the General Programme can be considered as well justified.

Table 4-14 Availability (working schedule) of Bulldozers for the General Programme

District	Financial source	Year procured	Nos.	Availability (working schedule	Working hours (Unit: 1,000 hrs)					
					1992/93	1993/94	1994/95	1995/96	1996/97	Total
Whole province	KR-II	1985/86	106	4	0	-	-	-	-	0
		1986/87	194	55	291	-	-	-	-	291
		1989/90	140	126	252	252	224	210	-	938
	First phase	1992/93		(150)	60	300	285	270	270	1,185
	Second phase	1993/94		(150)	-	60	300	285	270	915
	Sub-total		440	485	603	612	809	765	540	3,329
	Capability (1,000 ha) for development				48.24	48.96	64.72	61.20	43.20	266.32
	Target (1,000 ha) for development				10.07	49.75	47.31	44.78	44.78	196.69

2) Land Resource Development Project (the Present Project)

Annual operating time of bulldozers, both existing ones and those requested under the Project, has been distributed to each year by Project area (district) and by procurement year of bulldozers. The total expected working hour of these bulldozers amounts to 1,220,000 hrs or 37% as against 3,329,000 hrs above calculated for the General Programme. According to the expected working hour distributed to each year, the expected development area of agricultural land has been calculated at a work efficiency of 800 m^2/hr per bulldozer as in the case the General Programme.

The total development area of agricultural land will be 97,700 ha, which corresponds to 102% of 95,500 ha, the development target in the Project area for 5 years of 1992/93~1996/97.

As Table 4-15 shows, development target area and possible development area are not evenly proportioned on District level, but, when the Project is viewed as a whole, the request for assistance for the procurement of 113 units of bulldozer can be considered as well justified.

Table 4-15 Availability (working schedule) of Bulldozers for the Project (12 Districts)

(1/3)

District	Financial source	Year procured	Nos.	Availability (working schedule)	Working hours (Unit: 1,000 hrs)					
					1992/93	1993/94	1994/95	1995/96	1996/97	Total
Faisalabad	KR-II	1985	0	0	-	-	-	-	-	0
		1986	6	5	7.5	-	-	-	-	7.5
		1989	3	0	0	0	0	0	-	0
	For the Project	(1993)	-	6	2.4	12.0	11.4	10.8	10.8	47.4
	Sub-total		9	11	9.9	12.0	11.4	10.8	10.8	54.9
	Capability (1,000ha)				0.79	0.96	0.91	0.87	0.86	4.39
	Target for development (1,000ha)				0.26	1.30	1.24	1.17	1.17	5.14
Jhang	KR-II	1985	0	0	-	-	-	-	-	0
		1986	8	7	10.5	-	-	-	-	10.5
		1989	0	0	0	0	0	0	-	0
	For the Project	(1993)	-	7	2.8	14.0	13.3	12.6	12.6	55.3
	Sub-total		8	14	13.3	14.0	13.3	12.6	12.6	65.8
	Capability (1,000ha)				1.07	1.12	1.06	1.01	1.01	5.27
	Target for development (1,000ha)				0.42	2.10	2.00	1.89	1.89	8.30
Multal	KR-II	1985	0	0	-	-	-	-	-	0
		1986	3	1	1.5	-	-	-	-	1.5
		1989	3	3	5.4	5.4	4.8	4.5	-	20.1
	For the Project	(1993)	-	8	3.2	16.0	15.2	14.4	14.4	63.2
	Sub-total		6	12	10.1	21.4	20.0	18.9	14.4	84.8
	Capability (1,000ha)				0.81	1.71	1.60	1.51	1.15	6.78
	Target for development (1,000ha)				0.16	0.80	0.76	0.72	0.72	3.16
Lodhran	KR-II	1985	0	0	-	-	-	-	-	0
		1986	3	1	1.5	-	-	-	-	1.5
		1989	3	3	5.4	5.4	4.8	4.5	-	20.1
	For the Project	(1993)	-	6	2.4	12.0	11.4	10.8	10.8	47.4
	Sub-total		6	10	9.3	17.4	16.2	15.3	10.8	69.0
	Capability (1,000ha)				0.75	1.39	1.30	1.22	0.86	5.52
	Target for development (1,000ha)				0.16	0.80	0.76	0.72	0.72	3.16
Pakistan	KR-II	1985	0	0	-	-	-	-	-	0
		1986	3	0	0	-	-	-	-	0
		1989	2	2	3.6	3.6	3.2	3.0	-	13.4
	For the Project	(1993)	-	5	2.0	10.0	9.5	9.0	9.0	39.5
	Sub-total		5	7	5.6	13.6	12.7	12.0	9.0	52.9
	Capability (1,000ha)				0.45	1.09	1.01	0.96	0.72	4.23
	Target for development (1,000ha)				0.32	1.43	1.36	1.29	1.29	5.69

Table 4-15 Availability (working schedule) of Bulldozers for the Project (12 Districts)

(2/3)

District	Financial source	Year procured	Nos.	Availability (working schedule)	Working hours (Unit: 1,000 hrs)					
					1992/93	1993/94	1994/95	1995/96	1996/97	Total
D.G. Khan	KR-II	1985	5	0	-	-	-	-	-	0
		1986	5	0	0	-	-	-	-	0
		1989	7	7	12.6	12.6	11.2	10.5	-	46.9
	For the Project	(1993)	-	11	4.4	22.0	20.9	19.8	19.8	86.9
	Sub-total		17	18	17.0	34.6	32.1	30.3	19.8	133.8
	Capability (1,000ha)				1.36	2.77	2.57	2.42	1.58	10.70
	Target for development (1,000ha)				0.49	2.15	2.04	1.93	1.93	8.54
Muzaffar-garh	KR-II	1985	13	0	-	-	-	-	-	0
		1986	5	5	7.5	-	-	-	-	7.5
		1989	3	3	5.4	5.4	4.8	4.5	-	20.1
	For the Project	(1993)	-	9	3.6	18.0	17.1	16.2	16.2	71.1
	Sub-total		21	17	16.5	23.4	21.9	20.7	16.2	98.7
	Capability (1,000ha)				1.32	1.87	1.75	1.66	1.30	7.90
	Target for development (1,000ha)				0.56	280	2.66	2.52	2.52	11.06
Layyah	KR-II	1985	8	0	-	-	-	-	-	0
		1986	5	5	7.5	-	-	-	-	7.5
		1989	5	5	9.0	9.0	8.0	7.5	-	33.5
	For the Project	(1993)	-	7	2.8	14.0	13.3	12.6	12.6	55.3
	Sub-total		18	17	19.3	23.0	21.3	20.1	12.6	96.3
	Capability (1,000ha)				1.54	1.84	1.70	1.61	1.01	7.70
	Target for development (1,000ha)				0.52	2.60	2.47	2.34	2.34	10.27
Rajanpur	KR-II	1985	0	0	-	-	-	-	-	0
		1986	5	1	1.5	-	-	-	-	1.5
		1989	5	5	9.0	9.0	8.0	7.5	-	33.5
	For the Project	(1993)	-	5	2.0	10.0	9.5	9.0	9.0	39.5
	Sub-total		10	11	12.5	19.0	17.5	16.5	9.0	74.5
	Capability (1,000ha)				1.00	1.52	1.40	1.32	0.72	5.96
	Target for development (1,000ha)				0.56	2.80	2.06	2.52	2.52	11.06
Bahawalpur	KR-II	1985	17	0	-	-	-	-	-	0
		1986	5	1	1.5	-	-	-	-	1.5
		1989	5	5	9.0	9.0	8.0	7.5	-	33.5
	For the Project	(1993)	-	17	6.8	34.0	32.3	30.6	30.6	134.3
	Sub-total		27	23	17.3	43.0	40.3	38.1	30.6	169.3
	Capability (1,000ha)				1.38	3.44	3.22	3.05	2.45	13.54
	Target for development (1,000ha)				0.49	2.45	2.33	2.21	2.21	9.69

Table 4-15 Availability (working schedule) of Bulldozers for the Project (12 Districts)

(3/3)

District	Financial source	Year procured	Nos.	Availability (working schedule)	Working hours (Unit: 1,000 hrs)					
					1992/93	1993/94	1994/95	1995/96	1996/97	Total
Bahawalnagar	KR-II	1985	8	0	-	-	-	-	-	0
		1986	6	1	1.5	-	-	-	-	1.5
		1989	5	5	9.0	9.0	8.0	7.5	-	33.5
	For the Project	(1993)	-	15	6.0	30.0	28.5	27.0	27.0	118.5
	Sub-total		19	21	16.5	39.0	36.5	34.5	27.0	153.5
	Capability (1,000ha)				1.32	3.12	2.92	2.76	2.16	12.28
	Target for development (1,000ha)				0.49	2.45	2.33	2.21	2.21	9.69
R.Y. Khan	KR-II	1985	14	0	-	-	-	-	-	0
		1986	4	0	0	-	-	-	-	0
		1989	5	5	9.0	9.0	8.0	7.5	-	33.5
	For the Project	(1993)	-	17	6.8	34.0	32.3	30.6	30.6	134.3
	Sub-total		23	22	15.8	43.0	40.3	38.1	30.6	167.8
	Capability (1,000ha)				1.27	3.44	3.22	3.05	2.45	13.43
	Target for development (1,000ha)				0.49	2.45	2.33	2.21	2.21	9.69
Total	KR-II	1985	65	0	-	-	-	-	-	0
		1986	58	27	40.5	-	-	-	-	40.5
		1989	46	43	77.4	77.4	68.8	64.5	-	288.1
	For the Project	(1993)	-	113	45.2	226.0	214.7	203.4	203.4	892.7
	Sub-total		169	183	163.1	303.4	283.5	267.9	203.4	1,221.3
	Capability (1,000ha)				13.05	24.27	22.68	21.43	16.27	97.70
	Target for development (1,000ha)				4.92	24.13	22.94	21.73	21.73	95.45

(5) Benefit effected by the Project

1) New agricultural land development

The Project providing 113 units of bulldozer will enable to develop new agricultural land of 9.5 ha in whole 12 districts (the Project area).

2) Production increase in principal food crops and export farm products

Based on the results of development as shown in the Table 3-7 for whole Punjab Province using the land development equipment introduced through the Japan's aid, the production increase effect will be estimated for each principal crops as follows;

Wheat
352,200 ton/year × 9.5 ha/46.9 ha = 71,300 ton/year

Rice
113,900 ton/year × 9.5 ha/46.9 ha = 23,100 ton/year

As previously described, the Project area consists of southern 12 districts in the Punjab and occupies 50% of the total Punjab area, and 65% of cultivatable area of the Punjab is located in the Project area. This fact means that the southern districts are not sufficiently developed in comparison with the northern districts.

The comparative value added of land or the value of farmers' property will be increased by converting a part of these lands into agricultural land.

Cotton
115,600 ton/year × 9.5 ha/46.9 ha = 21,400 ton/year

As for principal food crops of wheat and rice, a production increase of 94,000 ton/year can be expected. This will have the effect to increase by 0.9% the total production of Punjab Province in wheat and rice, which are at present 10.52 million ton and 1.48 million ton respectively:
94,000/12,000,000 = 0.9%.

This will also contribute to increasing Pakistan's annual production by 0.5%.

The extend of self-sufficiency in rice is 130% (Table 2-5), and if 23% of the production volume (30/130 = 23%), 23,100 ton/year × 0.23 = 5,300 ton/year is exported, 4,240,000$ per year (= 5,300 ton/year × 800$/ton; supposing 800$/ton export income in Table 2-12, Basmati rice) will contribute to the foreign currency income. This is equivalent to 1% of the production of rice, 437 million $, as export goods (Table 2-12, 1992/93).

As for cotton, a production increase of 21,400 ton/year can be expected. This will have the effect to increase by 1.7% the total production in Punjab Province, 1,230,000 tons/year. (Table 3-3)

The increased production will have the effect to increase the foreign exchange revenue by 32,100,000$ per year (= 21,400 ton/year ×

1,500$/ton; supposing 1,500$/ton export income), equivalent to 0.4% of the total annual export amount, 8,200 million dollars per year.

3) Increase of employment opportunities

Since the agricultural land development programme will be carried out continuously, a certain volume of employment opportunities will be maintained. On the other hand, the expansion of agricultural land will increase the employment opportunities in agricultural and related sectors.

4) Increase of farmers' income

The expansion of planted area will increase farmers' income and upgrade their standard of living.

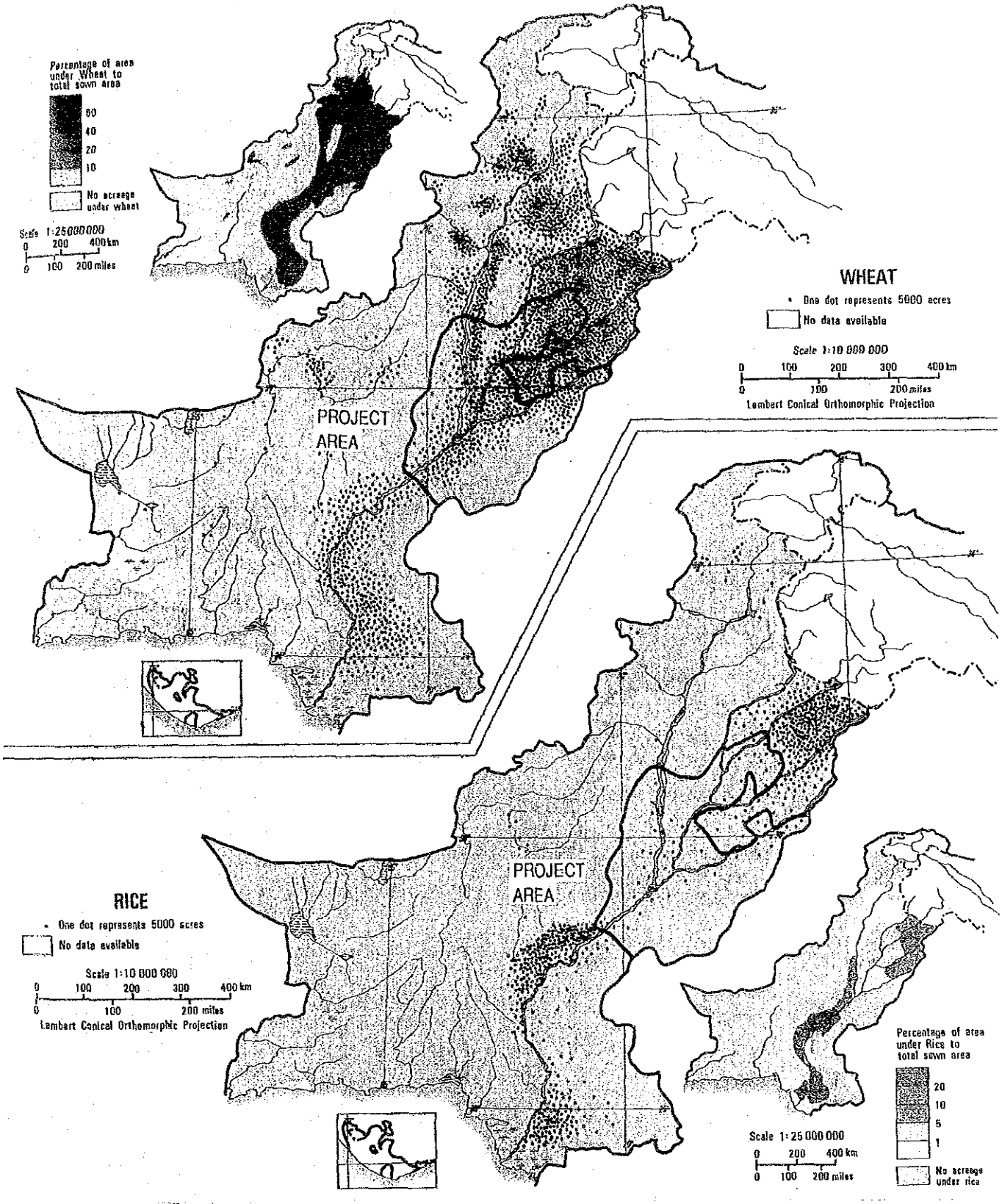


Fig. 4-4 CULTIVATING AREA OF THE PROJECT

Source : Collins • Longman Atlases

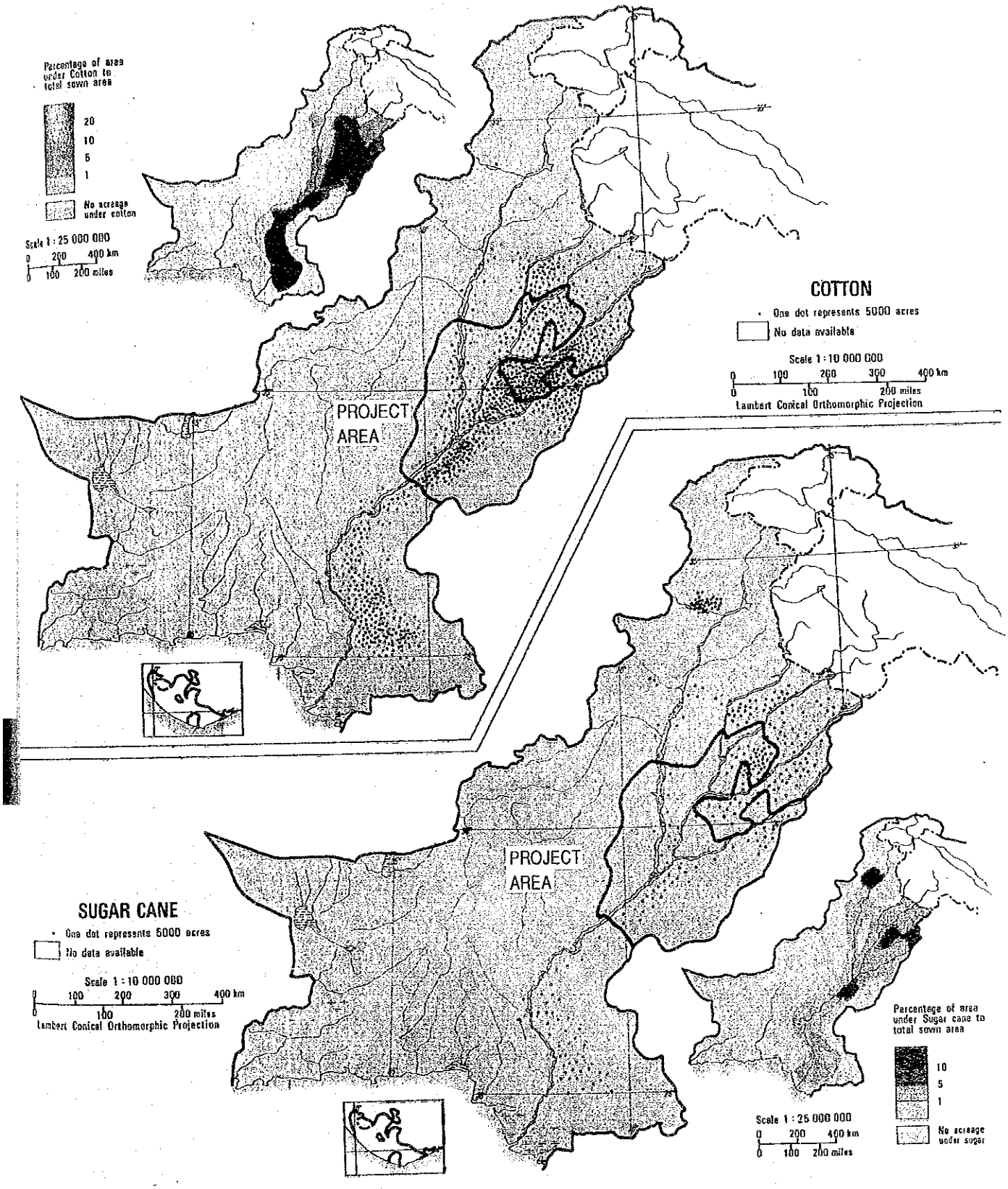


Fig. 4-5 CULTIVATING AREA OF THE PROJECT

Source : Collins • Longman Atlases

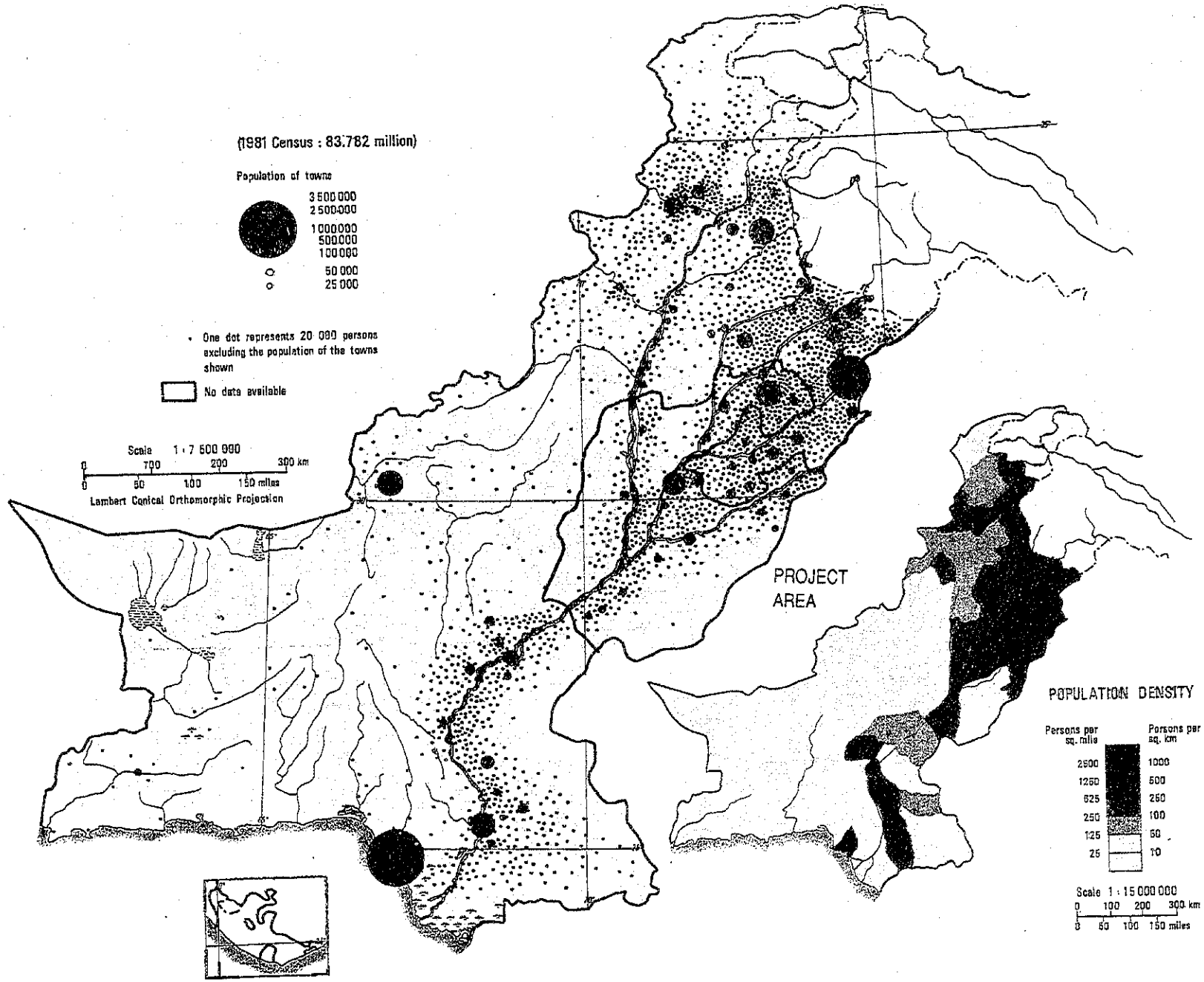


Fig. 4-6 POPULATION DISTRIBUTION

Source : Collins • Longman Atlases

4.2.2 Implementation and Operation Programme

The implementing agency of the Project is the DGAF of the Department of Agriculture of Punjab Province. The present organizations of the Department of Agriculture and of the DGAF are shown respectively in Fig. 3-1 and Fig. 3-2.

The Divisions and the selected Districts where the Project is to be implemented are shown in the table below, and the staff planning and operating system of the District Offices and workshops of Project area shown in Fig. 4-7.

Project Implementing Division	Project Implementing Districts
Faisalabad	• Faisalabad • Jhang
Multan	• Multan • Lodhran • Pakpattan
D.G. Khan	• D.G. Khan • Muzaffargarh • Layyah • Rajanpur
Bahawalpur	• Bahawalpur • Bahawalnagar • R.Y. Khan

The bulldozers to be procured under the project will be distributed to each District Office by the fixed quantity, and the total quantity for the whole project area will be 113. The number of bulldozers to be distributed to each District Office will be adjusted by the Division Office to which it belongs, in function with the annual development work volume of each District Office.

As shown in Table 3-10, the bulldozers procured with the KR-II aid in three times (1985/86, 1986/87, 1988/89) has been delivered to all 32 District Offices of Punjab Province. But, the number of bulldozers distributed to the Project area is 172 in total, of which 70 units are operable ones and 102 units deleted as unserviceable.

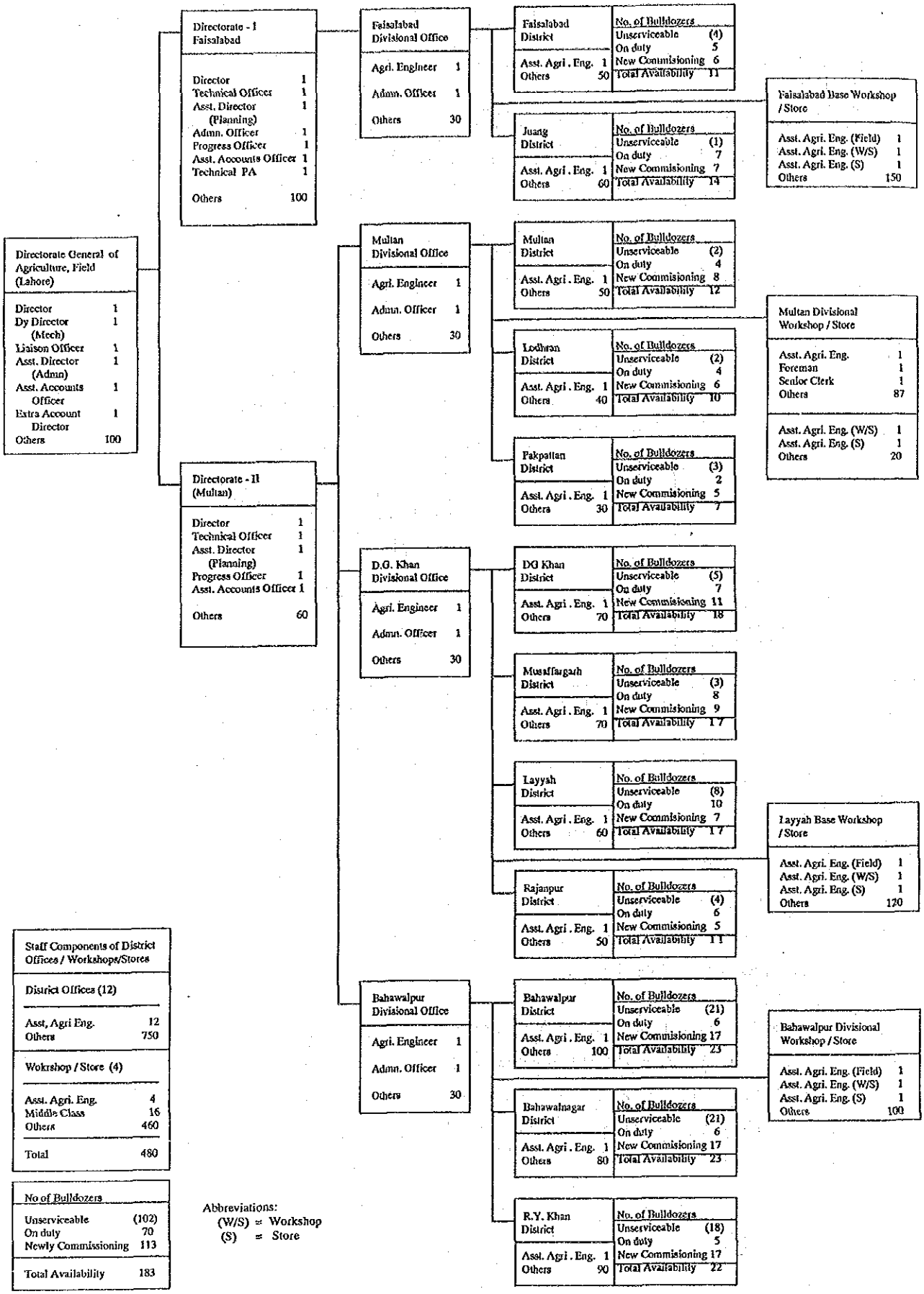


Fig. 4- 7 Implementing Organization of the Project

The District Office is operated by about 30 staff under the management of an office manager, who is Assistant Agricultural Engineer. Staff have generally long work record and have about 10 years of experience in the operation and management of equipment. Number of staff is quite sufficient especially because the number of lease machines has decreased to 2 to 21 in all districts.

Therefore, even if the number of bulldozers to be managed is increased by three times with the procurement of a large number of bulldozer under the Project, the District Offices have almost sufficient capacity, both qualitatively and quantitatively, of managing these bulldozers. It is therefore considered that there is no particular need of increasing the number of staff at District level.

The DGAF's annual budget, as average of 3 years, 1988/89, 89/90, 90/91 is about 230 million Rps as shown in Table 3-4. Of the total budget amount, about 32 million Rps is the amount of subsidy for lease charge. As the number of lease machines will increase by about 2.6 times after 1993/94 with the introduction of new machines under the Project, it will be necessary for the DGAF to increase the amount of subsidy for lease charge to about 83 million Rps.

4.2.3 Similar Projects and Relations with Other Assisting Countries and International Organizations

The Project will not overlap any project of other assisting countries or international organizations. At present, no other country or international organization is undertaking a similar project in the Project area of Punjab Province.

4.2.4 Study of the Requested Equipment

The equipment requested for the Project is as follows:

Bulldozer (110~130 HP)	200 units
Bulldozer (80~90 HP)	100 units
Spare parts (equivalent to 20% of the value of equipment)	
Vehicle	10 units
Spare parts (equivalent to 10% of the value of equipment)	

Medium size bulldozers are mainly used for the development of uncultivated land (levelling of uneven land) and small size bulldozer for the digging of cultivated land and fallow land for lowering the land level to receive irrigation water and for the improvement of feeder road. However, bulldozers are actually used commonly for these works.

The Basic Design Study Team made a survey of medium and small size bulldozers at work and a survey of uncultivated land to be developed under the Project, and has judged the capacity of the medium and small size bulldozers requested as well justified.

(1) No rocks are found on the project area, and the load of land development work will be small. Bulldozer work is mostly simple earth pushing using blade.

(2) As the requested bulldozers are of the same capacity as those procured in the past and in service at present, the staff in charge have good knowledge on the handling of machines and devices as well as on the operation and maintenance.

(3) Spare parts and devices have inter-changeability, and can be used efficiently.

(4) The leasing of equipment to farmers and the transportation for the recuperation of equipment are relatively easy.

As previously explained, of all projected areas of the General Programme, 12 districts have been chosen as top priority area for executing the project as the first priority phase. And the equipment will be distributed to each district in such way that the total development target can be attained within the Project period. The equipment planning is based on the lifetime work volume of a medium or small size bulldozer, 809 ha; calculated at 800 m^2/hr of average work capacity, 7 years lifetime and 11,000 hrs of total operation time.

Equipment	Quantity
Medium size Bulldozer	71 units
Small size Bulldozer	42 units
Spare parts for Bulldozer	For 2 years operation
Transporter	2 units
Spare parts for Transporter	For 2 years operation

4.2.5 Necessity of Technical Cooperation

The work assigned to the bulldozer in the agricultural land development Project is generally light, and the bulldozer can be operated efficiently if check-up and maintenance are done well.

However the DGAF has pointed out the necessity of receiving a technical cooperation from Japan for the transfer of higher technology for the management of the equipment to be introduced.

4.2.6 Basic Policy on Cooperation

The Project is extremely important and urgent for Punjab Province. Considering, that the effect, the reality and the implementing capacity of the recipient country have been confirmed, and that the effect of the Project meets the ideal of the general grant aid, it has been judged as rational to implement the Project with the general grant aid of the Japanese Government. Therefore, the outline of project will be studied, and the basic design will be made on the presumption of the grant aid of the Japanese Government. However, the content of the requested project should be changed partly as explained in the section where the content of the requested equipment was studied.

4.3 Outline of the Project

4.3.1 Implementing Agency and Operation System

The implementing agency of the Project is the Directorate General Agriculture, Field (DGAF) of the Department of Agriculture, Government of Punjab Province. The organization in charge of the maintenance, operation and management of the districted equipment for the agricultural land development are Division No.1 and Division No.2. The organization chart and staff disposition are illustrated in Figs. 3-1 and 3-2.

4.3.2 Project Plan

The equipment procured under the Project will be leased to farmers with charge and will be used for the following operation:

(1) Mainly, development of agricultural land

(2) Digging of cultivated lands and fallows for lowering their ground level for introducing irrigation water

(3) Improvement of feeder roads

4.3.3 Outline of Equipment

As a result of the study, the following equipment is considered as adapted to the condition of the Japanese cooperation.

Main Works	Equipment	
Land Development & Levelling	1) Medium size Bulldozer	71 units
	2) Small size Bulldozer	42 units
	3) Spare parts	for 2 years operation
Transportation of Bulldozers	4) Vehicles	2 units
	5) Spare parts	for 2 years operation

4.3.4 Maintenance and Management Plan

Equipment Maintenance and Management Plan

The maintenance and management of the equipment for agricultural land development to be procured under the Project shall be undertaken by 4 workshops: the Faisalabad Base Workshop belonging to the Faisalabad Division Office, the Multan Divisional Workshop belonging to the Multan Divisional Office, the Layyah Base Workshop belonging to D.G. Kahn Divisional Office and the Bahawalpur Divisional Workshop belonging to the Bahawalpur Divisional Office. (See Fig. 4-7) These workshops are sufficiently equipped with the maintenance facilities required for periodical maintenance and overhaul as explained in detail in 3.4.2.

These workshops have 460 staff in total comprising about 20 engineers of upper and middle class official, mechanics, electricians, welders. Considering that the workshops took charge of maintenance and management of 200 bulldozers at the peak in the project area, and that the number of operable bulldozers requiring maintenance service is estimated to be about 70 at present, it is considered that they well capable of taking charge of 113 bulldozers to be newly introduced.

As for daily maintenance and minor repair at the operation site of equipment, they are undertaken by the District Workshops belonging to the District Offices (of 12 districts of the Project area, 3 districts have District Workshop - Jhang, D.G. Khan, Bahawalpur) and the Divisional Workshops (Faisalabad, Multan). Maintenance and repair undertaken by the District Workshops are limited to relatively light work such as mounting and dismounting of engines, as explained in the section 3.4.2. In the case where heavy repair is required, the equipment is sent to a workshop of upper class.

The management of the above 3 District Workshops is assumed concurrently by the Assistant Agricultural Engineer of District Office, and each workshop has 10 to 30 staff comprising mechanics and technicians.

It is judged from the above that the maintenance and management, including repair and maintenance service, of the equipment to be newly introduced can be done sufficiently with the present facilities and system.

When the leasing operation starts for 113 units of new bulldozer, about 83,000,000 Rps is estimated to be required as subsidy for lease charge, and about 80% of it will be used for the maintenance service including the procurement of spare parts. After the third year of the Project when the spare parts procured with the equipment will be almost used

up, about 70,000,000 Rps of budget amount is needed to be earmarked in current account.

CHAPTER 5. BASIC DESIGN

CHAPTER 5. BASIC DESIGN

5.1 Design Policy

The Project consists in procuring medium and small size bulldozers with Japan's general grant aid. The following points will be taken into account for the selection of bulldozers.

5.1.1 Natural Condition

In most of Project area (high priority development area), the southern area of Punjab Province, the highest atmospheric temperature in summer rises above 40°C. The permissible operating temperature shall be set between 0° to 50°C.

Since the agricultural work is usually carried out in dusty conditions, some measures are required for the protection from dust.

5.1.2 Specification of Bulldozer

Based on the evaluation results in Chapter 3, simple structure models shall be adopted for this project.

5.1.3 Spare parts for Bulldozer

Spare parts required for the first 2 years of the use of equipment shall be provided.

5.1.4 Transport Vehicle

Low-bed trailer shall be adopted for carrying bulldozers. Spare parts required for the first two years of the use of equipment shall be provided.

5.1.5 Procurement from the Third Countries

No procurement from the third country other than Pakisan and Japan shall be considered.

5.1.6 Implementation Schedule

After the conclusion of consultants service contract, about 3 months are required for the opening of and evaluation of tenders. The procurement of equipment shall be completed within 5 months after the conclusion of the procurement contract: 3.5 months for manufacturing, shipping and inspection, and ocean transport, and 1.5

months for customs clearance and inland transport, confirmation of dispatching and completion of report.

5.2 Basic Design

5.2.1 The Project Equipment and Deployment

(1) Specification of equipment

The specification of medium/small size bulldozer should meet the condition of tropical and dusty zone as described in 4.1.1. Major specifications are shown in the Table 5-1.

(2) Deployment

The bulldozers for each district shall be deployed as follows:

Division	Bulldozer		
	Small size	Medium size	Total
Faisalabad	10	3	13
Multan	12	7	19
D.G. Kahn	9	23	32
Bahawalpur	11	38	49
Total	42	71	113

Note: Details in Table 4-15

5.2.2 Maintenance and Management Plan of Equipment

After the implementation of the Project, the maintenance and management of equipment shall be carried out by the Base Workshops and the Divisional Workshops at 4 places, belonging to the Divisional Offices of the Project area. Daily maintenance and repair are carried out by the Divisional Workshop, or by the District Workshop if the Divisional Office has an attached workshop.

Maintenance and management system of the equipment is shown in Fig. 4-7.

Table 5-1 Specification of Bulldozers

		Small Size	Medium Size
Type		Crawler Tractor	Crawler Tractor
Engine		80~95 HP Diesel	110~130 HP Diesel
Cooling system		Water cooled	Water cooled
Cluch		Multi-disc, Wet	Multi-disc, Wet
Transmission	Type	Direct drive Mechanical	Direct drive Mechanical
	Stage	Min. F5-R2	Min. F5-R3
Undercarriage	Type	Oscillation type	Oscillation type
	Shoe width	Min. 400mm	Min. 400mm
	Track gage	Min. 1,400mm	Min. 1,800mm
	Ground contact area	Min. 11,500cm^2	Min. 17,000cm^2
Blade	Type	Angle dozer	Angle dozer
	Control	Hydraulic	Hydraulic
Operating weight		Min. 9,000 kg	Min. 11,000 kg
Accessories		Hourmeter Pre-cleaner extension Oil-bath type air cleaner Drawbar Canopy Standard tools	Hourmeter Pre-cleaner extension Oil-bath type air cleaner Drawbar Canopy Standard tools
Spare parts		Good for 2 years operation	Good for 2 years operation

Table 5-2 Specification of Transporter

	Specifications
Type	Low bed freighter
Drive system	6 × 2
Dimensions: Overall length Overall width	 Less than 12,000 mm Less than 2,500 mm
Shipping weight	Min. 7,500 kg
Performance: Max. gradeability Max. loading capacity	 0.35 (tan θ) 11,000 kg min.
Engine: No. of cylinder Max. output	 6 320 HP min.
Transmission: Type No. of stage	 Synchromesh Min. 6
Brakes	Air over hydraulic w/dual circuit
Spare Parts	Good for 2 years operation

5.3 Procurement Plan

5.3.1 Basic Policy

The equipment to be procured under the Project for agricultural land development comprises construction machine, transporting vehicle and spare parts for respective machines. The scope of cooperation under the general grant aid of the Japanese Government will be as follows:

- Detailed design for agricultural land development project and provision of tender document
- Procurement of the equipment for agricultural land development
- Supervision of procurement

The implementing agency on the part of Pakistan is the Department of Agriculture, the Punjab Province, and the equipment shall be delivered to the implementing agency at Karachi Port.

5.3.2 Procurement Supervising Plan

A Japanese consulting firm will supervise the project from the procurement of equipment to the witness inspection at the Project site under the consignment of the government of Punjab Province. The initial guidance for operation and maintenance of the equipment will be carried out by the technician despatched from the equipment supplier under the supervision of the Japanese consultant.

5.3.3 Implementation Schedule

The implementation schedule of the Project is given in Fig. 5-1.

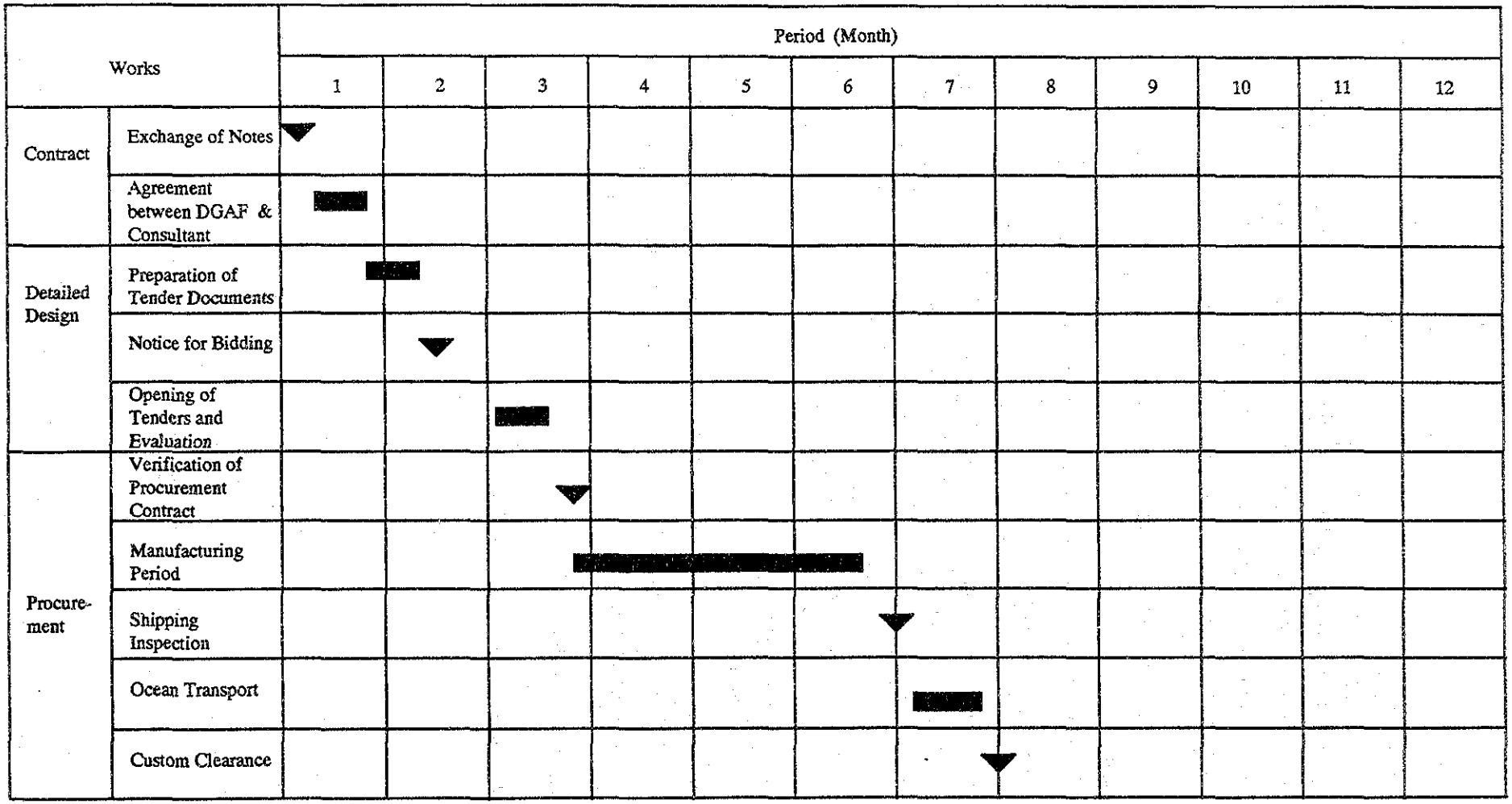


Fig. 5-1 Implementation Schedule

CHAPTER 6. EFFECT OF PROJECT AND CONCLUSION IN FIVE YEARS (1992/93~1996/97)

CHAPTER 6. EFFECT OF PROJECT AND CONCLUSION IN FIVE YEARS (1992/93~1996/97)

The Project consists in developing 95,000 ha of culturable wasteland owned by farmers into culturable land by means of 113 units of bulldozers, procured by the Department of Agriculture of Punjab Province and leased to farmers.

Punjab Province has developed 1,840,000 ha of agricultural land in total since it started land resources development in 1967. Of the total developed area, 470,000 ha is attributable to the 400 units of bulldozer procured by the KR-II of the Japanese government, and there have been recorded production increases of 350,000 tons of wheat, 110,000 tons of rice and 110,000 tons of cotton per year.

The Project will enable the Department of Agriculture of the Punjab to assist farmers to develop newly 95,000 ha of agricultural land in next 5 years and will bring about 90,000 tons per year of increase in the production of wheat and rice, staple food, and 20,000 tons per year of increase in the production of cotton, main export item. 90,000 tons per year of increase in the production of staple food accounts for 0.7% of Punjab Province's total production, 12,500,000 tons. This is considered as a substantial contribution to the food self-sufficiency, considering the population growth rate of the whole Pakistan, 3.1% per annum.

As for cotton, Pakistan's main export product, 20,000 tons of production increase is equal to 1.6% of Punjab Province's total annual production, 1,200,000 tons. The increased volume corresponds to 1.4% of Pakistan's total annual production, 1,400,000 tons and to 3% of the annual export (900 million dollars). If the whole quantity of production increase is exported, about 27 million dollars of foreign exchange will be earned additionally.

Similarly, 20,000 tons of expected increase in rice production will leave 5,000 tons after the domestic consumption, 15,000 tons, at the self-sufficiency rate of 130%. If this surplus quantity is exported, 1.7 million dollar of foreign exchange is expected to be earned. In addition, the Project will have the effect to increase small farmers' income by increasing their employment opportunities and will lead to the extermination of poverty and the relief of the poor.

Present condition and problems	Measures by the project	Effects of the project and degree of improvement
(1) Achievement of food self-sufficiency is difficult in Pakistan, where the population increases 3.1% per year.	To procure 113 units of bulldozers for assisting farmers in their development of agricultural land and develop newly 95,000 ha of agricultural land.	New development of 95,000 ha of agricultural land will being about 110,000 tons of increase in the production of food crops and will contribute to the establishment of food self-sufficiency.
(2) Improvement of trade balance through promotion of the export of agricultural produces and the increased production of import substitution produces.	To develop newly agricultural lands for increasing the production of cotton and rice, and of import substitution agricultural produces such as oil seeds, raw material of edible oil being imported.	The increased production in cotton and rice is expected to bring about 30 million dollars of increase in export amount. The increased production of oil seeds will have the effect to reduce its import.
(3) Unemployment in rural sector provokes an excessive influx of population into urban area and causes consequently social insecurities.	To increase employment opportunities in the primary sector, food processing and the secondary sector, spinning	Surplus labour in rural sector will be more absorbed by agriculture and its related field. This will have the effect of preventing overpopulation of urban area and assuring social stability.
(4) Living standards of small farmers, both owner farmers and owner-cum-farmers, occupying 70% of the total agricultural population is very low.	To give chance of extending agricultural holdings.	An extension of cultivating area will bring about an increase in crops. The sales of surplus crops will increase farmers' income and will raise their standards of living.

As explained above, the Project is expected to produce a substantial effect and to improve widely the standard of living of inhabitants of the Project area. Therefore it is considered as quite proper to execute the Project with a grant aid of the Government of Japan. It is considered that the recipient country has sufficient staff and experience for the operation and management of the Project.

APPENDICES

APPENDICES

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APPENDIX -1

Members of the Basic Design Study Team

Name	Assignment	Position
Yoshikatsu NAKAMURA	Team Leader	Director, 1st Basic Design Study Div., Grant Aid Study & Design Dept., JICA
Hisatoshi OKUBO	Project Coordinator	Staff, 1st Basic Design Study Div., Grant Aid Study & Design Dept., JICA
Yoichi KAKITA	Farm Development Planner	Chief of Overseas Technical Standard Section, Construction Dept., Agricultural Structure Improvement Bureau, Min. of Agriculture, Forestry & Fisheries
Daisaku INABA	Field Development Planner	Construction Project Consultants, Inc. (CPC)
Chikaichi TAKAHASHI	Irrigation Planner	Construction Project Consultants, Inc. (CPC)
Susumu SAKASHITA	Equipment Planner	Construction Project Consultants, Inc. (CPC)

Japan International Cooperation Agency (JICA)
P.O. Box 216
45th Floor, Shinjuku Mitsui Building
1, 2-chome, Nishi-shinjuku, Tokyo 163 Japan
Cable: JICAHDQ
Telex: J22271
Fax: (3)-3346-5079
Phone: (3)-3346-5325

Construction Project Consultants, Inc. (CPC)
No. 7 Matsuda Building
2-16, 1-chome, Okubo, Shinjuku-ku, Tokyo 169 Japan
Telex: 0-2325396 CPCTKO J
Fax: (3)-5273-4861
Phone: (3)-5273-3201

APPENDIX - 2

Schedule of the Basic Design Study Team

No.	Date/Mo.	Day	Activity
1	3/ 7	Fri.	Tokyo - Bangkok (TG641), Bangkok - (TG501) -
2	4/	Sat.	- Karachi - Islamabad (PK368)
3	5/	Sun.	JICA, EOJ, EAD
4	6/	Mon.	Islamabad - Lahore (PK611), Internal Meeting
5	7/	Tue.	P&D, Dept. of Agriculture, Site Survey (Ichogill)
6	8/	Wed.	Site Survey (Labannala)
7	9/	Thu.	Dept. of Agriculture, Site Survey (Gandsingaala), Workshop (Kasur)
8	10/	Fri.	Internal Meeting
9	11/	Sat.	Internal Meeting
10	12/	Sun.	Internal Meeting
11	13/	Mon.	P&D, Dept. Of Agriculture Lahore - Islamabad (PK604)
12	14/	Tue.	JICA, EOJ, EAD, Gov't. Member, Islamabad - Karachi (PK309)
13	15/	Wed.	Gov't. Member, Karachi -Bangkok (TG508). Consultant Member, Site Survey (Rawalpindi)
14	16/	Thu.	Gov't. Member, Bangkok - Tokyo (CX700/ CX508) Consultant Member, Data Collection
15	17/	Fri.	Consultant Member only, Islamabad - Multan (PK387)
16	18/	Sat.	Workshop (Multan), Site Survey (Muzaffargarh)
17	19/	Sun.	Meeting with Multan Division, Multan - Lahore (PK398),
18	20/	Mon.	Dept. of Agriculture
19	21/	Tue.	Lahore - Faisalabad, (Workshop & Field)
20	22/	Wed.	Faisalabad (Site Survey)
21	23/	Thu.	Meeting with Faisalabad Division, Faisalabad - Lahore
22	24/	Fri.	Internal Meeting
23	25/	Sat.	Dept. of Agriculture
24	26/	Sun.	Lahore - Islamabad (PK312), JICA
25	27/	Mon.	EAD
26	28/	Tue.	Site Survey, (Talagang)
27	29/	Wed.	EOJ
28	30/	Thu.	Dept. of Agriculture, JICA, EAD
29	31/	Fri.	Islamabad - Karachi (PK309)
30	1/ 8	Sat.	Karachi - Tokyo (TG502/TG640)

APPENDIX - 3

List of the Personnel Interviewed

Economic Affairs Division, Islamabad

Ahmad Shamsul Huda	Joint Secretary
Faizur Rahman	Section Officer

Planning and Development Department, Punjab

Zia-ur Rehman	Member
Abdul Ghafoor	Assistant Chief, Foreign Aid
Muhammad Afzal Shah	Chief, Agriculture

Agriculture Department, Punjab

Chaundhry Mohammad Iqbal	Minister
Mahammad Sadiq Cheema	Secretary
Mahammad Abid Farooq	Director General (Field)
Abdul Hameed Chaudry	Director, Agricultural Engineering, Faisalabad
Chaudry Abdul Salam	Director, Agricultural Engineering, Multan
Abdul Hamid Chandhy	Deputy Director (Mechanical)
Mian Ghulam Bari	Deputy Director (Monitor and Evaluation)
Mohammad Ashraf Khan	Assistant Director (Planning), Multan
Sufi Ghulam Rasool	Agricultural Engineer, Lahore Division
Mohammad Ashraf Mirza	Agricultural Engineer, Rawalpindi Division
Muhammad Ibrahim	Agricultural Engineer, Faisalabad Division
Mohammad Asghar	Agricultural Engineer, Multan Division
Falak Sher Khan	Agricultural Engineer, Talagang Division

Embassy of Japan

Tadahiro Abe	Counsellor
Masahiko Tanoi	First Secretary
Koichi Murase	Second Secretary

JICA

Akihiro Mitarai	Chief Representative
Koji Yoshimura	Representative

MINUTES OF DISCUSSIONS
ON THE BASIC DESIGN STUDY
ON LAND RESOURCE DEVELOPMENT PROJECT
FOR THE UPLIFT OF FARMING COMMUNITY
IN THE PROVINCE OF THE PUNJAB
IN THE ISLAMIC REPUBLIC OF PAKISTAN

In response to the request from the Government of the Islamic Republic of Pakistan, the Government of Japan decided to conduct a Basic Design Study on Land Resource Development Project for the Uplift of Farming Community in the Province of the Punjab (hereinafter referred to as "the Project"), and entrusted the study to the Japan International Cooperation Agency (JICA).

The JICA sent to Pakistan a study team headed by Mr.Yoshikatsu Nakamura, Director, First Basic Design Study Division, Grant Aid Study and Design Department, JICA, from 4th to 31st July, 1992.

The Team held a series of discussions with the authorities concerned of the Government of Pakistan and conducted a field survey in Punjab.

In the course of discussions and the field survey, both parties have confirmed the main items described on the attached sheets. The Team will proceed to further work and prepare the Basic Design Study Report.

Lahore 13th July, 1992

Mr.Yoshikatsu Nakamura
Leader
Basic Design Study Team, JICA

Mr.Muhammad Sadiq Cheema
Secretary
Agriculture Department
Government of the Punjab

Mr.Muhammad Afzal Shah
Chief Agriculture
Planning and Development Department
Government of the Punjab

(AKHTAR IQBAL)
Depury Secretary
Economic Affairs Division
Islamabad

Economic Affairs Division
Ministry of Finance and Economic Affairs
Government of Pakistan

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ATTACHMENT

1. Objective of the Project

The objective of the Project is to achieve higher agricultural production and productivity by further development of land resources in the project areas with the proposed equipment to be procured, and thus contributing to the improvement of the economic condition of the farming communities and the quality of rural life in the areas.

2. Project Areas

The project areas include all the districts in the Province of the Punjab and are shown in a priority order in Annex I.

3. Sponsoring Agency and Executing Agency

The sponsoring agency is the Agriculture Department of the Government of the Punjab and the authority responsible for the execution of the Project is the Directorate General Agriculture (Field) Punjab, Lahore.

4. Items requested by the Government of Pakistan

The Team has understood that the need for the items listed in Annex II requested by the Pakistani side is genuine and urgent. However, the final component of the items, both types and quantity, will be decided after a further study in Japan, based upon in principle the criteria described in Annex III.

5. Deployment Plan of Fleet of Tractors

The Team has recommended to the Pakistani side that the proposed Project have a system by which farmers with small land holding could obtain optimum benefit from the Project. The Team has also suggested that such measures as described in Annex IV are possibly taken. The Pakistani side has understood the points suggested by the Japanese side and will take them into consideration.

6. Japan's Grant Aid Programme System

(1) The Pakistani side has understood Japan's Grant Aid system explained by the Team.

(2) The Pakistani side will take necessary measures described in Annex V for smooth implementation of the Project, on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

7. Schedule of the Study

Based upon the Minutes of Discussions and technical examination of the study results, JICA will complete the final report and will send it to the Government of Pakistan by the end of November, 1992.

Annex I · List of districts in a priority order

1.	Dera Ghazi Khan	A
2.	Muzaffargarh	A
3.	Rajanpur	A
4.	Layyah	A
5.	Bahawalpur	A
6.	Bahawalnagar	A
7.	Rahim Yar Khan	A
1.	Faisalabad	B
2.	Multan	B
3.	Lodhran	B
4.	Pakpattan	B
5.	Jhang	B
6.	Bhakkar	B
7.	Gujranwala	B
8.	Sheikhunpura	B
9.	Kasur	B
10.	Okara	B
11.	Rawalpindi	B
12.	Jhelum	B
13.	Chakwal	B
14.	Attock	B
1.	Khanewal	C
2.	Sahiwal	C
3.	Vehari	C
4.	T.T.Singh	C
5.	Sargodha	C
6.	Khushab	C
7.	Gujrat	C
8.	Lahore	C
9.	Sialkot	C
10.	Narowal	C
11.	Mianwali	C

Annex II Items requested by the Government of Pakistan

(1)	110-130 HP Crawler Tractor	200 units
(2)	80-90 HP Crawler Tractor	100 units
(3)	20% spare parts for the items (1) and (2)	
(4)	Low Bed Freighter	10 units
(5)	10% spare parts for the item (4)	

Annex III Criteria and conditions for provision of equipment

In preparation and finalisation of the equipment plan, the following items are used as criteria and conditions:

1. Past performace of land development schemes utilizing the tractors granted under KR-II.

2. Size of area to be developed, and a number of tractors currently available and ones requested.

3. Conditions of land to be developed and required specifications of equipment.

4. Financial viability of farm development schemes in each district

5. Technical and managerial competance of each district

6. The items under the grant aid by the Government of Japan are for exclusive use for the Project in Punjab.

Annex IV Deployment Plan of Fleet of Tractors

1. To establish a monitoring system to ensure that farmers with small land holding could have better participation in the Project.

2. To maintain a tally or ledger system in which hiring-out of tractors are recorded together with farmers' land holding status.

3. To introduce a tractor hiring charge system to facilitate small farmers' participation.

Annex V Necessary measures to be taken by the Government of Pakistan

1. To provide data and information necessary for implementation of the Project.

2. To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation in Pakistan and prompt internal transportation of the items purchased under the Grant Aid.

3. To bear the following commissions to the Japanese foreign exchange bank for banking services based upon the Banking Arrangement.

(1) Advising commission of Authorization to Pay

(2) Payment Commission

4. To exempt Japanese nationals involved in the Project from custom duties, internal taxes and other fiscal levies which may be imposed in the Islamic Republic of Pakistan with respect to the supply of the products and services under the verified contracts.

5. To accord Japanese nationals whose sevices may be required in connection with the supply of the products and services under the verified contract such facilities as may be necessary for their entry into Pakistan and stay therein for the performance of their work.

6. To bear all the expenses other than those to be borne by the Grant Aid.

7. To ensure the necessary budget and personnel for the proper and effective implementation of the Project, including operation and maintenace of the equipment provided under the Grant Aid.

APPENDIX -5 Request Letter for Technical Cooperation

DIRECTORATE GENERAL AGRICULTURE
(FIELD) PUNJAB, LAHORE.

Subject: LAND RESOURCE DEVELOPMENT FOR THE UPLIFT OF FARMING COMMUNITY.

The Agricultural Engineering Wing of the Agriculture Department provides buldozers for bringing new areas under plough and improving the productivity of the existing areas. At present 1.815 million hectares is lying as culturable waste which can be brought under plough for increasing the over all agricultural production but it could lonly be possible if the buldozers are made available. It is proposed that :

1. Provision of buldozers and allied equipments

(a) Grant for 300 buldozers with 20% spare parts and ten (10) transporters with 10% spare parts may be arranged so that the culturable waste area of 1.815 million hectares can be brought under plough. There is a dire and immediate need to procure the above fleet of buldurs during the current financial year. Year-wise phasing of the project is given below:

Year	Machinery/equipment to be procured:
1st year	(i) Procurement of 100 large & 50 medium Crawler Tractors alongwith 20% spare parts.
	(ii) Procurement of 5 Nos.Trans-porters(Low Bed Freighters) alongwith 10% spare parts.
2nd year	(i) Procurement of 100 large & 50 medium Crawler Tractors alongwith 20% spare parts.
	(ii) Procurement of 5 Nos.Trans-porters(Low Bed Freighters) alongwith 10% spare parts.

(b) The need of buldozers can be appriciated from the fact that the farmers has to wait# for 6 to 12 months for getting the buldozers on his turn. On an average 60,000 hours are brought forward every month due to shortage of buldozers.

2. Upgradation of workshops & TECHNICAL ASSISTANCE.

440 buildozers received through KR-II are now nearing 10,000 hours and require major repair which involves overhauling of engine, transmission, final drive, hydraulics, fuel injection system and electricals. To handle a job of that kind this Department needs technical assistance in terms of hardware and on the job training in Pakistan by Japanese experts. This will help this Department to maintain a larger fleet of buildozer to help farmers in large number. The Department has the facility of Agricultural Engineering Workshops in 23 districts for the repair and maintenance of the buildozers. There is a need to provide modern technology in the workshops for precise repair and maintenance. Moreover the staff needs to be trained and this facility will be developed locally for proper repair and maintenance and manufacturing of spare parts.

DIRECTOR GENERAL AGRICULTURE,
(FTCLO) PUNJAB, LAHORE.

APPENDIX -6

Table of Existing Bulldozers

Deployment & Present Condition of Bulldozer

(KOMATSU D50A-17)

Year of Commissioning : 1985 - 86

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
B/Pur	KOMATSU	D50A-17	NKD- 1		10986	R
B/Pur	KOMATSU	D50A-17	2		13173	U
B/Pur	KOMATSU	D50A-17	3		16613	U
B/Pur	KOMATSU	D50A-17	4		14524	U
B/Pur	KOMATSU	D50A-17	5		15553	U
B/Pur	KOMATSU	D50A-17	6		14874	U
B/Pur	KOMATSU	D50A-17	7		17334	U
B/Pur	KOMATSU	D50A-17	8		14861	U
B/Pur	KOMATSU	D50A-17	9		18130	U
B/Pur	KOMATSU	D50A-17	10		15631	U
B/Pur	KOMATSU	D50A-17	11		15889	U
B/Pur	KOMATSU	D50A-17	12		13884	U
B/Pur	KOMATSU	D50A-17	13		16085	U
B/Pur	KOMATSU	D50A-17	14		12630	U
B/Pur	KOMATSU	D50A-17	15		12646	U
B/Pur	KOMATSU	D50A-17	16		14191	U
B/Pur	KOMATSU	D50A-17	17		16130	U
B/Pur	KOMATSU	D50A-17	18		15550	U
B/Pur	KOMATSU	D50A-17	19		14078	U
B/Pur	KOMATSU	D50A-17	20		13553	U
B/Pur	KOMATSU	D50A-17	21		16112	U
B/Pur	KOMATSU	D50A-17	22		16635	U
B/Pur	KOMATSU	D50A-17	23		12796	U
B/Pur	KOMATSU	D50A-17	24		10233	R
B/Pur	KOMATSU	D50A-17	25		13688	U

Note : Present condition

S : Still serviceable

R : Need for minor repair

U : Unserviceable (need for replacement)

Source : Agriculture Department, Punjab

Year of Commissioning : 1985 - 86

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
B/Pur	KOMATSU	D50A-17	NKD- 26		13429	U
B/Pur	KOMATSU	D50A-17	27		11428	U
B/Pur	KOMATSU	D50A-17	28		14207	U
Multan	KOMATSU	D50A-17	29		12722	U
Multan	KOMATSU	D50A-17	30		10278	R
Multan	KOMATSU	D50A-17	31		10207	R
Multan	KOMATSU	D50A-17	32		15275	U
Multan	KOMATSU	D50A-17	33		14004	U
Multan	KOMATSU	D50A-17	34		10165	R
Multan	KOMATSU	D50A-17	35		12998	U
Multan	KOMATSU	D50A-17	36		——	U
Multan	KOMATSU	D50A-17	37		12672	U
Multan	KOMATSU	D50A-17	38		11923	U
D.G.Khan	KOMATSU	D50A-17	39		11616	U
D.G.Khan	KOMATSU	D50A-17	40		13482	U
D.G.Khan	KOMATSU	D50A-17	41		13833	U
D.G.Khan	KOMATSU	D50A-17	42		13697	U
D.G.Khan	KOMATSU	D50A-17	43		16722	U
D.G.Khan	KOMATSU	D50A-17	44		11212	U
D.G.Khan	KOMATSU	D50A-17	45		13495	U
D.G.Khan	KOMATSU	D50A-17	46		12404	U
D.G.Khan	KOMATSU	D50A-17	47		13336	U
D.G.Khan	KOMATSU	D50A-17	48		13349	U
D.G.Khan	KOMATSU	D50A-17	49		12327	U
D.G.Khan	KOMATSU	D50A-17	50		13626	U
D.G.Khan	KOMATSU	D50A-17	51		13421	U
D.G.Khan	KOMATSU	D50A-17	52		12402	U
D.G.Khan	KOMATSU	D50A-17	53		13495	U

Year of Commissioning : 1985 - 86

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
Jhelum	KOMATSU	D50A-17	54	80733	11862	U
Jhelum	KOMATSU	D50A-17	55	80734	13315	U
Jhelum	KOMATSU	D50A-17	56	80735	12522	U
Jhelum	KOMATSU	D50A-17	57	80736	12470	U
Jhelum	KOMATSU	D50A-17	58	80737	12636	U
Jhelum	KOMATSU	D50A-17	59	80738	9830	S
R/Pindi	KOMATSU	D50A-17	60	80739	12150	U
R/Pindi	KOMATSU	D50A-17	61	80740	10621	R
R/Pindi	KOMATSU	D50A-17	62	80741	11936	U
R/Pindi	KOMATSU	D50A-17	63	80742	12136	U
R/Pindi	KOMATSU	D50A-17	64	80743	9884	R
R/Pindi	KOMATSU	D50A-17	65	80744	9739	U
R/Pindi	KOMATSU	D50A-17	66	80745	13115	U
R/Pindi	KOMATSU	D50A-17	67	80746	11370	U
R/Pindi	KOMATSU	D50A-17	68	80747	11110	U
R/Pindi	KOMATSU	D50A-17	69	80748	11532	U
R/Pindi	KOMATSU	D50A-17	70	80749	12797	U
R/Pindi	KOMATSU	D50A-17	71	80750	11257	U
R/Pindi	KOMATSU	D50A-17	72	80751	10828	U
R/Pindi	KOMATSU	D50A-17	73	80752	9157	S
R/Pindi	KOMATSU	D50A-17	74	80753	10829	R
R/Pindi	KOMATSU	D50A-17	75	80754	7892	S
R/Pindi	KOMATSU	D50A-17	76	80756	9701	R
R/Pindi	KOMATSU	D50A-17	77	80757	10184	R
R/Pindi	KOMATSU	D50A-17	78	80758	12819	U
R/Pindi	KOMATSU	D50A-17	79	80759	11579	U
R/Pindi	KOMATSU	D50A-17	80	80812	11059	U
R/Pindi	KOMATSU	D50A-17	81	80813	11047	U

Year of Commissioning : 1985 - 86

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
S.C.R/Pindi	KOMATSU	D50A-17	82	80760	11763	U
S.C.R/Pindi	KOMATSU	D50A-17	83	80761	11046	U
S.C.R/Pindi	KOMATSU	D50A-17	84	80762	12619	U
S.C.R/Pindi	KOMATSU	D50A-17	85	80763	13351	U
S.C.R/Pindi	KOMATSU	D50A-17	86	80764	12783	U
S.C.R/Pindi	KOMATSU	D50A-17	87	80765	12580	U
S.C.R/Pindi	KOMATSU	D50A-17	88	80766	12955	U
S.C.R/Pindi	KOMATSU	D50A-17	89	80768	8259	S
S.C.R/Pindi	KOMATSU	D50A-17	90	80770	12550	U
S.C.R/Pindi	KOMATSU	D50A-17	91	80771	10022	R
S.C.R/Pindi	KOMATSU	D50A-17	92	80772	11331	U
S.C.R/Pindi	KOMATSU	D50A-17	93	80773	11696	U
S.C.R/Pindi	KOMATSU	D50A-17	94	80775	12663	U
S.C.R/Pindi	KOMATSU	D50A-17	95	80776	11253	U
S.C.R/Pindi	KOMATSU	D50A-17	96	80777	11050	R
S.C.R/Pindi	KOMATSU	D50A-17	97	80778	11642	U
S.C.R/Pindi	KOMATSU	D50A-17	98	80780	13868	U
S.C.R/Pindi	KOMATSU	D50A-17	99	80781	12922	U
S.C.R/Pindi	KOMATSU	D50A-17	100	80782	11439	U
S.C.R/Pindi	KOMATSU	D50A-17	101	80783	11092	R
S.C.R/Pindi	KOMATSU	D50A-17	102	80784	11159	U
S.C.R/Pindi	KOMATSU	D50A-17	103	80768	11861	U
S.C.R/Pindi	KOMATSU	D50A-17	104	80794	10660	R
S.C.R/Pindi	KOMATSU	D50A-17	105	81503	10295	R
S.C.R/Pindi	KOMATSU	D50A-17	106	80799	13479	U

KOMATSU D50A-17

S 4
R 15
U 87
Total 106

(KOMATSU D50A-17)

Year of Commissioning : 1986 - 87

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
R/Pindi	KOMATSU	D50A-17	NKD-107	81028	9914	S
R/Pindi	KOMATSU	D50A-17	108	81029	9395	S
Jhelum	KOMATSU	D50A-17	109	81030	10266	R
Jhelum	KOMATSU	D50A-17	110	81031	9776	S
Jhelum	KOMATSU	D50A-17	111	81033	10099	S
R/Pindi	KOMATSU	D50A-17	112	81035	10410	R
R/Pindi	KOMATSU	D50A-17	113	81037	10027	S
R/Pindi	KOMATSU	D50A-17	114	81038	10619	R
R/Pindi	KOMATSU	D50A-17	115	81039	11139	R
R/Pindi	KOMATSU	D50A-17	116	81046	12890	U
R/Pindi	KOMATSU	D50A-17	117	81047	9652	S
D.G.Khan	KOMATSU	D50A-17	118		11387	U
D.G.Khan	KOMATSU	D50A-17	119		13412	U
D.G.Khan	KOMATSU	D50A-17	120		11644	U
D.G.Khan	KOMATSU	D50A-17	121		11683	U
D.G.Khan	KOMATSU	D50A-17	122		9846	U
D.G.Khan	KOMATSU	D50A-17	123		10110	S
D.G.Khan	KOMATSU	D50A-17	124		9324	S
D.G.Khan	KOMATSU	D50A-17	125		12446	U
D.G.Khan	KOMATSU	D50A-17	126		10620	R
D.G.Khan	KOMATSU	D50A-17	127		10597	R
D.G.Khan	KOMATSU	D50A-17	128		10201	R
B/Pur	KOMATSU	D50A-17	129		12725	U
B/Pur	KOMATSU	D50A-17	130		13168	U
B/Pur	KOMATSU	D50A-17	131		12275	U

Note : Present condition

S : Still serviceable
R : Need for minor repair
U : Unserviceable (need for replacement)

Source : Agriculture Department, Punjab

Year of Commissioning : 1986 - 87

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
B/Pur	KOMATSU	D50A-17	132		13300	U
B/Pur	KOMATSU	D50A-17	133		1189	U
B/Pur	KOMATSU	D50A-17	134		8836	S
B/Pur	KOMATSU	D50A-17	135		9703	S
B/Pur	KOMATSU	D50A-17	136		12418	U
B/Pur	KOMATSU	D50A-17	137		14500	U
B/Pur	KOMATSU	D50A-17	138		12945	U
B/Pur	KOMATSU	D50A-17	139		11985	U
S.C.R/Pindi	KOMATSU	D50A-17	140	81013	9789	R
S.C.Rwp	KOMATSU	D50A-17	141	81015	9932	S
S.C.Rwp	KOMATSU	D50A-17	142	81016	10821	R
S.C.Rwp	KOMATSU	D50A-17	143	81018	9130	S
S.C.Rwp	KOMATSU	D50A-17	144	81019	10781	R
S.C.Rwp	KOMATSU	D50A-17	145	81020	10244	R
S.C.Rwp	KOMATSU	D50A-17	146	81021	10156	R
S.C.Rwp	KOMATSU	D50A-17	147	81022	8980	S
S.C.Rwp	KOMATSU	D50A-17	148	80124	9066	S
S.C.Rwp	KOMATSU	D50A-17	149	81025	10125	S
S.C.Rwp	KOMATSU	D50A-17	150	81027	10893	R

KOMATSU D50A-17

S …… 15

R …… 13

U …… 16

Total 44

(KOMATSU D50A-17)

Year of Commissioning : 1989 - 90

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
B/Pur	KOMATSU	D50A-17	NKD-151		7414	S
B/Pur	KOMATSU	D50A-17	152		6025	S
B/Pur	KOMATSU	D50A-17	153		6268	S
B/Pur	KOMATSU	D50A-17	154		8056	S
B/Pur	KOMATSU	D50A-17	155		7716	S
B/Pur	KOMATSU	D50A-17	156		6798	S
B/Pur	KOMATSU	D50A-17	157		7528	S
B/Pur	KOMATSU	D50A-17	158		6772	S
B/Pur	KOMATSU	D50A-17	159		7091	S
B/Pur	KOMATSU	D50A-17	160		6065	S
B/Pur	KOMATSU	D50A-17	161		4990	S
B/Pur	KOMATSU	D50A-17	162		7434	S
B/Pur	KOMATSU	D50A-17	163		6228	S
B/Pur	KOMATSU	D50A-17	164		6922	S
B/Pur	KOMATSU	D50A-17	165		6501	S
Multan	KOMATSU	D50A-17	166		6589	S
Multan	KOMATSU	D50A-17	167		6730	S
Multan	KOMATSU	D50A-17	168		7970	S
Multan	KOMATSU	D50A-17	169		6350	S
Multan	KOMATSU	D50A-17	170		6624	S
Multan	KOMATSU	D50A-17	171		5992	S
Multan	KOMATSU	D50A-17	172		5617	S
Multan	KOMATSU	D50A-17	173		5795	S
Multan	KOMATSU	D50A-17	174		6490	S
Multan	KOMATSU	D50A-17	175		5592	S

Note : Present condition

S : Still serviceable
R : Need for minor repair
U : Unserviceable (need for replacement)

Source : Agriculture Department, Punjab

Year of Commissioning : 1989 - 90

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
Multan	KOMATSU	D50A-17	176		5542	S
Multan	KOMATSU	D50A-17	177		7176	S
Multan	KOMATSU	D50A-17	178		5679	S
Multan	KOMATSU	D50A-17	179		6930	S
Multan	KOMATSU	D50A-17	180		6653	S
Multan	KOMATSU	D50A-17	181		6789	S
Multan	KOMATSU	D50A-17	182		7176	S
Multan	KOMATSU	D50A-17	183		6172	S
Multan	KOMATSU	D50A-17	184		6919	S
Multan	KOMATSU	D50A-17	185		5998	S
Multan	KOMATSU	D50A-17	186		5950	S
Multan	KOMATSU	D50A-17	187		6597	S
Multan	KOMATSU	D50A-17	188		5337	S
Multan	KOMATSU	D50A-17	189		5137	S
Multan	KOMATSU	D50A-17	190		5592	S
D.G.Khan	KOMATSU	D50A-17	191		5339	S
D.G.Khan	KOMATSU	D50A-17	192		5751	S
D.G.Khan	KOMATSU	D50A-17	193		5860	S
D.G.Khan	KOMATSU	D50A-17	194		5113	S
D.G.Khan	KOMATSU	D50A-17	195		6860	S
D.G.Khan	KOMATSU	D50A-17	196		5365	S
Multan	KOMATSU	D50A-17	197		7434	S
Multan	KOMATSU	D50A-17	198		7249	S
Multan	KOMATSU	D50A-17	199		5435	S
Multan	KOMATSU	D50A-17	200		6977	S
Multan	KOMATSU	D50A-17	201		6017	S
Multan	KOMATSU	D50A-17	202		5741	S

Year of Commissioning : 1989 - 90

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
Multan	KOMATSU	D50A-17	203		5904	S
Multan	KOMATSU	D50A-17	204		5155	S
Multan	KOMATSU	D50A-17	205		5536	S
Multan	KOMATSU	D50A-17	206		5840	S
Multan	KOMATSU	D50A-17	207		5509	S
Multan	KOMATSU	D50A-17	208		7261	S
Multan	KOMATSU	D50A-17	209		6905	S
Multan	KOMATSU	D50A-17	210		7400	S
R/Pindi	KOMATSU	D50A-17	211	81510	4788	S
R/Pindi	KOMATSU	D50A-17	212	81511	6200	S
R/Pindi	KOMATSU	D50A-17	213	81512	6213	S
R/Pindi	KOMATSU	D50A-17	214	81514	5582	S
R/Pindi	KOMATSU	D50A-17	215	81515	8860	S
R/Pindi	KOMATSU	D50A-17	216	81538	5396	S
Jhelum	KOMATSU	D50A-17	217	81539	6777	S
Jhelum	KOMATSU	D50A-17	218	81542	6122	S
R/Pindi	KOMATSU	D50A-17	219	81544	6518	S
R/Pindi	KOMATSU	D50A-17	220	81546	5365	S
Lahore	KOMATSU	D50A-17	221	81548	5179	S
Lahore	KOMATSU	D50A-17	222	81549	5101	S
Lahore	KOMATSU	D50A-17	223	81551	4447	S
Lahore	KOMATSU	D50A-17	224	81552	4574	S
Lahore	KOMATSU	D50A-17	225	81554	4686	S
Lahore	KOMATSU	D50A-17	226	81555	4502	S
Lahore	KOMATSU	D50A-17	227	81556	4416	S
Lahore	KOMATSU	D50A-17	228	81557	4704	S
Lahore	KOMATSU	D50A-17	229	81560	4237	S

Year of Commissioning : 1989 - 90

District	Maker	Model	Code No.	Serial No.	Service Meter	Present Condition (S.R.U)
G/Wala	KOMATSU	D50A-17	230	81562	4300	S
G/Wala	KOMATSU	D50A-17	231	81563	4198	S
G/Wala	KOMATSU	D50A-17	232	81564	5300	S
G/Wala	KOMATSU	D50A-17	233	81565	3938	S
G/Wala	KOMATSU	D50A-17	234	81568	4482	S
G/Wala	KOMATSU	D50A-17	235	81569	4993	S
G/Wala	KOMATSU	D50A-17	236	81570	4720	S
G/Wala	KOMATSU	D50A-17	237	81571	4440	S
Sargodha	KOMATSU	D50A-17	238	81554	4450	S
Sargodha	KOMATSU	D50A-17	239	81575	5120	S
Sargodha	KOMATSU	D50A-17	240	81576	5308	S
Sargodha	KOMATSU	D50A-17	241	81578	4291	S
Sargodha	KOMATSU	D50A-17	242	81579	4674	S
Sargodha	KOMATSU	D50A-17	243	81581	4674	S
Sargodha	KOMATSU	D50A-17	244	81582	4135	S
Sargodha	KOMATSU	D50A-17	245	81585	4140	S
Sargodha	KOMATSU	D50A-17	246	81586	4681	S
Sargodha	KOMATSU	D50A-17	247	81587	4235	S
Sargodha	KOMATSU	D50A-17	248	81588	4382	S
Sargodha	KOMATSU	D50A-17	249	81589	4209	S
Sargodha	KOMATSU	D50A-17	250	81591	5108	S
Sargodha	KOMATSU	D50A-17	251	81593	5360	S
Sargodha	KOMATSU	D50A-17	252	81594	4794	S
F/Abad	KOMATSU	D50A-17	253	81595	6824	S
F/Abad	KOMATSU	D50A-17	254	81597	6264	S
F/Abad	KOMATSU	D50A-17	255	81599	7188	S
F/Abad	KOMATSU	D50A-17	256	81600	6145	S