CHAPTER IV: BULLDOZERS USED FOR AGRIGULTURAL DEVELOPMENT: OPERATIONAL STRUCTURE AND MANAGEMENT CONDITIONS

Section 4.1: Pakistan Federal Ministry of Food, Agriculture & Livestock

The responsibility for agricultural development in Pakistan is shouldered by the Agricultural Departments of each province; the federal Ministry of Food, Agriculture and Livestock handles communication and organizational duties that accompany agricultural development in each province. Overseas aid can be requested either directly by each province or collectively through the federal Ministry of Agriculture. When a province requests such aid directly, the institution responsible for carrying out the project will contact the assisting institution directly. The Ministry of Agriculture compiles requests made through the federal Ministry of Agriculture by each province.

Since the Agricultural Department of each province bears the responsibility for agricultural development, there is not a department within the federal Ministry of Agriculture that corresponds to the Agricultural Engineering Department of each province. When cooperative efforts in agricultural development are required, the Additional Secretary of the Ministry of Agriculture or the Director General of the Water Management Cell coordinates the efforts of all provinces. The following is an organizational diagram of the federal Ministry of Agriculture.

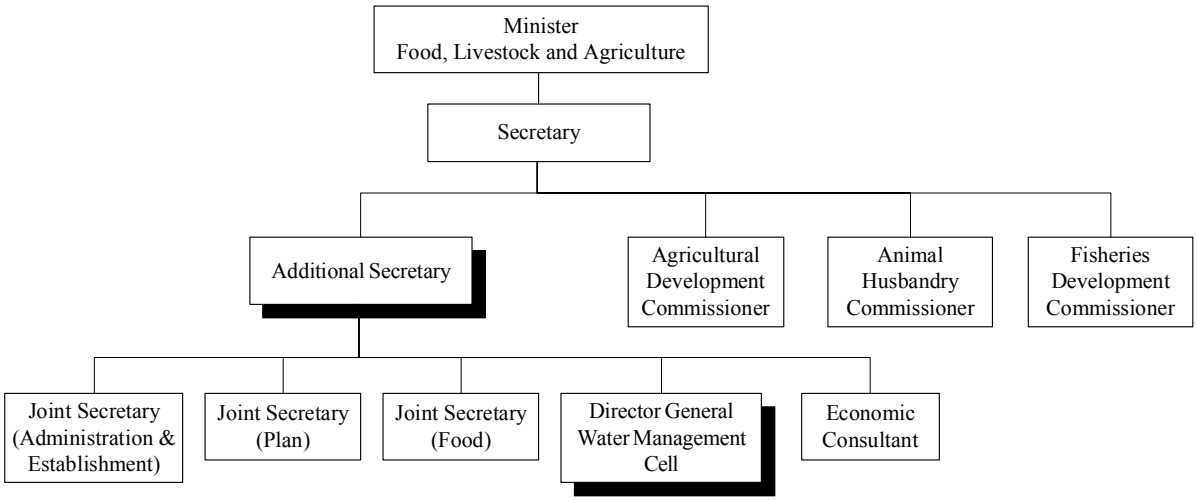


Diagram 4-1: Pakistan Federal Ministry of Food, Agriculture & Livestock
Source: Pakistan Federal Ministry of Food, Agriculture & Livestock

Project implementation in Pakistan can be handled accordingly to the national or provincial budgets; however, agricultural development using bulldozers is generally posted to the budget of each province, at their discretion. In fiscal year 2004-2005, the federal budget[1] included only Rs 1 million for agricultural development using bulldozers.

Highlight #1: Collateral Funds Set Aside for Aid Japan Provides to Increase Food Production (2KR)

Since the 1980s, Japan has provided aid through 2KR; during this time we have repeatedly provided bulldozers and spare parts to each province. A condition for 2KR grants was that the Pakistani government establishes a reserve in a bank account at the Central Bank, equivalent to two-thirds of the grant amount, and, having determined the purposes for which it will be used in cooperation with the Japanese government, use these funds for Pakistan's socio-economic development. Despite this, the fees from renting the bulldozers in each province are combined with other regional taxes and deposited to one Central Bank account. Since this is one part of the national budget (including aid to the provinces), this makes it difficult to monitor reserves in a separate account used only for collateral funds. Consequently, the government of Pakistan first establishes a reserve in the Central Bank at the time they receive the 2KR grant, and simultaneously subtracts this amount from the amount of aid distributed to the provinces. According to the Japanese embassy in Pakistan, these funds are then designated as the Japan Fund and distributed to each province. This means that although the reserves of collateral funds are created automatically, the provinces receiving these funds determine the purpose of use at their own discretion. Although the Department of Finance in each province receiving these funds is then obligated to secure an agreement with the Japanese embassy with regard to their use, these bureaus were unaware of this obligation and consequently treated all of the funds as normal aid, without seeking agreement from the Japanese government on the purposes for which they would be used.

When providing aid through 2KR in the future, the funds reserved at the federal level under the current system should be handled in the following manner:

1. These funds should be distributed as aid to the provinces, but the provinces' Departments of Finance must confirm the fact that they are aware of their responsibility to hold cooperative discussions with the Japanese embassy in Pakistan and jointly agree on the purposes for which these funds will be used.
2. It will otherwise be necessary to refrain from distributing aid to the provinces and have the federal government bear the responsibility for reaching a cooperative agreement with the Japanese embassy in Pakistan, then assume the duty of distributing the funds themselves.

[1]According to the Public Sector Development Programme 2004-2005.

Section 4.2: Punjab Province

Subsection 4.2.1: Organizational Structure

Below is a diagram of the organizational structure of the Agricultural Department of Punjab Province. The Directorate of Agricultural Engineering, the Directorate of Soil Conservation, and the Agricultural Mechanization Research Institute for the three regions of Multan, Faisalabad, and Lahore are subsumed under the Directorate General of Agriculture (Field) of Lahore, the capital of the province.

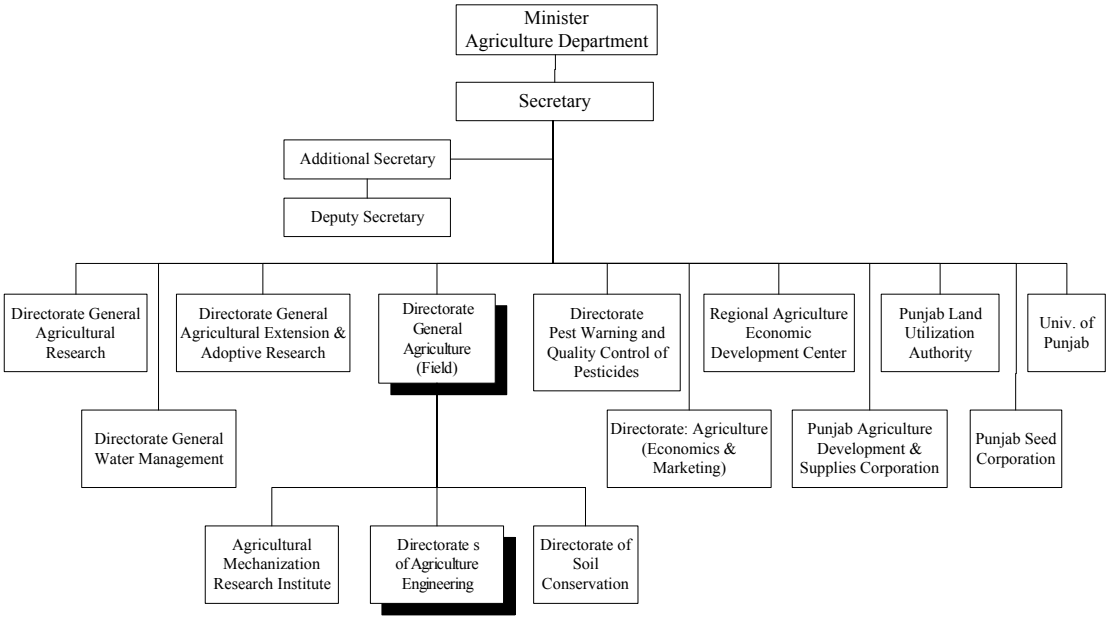


Diagram 4-2: Organizational Structure of the Agricultural Department of Punjab Province
Source: *Report on the Basic Study of Agricultural for the Islamic Republic of Pakistan*; JICA

The Directorates of Agricultural Engineering for the regions of Multan, Faisalabad, and Lahore are managed as three separate divisions. These three divisional offices rent bulldozers through a total of 34 district offices. There is one agricultural engineer stationed at each divisional office; in addition to overseeing the activities of the district offices, this engineer is responsible for the Assistant Agricultural Engineers at the district offices (approximately 30 to 100 people), who handle bulldozer rentals. The following repair facilities are established in these districts offices: eight Category A facilities, seven Category B facilities and nine Category C facilities. (See Chapter 3 for a description of repair facility categories.) In Punjab Province, designated workshops are not under the jurisdiction of designated districts. When the engineers at lower-ranking workshops cannot resolve their problems, they commission repairs from a higher-ranking workshop in their own division or from one in another division, depending on their needs.

Table 4-1 details the offices of the Directorate General of Agriculture (Field) and the locations of the repair facilities.

Table 4-1: Directorate General of Agriculture (Field) Office Repair Facility Locations

Region	Division	District
Lahore	Lahore	Lahore (A), Sheikhupura (C), Kasur (C), Okara
	Gujranwala	Gujranwala (B), Hafizabad, Gujrat (C), Sialkot (C), Narowal
	Rawalpindi	Rawalpindi (A&B), Attock (B), Chakwal, Jhelum (C)
Faisalabad	Faisalabad	Faisalabad (A), Jhang (C), Toba Tek Singh
	Sargodha	Sargodha (C), Khushab / Jauharabad, Mianwali (B), Quaidabad*(A), Bhakkar
	Talagang	Talagang (A), Chakwal
Multan	Multan	Multan (A), Khanewal, Sahiwal (B), Vehari (C)
	D.G. Khan	D.G. Khan (B), Layyah (A), Muzaffargarh, Rajanpur
	Bahawalpur	Bahawalpur (A), Bahawalnagar (C), Khanpur (B)

*Quaidabad is only a repair facility; it does not rent bulldozers.

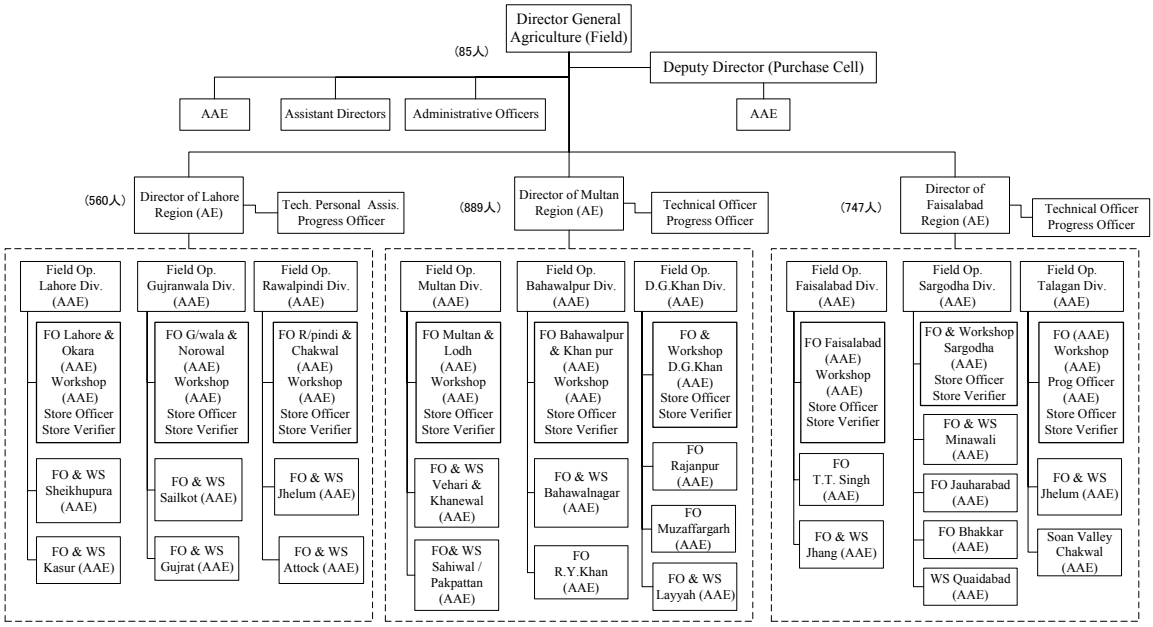
Source: Directorate General of Agriculture (Field), Punjab Province

Highlight #2: Bulldozer Rental Procedures

All four provinces follow virtually the same procedures for bulldozer rental:

1) Farmers wishing to develop agricultural land go to the district level office and inform the Assistant Agricultural Engineer of their intention to rent a bulldozer.
2) The Assistant Agricultural Engineer conducts a site survey of the farmer's lands, estimates the number of bulldozer hours needed, then tells the farmer how many hours it will take and what the corresponding fee will be.
3) The farmer deposits the appropriate fee for the number of hours to be used in the designated governmental account. He then submits the proof of deposit to the supervising office together with his proposal. He attaches to this proposal proof that he owns the land or hold tenant's rights; this documentation is issued by the Registry Office.
4) Bulldozers are rented out according to the order in which the applications are received; priority is not assigned according to income or region. The operator's wages are included in the fee; however, fuel and transport expenses are not included for some provinces and must be paid separately.

Diagram 4-3 shows the organizational structure for the Directorate General of Agriculture (Field).



FO: Field Operations; AE: Agricultural Engineer; AAE: Assistant Agricultural Engineer

Diagram 4-3: Organizational Structure for the Directorate General of Agriculture (Field)
Source: Directorate General of Agriculture (Field), Punjab Province

Subsection 4.2.2: Personnel

The Directorate General of Agriculture (Field) had a total of 5,570 employees during fiscal year 2004-2005. This included headquarter employees; there were 3,004 employees involved in bulldozer rental, maintenance and management.[2] Table 4-2 shows the allocation of personnel involved in the rental, maintenance, and management of bulldozers for the Directorate General of Agriculture (Field).

[2]The administrative division for the Directorate General of Agriculture (Field) oversees the Directorate of Soil Conservation and Agricultural Mechanization Research Institute, in addition to duties related to bulldozer operations.

Table 4-2: Directorate General of Agriculture (Field), Bulldozer-Related Personnel Allocations (2004-2005 Fiscal Year) (# of people)

	HQ	Lahore	Multan	Faisalabad	Total
Director General	1	0	0	0	1
Director	0	1	1	1	3
Deputy Director	1	0	0	0	1
AE/ Technical Officer	0	3	4	4	11
AAE / Technical Assist. Personnel	9	23	16	14	62
Asst. Director	3	0	0	2	5
ADM officer	1	1	1	1	4
Superintendent	2	5	4	4	15
Stenographer	3	1	2	2	8
Head Clerk	9	11	8	15	43
Senior Clerk/ Junior Auditor	10	17	29	29	85
Junior Clerk	14	66	114	98	292
Driver	8	28	36	42	114
Chowkidar	4	64	93	86	247
Office Attendant	14	24	33	50	121
Sweeper	1	11	11	15	38
Other office staff	6	38	70	67	181
Foreman/Superintendent	0	7	13	11	31
Assist Foreman	0	0	0	3	3
Crank Shaft Grinder	0	0	2	0	2
Unit Supervisor	0	14	26	15	55
Mechanic	0	43	87	75	205
Electrician	0	14	21	21	56
Machine man	0	0	2	3	5
Bulldozer Operator	0	99	219	138	456
Tractor Driver	0	8	11	25	44
Greaser	0	124	183	113	420
Turner	0	15	22	19	56
Fitter	0	15	32	34	81
Welder	0	11	7	13	31
Other Trade	0	24	67	73	164
Helper	0	75	54	35	164
Total	86	742	1,168	1,008	3,004

Source: Directorate General of Agriculture (Field), Punjab Province

Subsection 4.2.3: Status of Bulldozer Management and Usage

1) Details of Aid Provided by Japan

During fiscal year 1991-1992, Japan provided 138 bulldozers to Punjab Province via the 2KR project; during fiscal year 1994-1995, we supplied spare parts.

Table 4-3: Aid Supplied by Japan to the Punjab Province Agricultural Department

Fiscal Year	Nature of Aid	Total Amount
1985-1986	Supplied 106 bulldozers and spare parts for 40% of these via 2KR	¥2.856 billion
1986-1987	Supplied 194 bulldozers and spare parts for 40% of these via 2KR	
1989-1990	Supplied 140 bulldozers, 4 sets of equipment for rebuilding undercarriages and 2 mobile workshops via 2KR	¥1.599 billion
1992-1993	Supplied 113 bulldozers, spare parts for 20% of these and 2 transport trucks via general grant	¥1.764 billion
1993-1994	Supplied spare parts via 2KR	¥310.0 million

Source: Directorate General of Agriculture (Field), Punjab Province

2) Number of Bulldozers and Operational Status

Once monthly, reports on bulldozer rentals and income and expenditures for the repair facilities are submitted to the headquarters in Lahore. These are recorded by equipment type using a computer. According to these records, 491 bulldozers are currently distributed to 17 different districts; of these, 314 are currently in operation. The number of bulldozers per district in Punjab Province is shown below.

Table 4-4: Number of Bulldozers Per District in Punjab Province

(Units)

Region	Division	District	# of Bulldozers	# Operable* (July 2003-May 2004)
Lahore	Lahore	Lahore	10	6
		Sheikhupura	11	7
		Kasur	10	7
		Okara	9	7
	Gujranwala	Gujranwala	9	5
		Hafizabad	3	3
		Gujrat	8	5
		Sialkot	2	2
		Narowal	2	2
	Rawalpindi	Rawalpindi	16	13
		Attock	14	10
		Chakwal	13	9
		Jhelum	13	8
Faisalabad	Faisalabad	Faisalabad	15	8
		Jhang	13	8
		T.T. Singh	11	6
	Sargodha	Sargodha	12	8
		Khushab	9	6
		Mianwali	11	7
		Bhakkar	12	8
	Talagang	Talagang	21	17
		Chakwal	14	14
Multan	Multan	Multan	25	14
		Khanewal	18	9
		Sahiwal	17	9
		Vehari	18	10
	D.G. Khan	D.G Khan	24	14
		Layyah	22	14
		Muzaffargarh	25	14
		Rajanpur	12	9
	Bahawalpur	Bahawalpur	33	20
		Bahawalnagar	22	13
		Khanpur	37	22
Total			491	314

* Operable bulldozers are those requiring repairs costing Rs 2 million or less.

Source: Directorate General of Agriculture, Punjab Province

Although the bulldozers currently in operation are old, they have been relatively well maintained. The average yearly operating time of 2,000 hours is extremely high. Below, we show the yearly operating time for operable bulldozers by region.

Table 4-5: Average Yearly Operating Time for Bulldozers in Punjab Province (July 2003-May 2004)

Region	# of Bulldozers	# Operable	Average Yearly Operating Time Per Unit*
Lahore	120	84	1,807 hours
Faisalabad	118	82	2,019 hours
Multan	253	148	2,270 hours
Total/Average	491	314	2,081 hours

* 11 months' operation converted to yearly basis

Source: Created by the Preparatory Study Team based on data from the Directorate General of Agriculture (Field), Punjab Province

3) Bulldozer Users

Punjab Province has kept records of the land area prepared by bulldozers; in the past five years, 2.7 acres of land per person has been prepared, an extremely low amount compared to that of other provinces. We think this is due to the following factors: 1) Many of these regions are truly difficult to work; 2) the size of the bulldozers used is small compared with those of other provinces; and 3) these are more realistic numbers than the ones put on paper by other provinces. Below, we show bulldozer usage time and area prepared per person. Please note that data on the number of users per separate land area are not currently available due to the fact that detailed data on land area prepared are not kept on a centralized basis.

Table 4-6: Bulldozer Usage Time Per Person in Punjab Province

Fiscal Year	Total # of Operating Hours	# of Users	Usage Time Per Person	Total Area of Land Prepared	Total Area Prepared Per Person
1999-2000	518,664 hours	10,799 people	48.0 hours	22,949acres	2.1acres
2000-2001	553,974 hours	7,702 people	71.9 hours	23,311acres	3.0acres
2001-2002	589,793 hours	9,026 people	76.6 hours	29,700acres	3.3acres
2002-2003	604,721 hours	10,355 people	58.4 hours	23,328acres	2.3acres
2003-2004 (to May end)	598,881 hours	9,979 people	60.0 hours	24,002acres	2.4acres
Yearly Avg.	584,095	9,754	59.9	25,094 acres	2.6 acres

Source: Directorate General of Agriculture (Field), Punjab Province

4) Waiting Time for Bulldozers

The waiting time for bulldozers by region for Punjab Province is shown below. The calculated average waiting time is one month; however, rather than pay in advance, the users determine when they will use the bulldozer after first confirming with the office when the machines will be available. They then pay in advance, so the actual waiting time is probably longer than one month.

Table 4-7: Waiting Time for Bulldozers in Punjab Province

Region	# of Hours Reserved (June 2003)	Monthly Average Operating Hours (July 2003-May 2004)	# of Months' Wait
Lahore	6,577 hours	12,651 hours	0.5 months
Faisalabad	14,545 hours	13,794 hours	1.1 months
Multan	32,708 hours	27,998 hours	1.2 months
Total/Average	53,830 hours	54,443 hours	1.0 months

Source: Created by the Preparatory Study Team based on data from the Directorate General of Agriculture (Field), Punjab Province

Subsection 4.2.4: Financial Status

According to the Directorate General of Agriculture in Punjab Province, the current rental price for bulldozers ranges between Rs 259-358 an hour, with an additional Rs 29/km added for transport expenses, as shown in Table 4-8. This differs somewhat, depending on the type of bulldozer and whether it will be used for irrigated crop lands or for rain-fed crop lands.

Table 4-8: Bulldozer Rental Fees for Punjab Province

(Rupees/hour)

Machine Type / Purpose for Bulldozer Use	Komatsu	Caterpillar
Used for agriculture in regions with irrigated croplands	358	328
Used for agriculture in regions with rain-fed croplands	275	259
Used for agriculture by a governmental institution, NGO or government corporation	525	453
Used for non-agricultural purposes by a governmental institution, NGO or government corporation	800	700
Lent to private enterprise	900	800

Source: Directorate General of Agriculture (Field), Punjab Province

The income and expenditures for bulldozer rental for the Directorate General of Agriculture (Field) are as follows[3]:

Table 4-9: Bulldozer Rental Income for Punjab Province

Fiscal Year	Total # of Operating Hours	Income (Rs 000)
1999-2000	518,664 hours	99,409
2000-2001	553,974 hours	119,437
2001-2002	589,793 hours	178,889
2002-2003	604,721 hours	209,356
2003-2004 (to May end)	598,881 hours	208,317

Source: Directorate General of Agriculture (Field), Punjab Province

[3]According to the Directorate General of Agriculture (Field), it is difficult to separate expenses incurred for bulldozer operations from other expenses; this is therefore a rough estimate.

Table 4-10: Directorate General of Agriculture Field: General Budget for Bulldozers

(Estimated value: Rs 000)

	Wages/ Benefits	Spare Parts	Fuel, Oil etc.	Expenses for Energy, Communications, etc.	Total
Percentage allotted to the Directorate General of Agriculture (Field)	(60%)	(60%)	(80%)	(60%)	
1999-2000	135,000	54,000	107,000	26,000	322,000
2000-2001	143,000	76,000	139,000	30,000	388,000
2001-2002	151,000	82,000	157,000	21,000	411,000
2002-2003	152,000	85,000	188,000	22,000	447,000

Source: Created by the Preparatory Study Team based on data from the Directorate General of Agriculture (Field), Punjab Province

According to the above estimates, income from bulldozer operations covers approximately 40 to 50 percent of expenses for Punjab Province. This is sufficient to cover all fuel and oil expenses and half of spare parts expenses. A broad comparison of bulldozer rental fees to actual expenses (these are cash expenditures; depreciation expenses are not included) for fiscal year 2002-2003 is shown below.

Table 4-11: Punjab Province: Comparison of Current Bulldozer Rental Fees and Actual Expenses

	Fee	Notes
Current Rental Fees	Rs 259−358/hour	—
Actual Expenses (2002-2003)	Rs 739/hour	Rs 447 million (yearly budget)/604,721 hours (operating time)

Source: JICA Preparatory Study Team

This amounts to around Rs 1,050/hour for Punjab Province, once depreciation expenses are taken into consideration; we believe these fees are sustainable under the current system.

Highlight #3: Depreciation Expenses for Bulldozers Used for Land Development

There are various ways of looking at the depreciation expenses for bulldozers used in land development; one possible method uses the following costs:

Equipment Expenses: Rs 5mn/24,000 hours ≅ Rs 200/hour
Parts Expenses: Rs 100/hour
Total: Rs 300/hour

The four provinces have booked no depreciation up to this point, giving as their reason the fact that these machines were donated free of charge.

Highlight #4: Provincial Budget Systems

The provincial budgets in Pakistan consist of a budget for public sector development programs and current expenditures unrelated to development. The development budget is put together from the budgets of specific projects that cover a specific amount of time. A PC-1 (project plan and budget documentation) is produced for each of these projects and is implemented after applying for approval from the government. Expenses incurred during the course of the project (construction, procurement stages), such as expenses for management, operation, and spare parts, are allocated to the development budget. All costs incurred after the implementation period, such as salaries for provincial employees and all recurrent costs, including those for spare parts supply, are allocated to current expenses.

The provincial agricultural departments receive income from management of bulldozers used for agricultural land development; however, this income is transferred to the federal government along with other taxes. The federal government then distributes aid to the provinces in excess of this amount. Each province then allocates this to individual departments or projects at their discretion. Consequently, income and expenditures are not currently linked since the profitability of bulldozer operations is not accounted for separately.

Section 4.3: Sindh Province

Subsection 4.3.1: Organizational Structure

A diagram of the organizational structure of the Agricultural Department in Sindh Province is shown below. There are three directorates in the Agricultural Department for Sindh Province: the Directorate General for Agricultural Research, the Directorate General for Agricultural Extension, and the Directorate General for Agricultural Engineering and Water Management. In addition, the Agricultural Department also has an aid agency. The Agricultural Engineering Wing is subsumed under the Directorate General for Agricultural Engineering and Water Management.

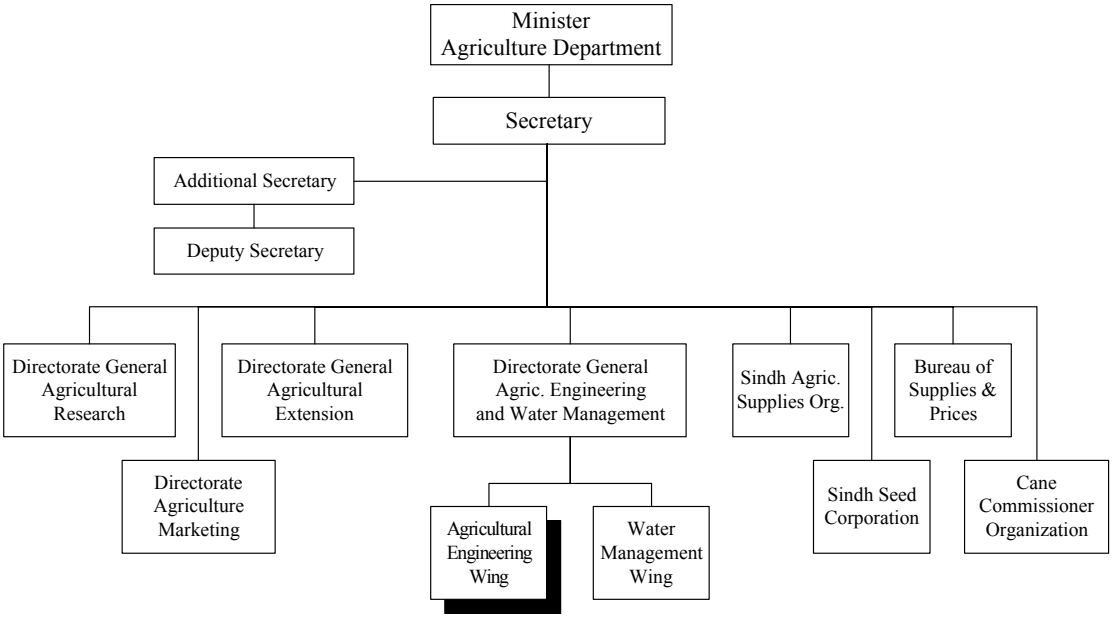


Diagram 4-4: Organizational Structure for the Agricultural Department of Sindh Province

Source: *Report on the Basic Study of Agricultural for the Islamic Republic of Pakistan*; JICA

The headquarters of the Agricultural Engineering Wing is located in the city of Hyderabad, about 150 kilometers east of the city of Karachi, where the Agricultural Department of the province is located. Within Sindh Province, the operational management and rental of bulldozers is handled by the following five divisions, which are divided into 17 sub-divisions. One Agricultural Engineer is stationed in each of the Divisions; they supervise the activities of the sub-divisions, where the Assistant Agricultural Engineers in the sub-division offices are responsible for bulldozer rental. The locations of the Agricultural Engineering Wing offices are shown below.

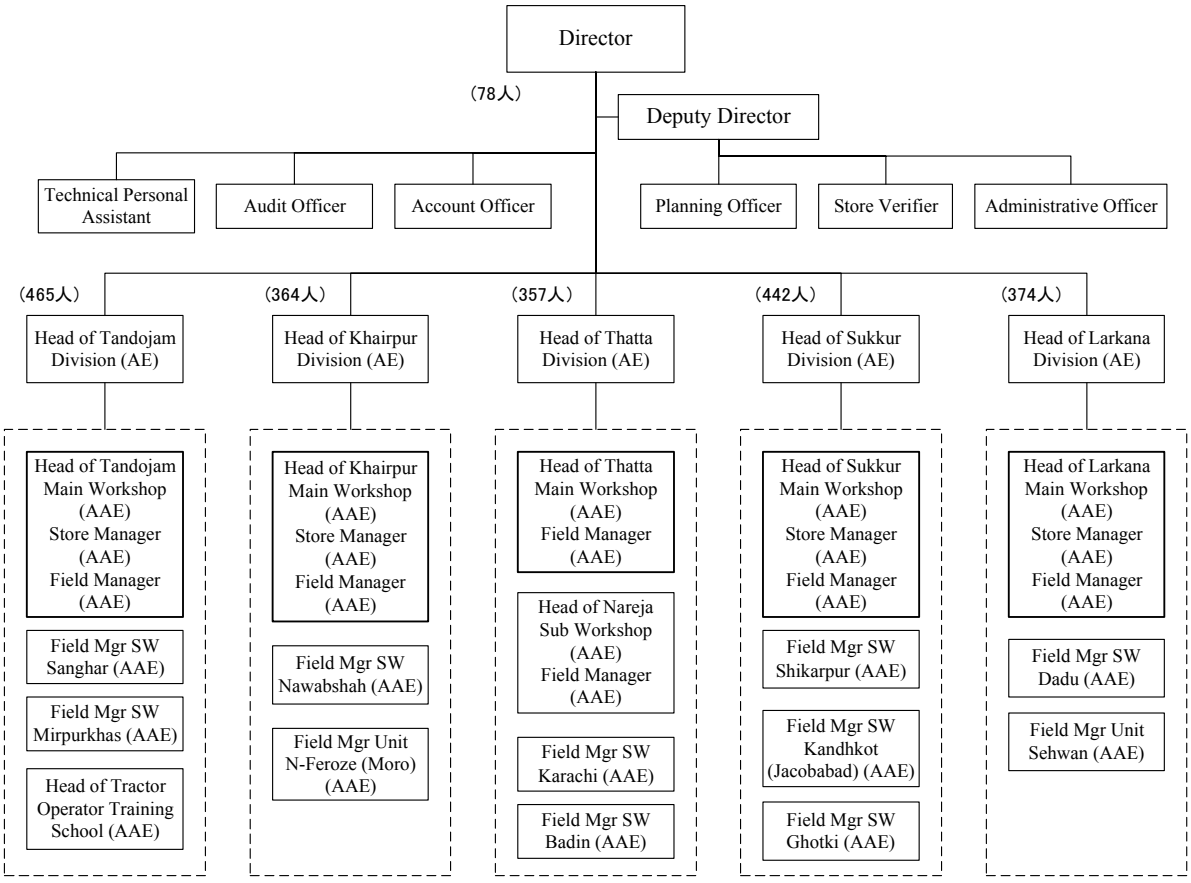
Table 4-11: Location of Agricultural Engineering Wing Offices for Sindh Province

Division	Sub-Division
Sukkur	Sukkur, Ghotki, Jacobabad (Kandhkot), Shikarpur
Tandojam	Tandojam, Mirpurkhas, Sanghar
Larkana	Larkana, Dadu, Sehwan
Khairpur	Khairpur, Nawabshah, Nausharo-Feroz (Moro)
Thatta	Thatta, Badin, Hyderabad (Nareja), Karachi

Those underlined are the locations of the main repair facilities.

Source: Agricultural Engineering Wing for Sindh Province

The main repair facilities are located in the five central sub-divisions of the divisions; these perform relatively large-scale repairs and service. In the remaining 12 sub-divisions, there are ten minor repair facilities and two units (located in Sehwan and Moro, they are smaller in scale than the minor repair facilities); these perform daily checks and light repairs. A field manager in each sub-division handles bulldozer rental duties; with the exception of Nareja, these field managers also function as the person in charge of the minor repair facilities or units. A diagram of the organizational structure for the Agricultural Engineering Wing of Sindh Province is shown below.



SW: Sub-workshop; AE: Agricultural Engineer; AAE: Assistant Agricultural Engineer

Diagram 4-5: Organizational Structure for the Agricultural Engineering Wing of Sindh Province

Source: Agricultural Engineering Wing, Sindh Province

Subsection 4.3.2: Personnel

The Agricultural Engineering Wing of Sindh Province had 2,080 employees as of July 2004. According to the Agricultural Engineering Wing, this scale is necessary to handle operations for 320 bulldozers and the attendant facilities and personnel; however, as stated below, only 64 bulldozers are currently in operation, so they actually have excess personnel. Personnel allocation for the Agricultural Engineering Wing of Sindh Province is shown in Table 4-12, below.

Table 4-12: Personnel Allocation for the Agricultural Engineering Wing of Sindh Province (Fiscal Year 2004-2005)

(# of people)

	HQ	T. Jam	Thatta	Larkan	Sukkur	Khairpur	Total
Director	1	-	-	-	-	-	1
Deputy Director	1	-	-	-	-	-	1
Agriculture Engineer	-	1	1	1	1	1	5
Assistant Agri. Engineer	-	5	4	3	6	3	21
Workshop Superintendent	-	1	-	-	-	-	1
Store Officer	-	1	-	1	-	-	2
Technical Personal Assistant	1	-	-	-	-	-	1
Accounts Officer	1	-	-	-	-	-	1
Audit Officer	1	-	-	-	-	-	1
Planning Officer	1	-	-	-	-	-	1
Store Verifier	1	-	-	-	-	-	1
Officer Superintendent	2	1	-	1	-	-	3
Administrative Officer	1	-	-	-	-	-	1
Stenographer	3	-	-	-	-	-	3
Assistant	4	5	1	4	3	1	18
Foreman	-	5	2	5	3	3	18
Unit Supervisor	-	6	3	12	5	9	35
Storekeeper / attendant	-	9	21	26	33	8	87
Senior / Junior Clerk	27	19	15	21	23	17	122
Borer & Assistant	-	21	4	15	4	11	55
Driller & Assistant	-	24	1	7	0	16	50
Bulldozer Operator	-	81	75	70	61	73	360
Greaser	-	77	66	68	94	59	364
Mechanic	-	26	23	22	43	16	130
Driver	2	20	13	21	20	14	90
Turner & Assistant	-	9	5	6	9	5	34
Blacksmith	-	3	1	2	6	3	15
Electrician	-	5	4	5	4	5	23
Bench Fitter	-	2	2	1	3	3	11
Fitter	-	12	6	10	10	9	47
Other	32	132	110	73	114	108	569
Total	78	465	357	374	442	364	2080

Source: Agricultural Engineering Wing, Sindh Province

Subsection 4.3.3: Status of Bulldozer Management and Usage

1) Details of Aid from Japan

During fiscal year 1991-1992, Japan provided 138 bulldozers to Sindh Province via the 2KR project; during fiscal year 1994-1995, we supplied spare parts.

Table 4-13: Aid Supplied by Japan to the Sindh Province Agricultural Engineering Wing

Fiscal Year	Nature of Aid	Total Amount
1991-1992	Supplied 47 bulldozers via 2KR	¥600 million
1991-1992	Supplied 91 bulldozers and spare parts for 10% of these via 2KR	¥1.33 billion
1994-1995	Supplied spare parts via 2KR	¥150 million

Source: Agricultural Engineering Wing, Sindh Province

2) Number of Bulldozers and Operational Status

Once monthly, reports on bulldozer rentals, and income and expenditures for the repair facilities are submitted to the headquarters. These are recorded by equipment type using a computer. According to these records, 135 bulldozers are currently distributed to 17 different sub-divisions; of these, 64 are currently in operation, on average. These numbers fluctuate from month to month, as the aging bulldozers are prone to repeated breakdowns and repairs. The number of bulldozers per sub-division in Sindh Province is shown below.

Table 4-14: Number of Bulldozers Per Sub-Division in Sindh Province (Units)

Division	Sub-Division	# of Bulldozers	Average # in Operation Monthly* (July 2003-May 2004)
Sukkur	Sukkur	7	5.0
	Ghotki	8	3.4
	Kandhkot	9	3.5
	Shikarpur	5	3.4
Tandojam	Tandojam	13	7.8
	Mirpurkhas	5	3.2
	Sanghar	5	3.4
Larkana	Larkana	12	6.5
	Dadu	9	3.6
	Sehwan	6	4.1
Khairpur	Khairpur	11	6.6
	Nawabshah	7	2.9
	Moro	5	3.3
Thatta	Thatta	9	2.6
	Badin	13	1.5
	Nareja	11	3.2
	Total:	135	64

*Average of units operated monthly, even if only for a short time. Determined by the Preparatory Study Team. Source: Agricultural Engineering Wing, Sindh Province

The bulldozers currently in operation are old, so the average yearly operating time of 737 hours is extremely low. Below, we show the yearly operating time for bulldozers by division.

Table 4-15: Average Operating Time for Bulldozers in Sindh Province (July 2003-May 2004)

Division	# of Bulldozers	Avg. # in Operation Monthly	Avg. Monthly Operating Time for Operable Machines*
Sukkur	29units	16units	821 hours
Tandojam	23units	14units	718 hours
Larkana	27units	14units	786 hours
Khairpur	23units	13units	603 hours
Thatta	33units	7units	731 hours
Total/Average:	135 units	64 units	737 hours

* 11 months operating time converted to yearly basis

Source: Created by the Preparatory Study Team based on data from the Agricultural Engineering Wing, Sindh Province

3) Bulldozer Users

Sindh Province does not maintain data on the area of land prepared by bulldozer. Based on experience, we are using a value of approximately 5 hours per acre of land. The area of land prepared per person with bulldozers is shown below.

Table 4-16: Bulldozer Time Usage by Person in Sindh Province

Fiscal Year	Total Operating Time	# of Users	Hours of Usage Per Person	Tl Area Prepared (Estimated)	Area Prepared Per Person (Estimated)
1999-2000	133,058 hours	1,350 people	98.5 hours	27,180acres	19.7acres
2000-2001	67,672 hours	1,317 people	51.4 hours	12,336acres	10.3acres
2001-2002	45,515 hours	690 people	66.0 hours	8,550acres	13.2acres
2002-2003	36,667 hours	633 people	57.9 hours	7,050acres	11.6acres
2003-2004 (to May end)	43,419 hours	580 people	74.9 hours	9,365acres	15.0acres
Yearly Avg.	66,056 hours	924 people	71.5 hours	13,066acres	14.3acres

Source: Agricultural Engineering Wing, Sindh Province

4) Bulldozer Waiting Time

The waiting times for bulldozer usage by sub-division in Sindh Province are shown below.

Table 4-17: Waiting Time for Bulldozers in Sindh Province

Division	Sub-division	Farmers Waiting	Estimated Usage Tm	Ave. Op. Time	Mths Wait
Sukkur	Sukkur	3	108 hrs	401 hrs	0.3 mths
	Shikarpur	2	137 hrs	263 hrs	0.5 mths
	Kandhkot	4	388 hrs	266 hrs	1.5 mths
	Ghotki	0	0 hrs	250 hrs	0.0 mths
Tandojam	Tandojam	19	914 hrs	506 hrs	1.8 mths
	Mirpurkhas	4	182 hrs	204 hrs	0.9 mths
	Sanghar	12	445 hrs	230 hrs	1.9 mths
Larkana	Larkana	22	794 hrs	506 hrs	1.6 mths
	Dadu	7	177 hrs	217 hrs	0.8 mths
	Sehwan	1	45 hrs	289 hrs	0.2 mths
Khairpur	Khairpur	11	189 hrs	366 hrs	0.5 mths
	Nawabshah	9	583 hrs	98 hrs	5.9 mths
	Moro	13	857 hrs	245 hrs	3.5 mths
Thatta	Thatta	5	212 hrs	183 hrs	1.2 mths
	Badin	16	554 hrs	108 hrs	5.1 mths
	Nareja	4	58 hrs	201 hrs	0.3 mths
Total		132	5,643 hrs	4,333 hrs	1.3 mths

Source: Created by the Preparatory Study Team based on data from the Agricultural Engineering Division of Sindh Province

The average waiting time for bulldozer use in Sindh Province is 1.3 months, a relatively short amount of time. Despite this, the waiting times for Nawabusha in the Khairpur Division and Badin in the Thatta Division are in excess of five months, showing that these divisions are not allocating bulldozers in a practical manner.

Subsection 4.3.4: Financial Status

According to the Agricultural Engineering Wing in Sindh Province, the current rental price for bulldozers includes a basic fee[4] of Rs 175 per hour, a fee for light diesel fuel of approximately 14 liters per hours (= Rs 364), and a one-way transport fee of Rs 15 per kilometer. Excluding the transport fee, the usage fee is Rs 539 per hour, somewhat higher than that of other provinces.

The income from bulldozer rentals received by the Agricultural Engineering Wing and the expenditures for the Wing are noted below.[5]

Table 4-18: Income from Bulldozer Rentals in Sindh Province

Fiscal Year	Total operating time (# of hours)	Income (Rs 000)
1999-2000	133,058 hours	26,042
2000-2001	67,672 hours	12,719
2001-2002	45,515 hours	10,152
2002-2003	36,343 hours	6,416
2003-2004 (to May end)	43,419 hours	8,419

Source: Agricultural Engineering Wing, Sindh Province

Table 4-19: Budget for Agricultural Engineering Wing, Sindh Province

(Rs 000)

	Wages/Benefits	Spare Parts	Fuel/Oil	Expenses for Energy, Communications, etc.	Total
1999-2000	105,138	6,946	19,248	5,490	136,821
2000-2001	120,191	10,999	9,975	5,749	146,914
2001-2002	130,883	1,050	10,350	3,539	145,822
2002-2003	137,801	16,602	9,819	3,660	167,881

Source: Agricultural Engineering Wing, Sindh Province

Although they raised enough income from direct expenses for such things as spare parts and fuel and oil in fiscal year 1999-2000; income has decreased due to the aging of the bulldozers and consequent decrease in operating time due to breakdown. In fiscal year 2002-2003, income was only around 4 percent of expenditures (24 percent of direct expenses).

Synthesizing the information above, we have produced a rough comparison of bulldozer rental prices and actual expenses for fiscal year 2002-2003 below (these are cash expenses; depreciation is not included).

[4]The fee from December 2003 onward. It was Rs 200 prior to this.

[5]The farmer renting the bulldozer pays the fuel fee directly to the operator, so this is not included in the income and expenditures.

Table 4-20: Sindh Province: Comparison of Current Bulldozer Rental Fees and Actual Expenses

	Fee	Notes
Current Rental Fee	Rs 564/hour	Rs 200/hour (rental fee) + Rs 364/hour (fuel expenses)
Actual Expenses	Rs 4,619/hour	Rs 167,881,000 (yearly budget)/36,343 hours (operating time)

Source: JICA Preparatory Study Team

If the number of personnel were reduced in proportion to the number of machines, indirect expenses would decrease to 20 percent of current levels; this would result in hourly expenses of Rs 1,500/hour. If depreciation of around Rs 300/hour were added to this, the resulting Rs 1,800/hour would be at the appropriate level for a rental fee. However, this is extremely high compared to that of other provinces.

Section 4.4: Balochistan Province

Subsection 4.4.1: Organizational Structure

The Agriculture, Cooperatives, Fisheries & Foods Department contains two Directorates General: the Directorate General for Agricultural Research and the Directorate General for Agricultural Extension; it also includes other organizations such as the Directorate for Agricultural Engineering, the Directorate for Food and other divisions.

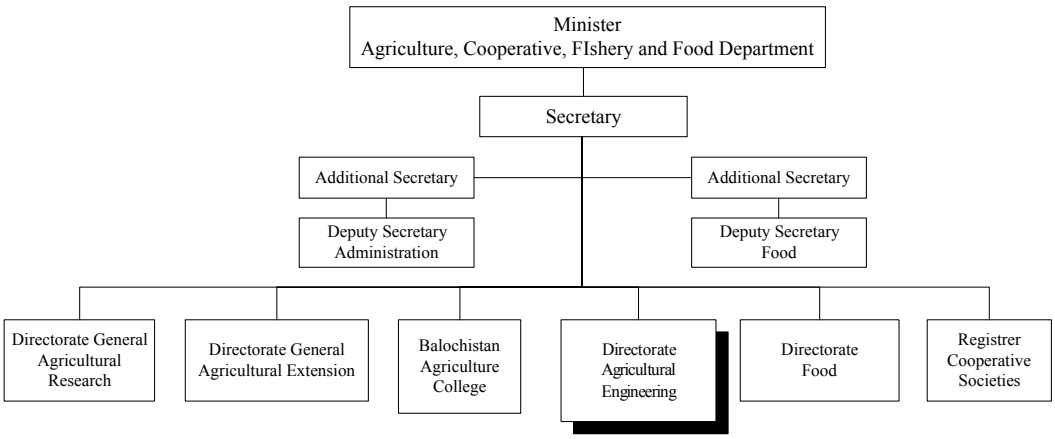


Diagram 4-6: Agriculture, Cooperatives, Fisheries & Foods Department of Balochistan Province

Source: *Report on the Basic Study of Agriculture for the Islamic Republic of Pakistan*; JICA

The headquarters of the Directorate of Agricultural Engineering is located in the city of Quetta, the capital of Balochistan Province. The northern and southern sections of Balochistan Province are each divided into three divisions; these handle rentals, operation and maintenance of bulldozers. One Agricultural Engineer is stationed in each of these divisions and 34 offices cover the activities of the 26 districts.

The Assistant Agricultural Engineers stationed in offices at the district level handle bulldozer rentals. The repair facilities and offices of the Directorate for Agricultural Engineering for Balochistan Province are shown below.

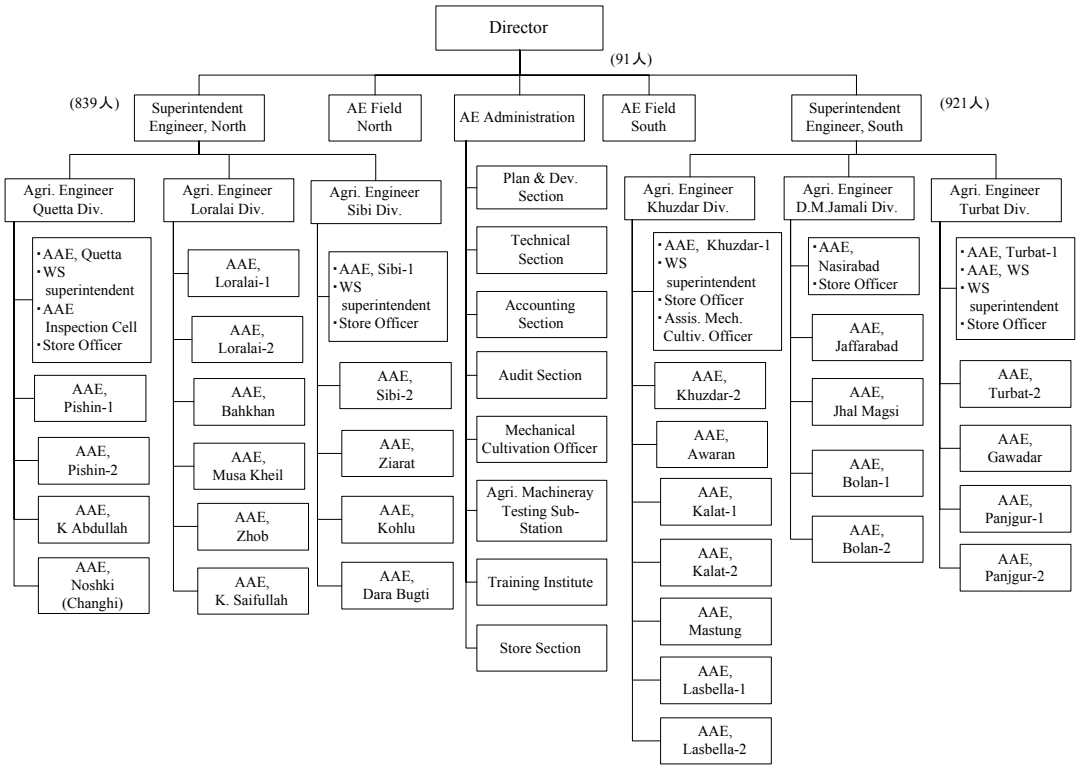
Table 4-21: Locations of Repair Facilities and Offices of the Directorate of Agricultural Engineering in Balochistan Province

Region	Division	District
North	Quetta	Quetta (MW), Pishin, Killa Abdullah, Changhi
	Loralai	Loralai (SW), Barkhan, Musa Kheil, Zhob (SW), Killa Saifullah
	Sibi	Sibi (SW), Ziarat, Kohlu (SW), Dera Bugti
South	Khuzdar	Khuzdar (MW), Awaran, Kharan (SW), Kalat, Mastung, Lasbela (SW)
	J.M. Damali	Nasirabad (SW), Jaffarabad, Jhal Magsi, Bolan
	Turbat	Turbat (MW), Gawadar (SW), Panjgur (SW)

MW: Main workshop; SW: Sub-workshop (minor workshops)

Source: Directorate for Agricultural Engineering, Balochistan Province

Daily checks and light repairs are performed by employees of the Directorate for Agricultural Engineering who are stationed in district offices, or by the minor workshops set up in nine locations throughout the province. Relatively large-scale repairs and maintenance that cannot be handled by these facilities are performed at the main workshops in Quetta, Khuzdar, and Turbat. Due to geographical proximity, the main workshop in Quetta currently performs large-scale repairs and maintenance for the machines of the J.M. Damali Division, in addition to those of the Loralai Division and the Sibi Division. An organizational diagram of the Directorate for Agricultural Engineering is shown below.



SW: Sub-workshop; AE: Agricultural Engineer; AAE: Assistant Agricultural Engineer

Table 4-7: Organizational Diagram for the Directorate for Agricultural Engineering in Balochistan Province

Source: Directorate for Agricultural Engineering, Balochistan Province

Subsection 4.4.2: Personnel

There were 1,951 employees in the Directorate for Agricultural Engineering in Balochistan Province during fiscal year 2004-2005. Personnel allocation for this Directorate is shown below.

Table 4-22: Personnel Allocation for the Directorate for Agricultural Engineering in Balochistan Province (Fiscal Year 2004-2005) (# of people)

	HQ	Quetta	Loralai	Sibi	Khuzdar	J.M. Damali	Turbat	Total
Director	1	-	-	-	-	-	-	1
Superintending Director	2	-	-	-	-	-	-	2
Agriculture Engineer	3	1	1	1	1	1	1	9
Assistant Agri. Engineer	7	12	6	7	12	5	6	55
Mechanical Cultivation Officer	1	-	-	-	1	-	-	2
Assistant Director	1	-	-	-	-	-	-	1
Workshop Superintendent	-	-	-	1	1		1	3
Store Officer	-	1	-	1	1	1	1	5
Accounts officer	2	-	-	-	-	-	-	2
Audit Officer	2	-	-	-	-	-	-	2
Store Verifier	1	-	-	-	-	-	-	1
Office Superintendent	2	1	1	1	1	1	1	8
Administrative Officer	1	-	-	-	-	-	-	1
Stenographer	2	-	-	-	-	-	-	2
Assistant	10	4	2	2	3	3	1	25
Foreman	1	4	1	2	4		3	15
Sub Engineer	1	1	2	2	3	3	-	12
Unit Supervisor	-	2	4	-	6	3	2	17
Assistant Foreman	-	-	-	1	1	-	-	2
Store Keeper	12	7	4	5	5	2	4	39
Senior / Junior Clerk	17	22	11	18	19	9	16	112
Bulldozer Operator	1	72	48	52	106	38	47	364
Greaser	1	119	45	72	126	39	56	458
Mechanic	1	24	11	11	20	9	10	86
Mechanist	-	2	2	1	2	-	2	9
Driver	7	32	9	10	31	19	14	122
Denter	-	3	-	-	1	-	-	4
Turner	-	6	3	2	5	1	3	20
Welder	1	3	-	3	3	1	2	13
Black Smith	-	1	-	1	2	-	1	5
Electrician	-	8	6	6	10	6	6	42
Bench Fitter	-	2	1	1	2	1	1	8
Fitter	-	22	12	12	18	10	10	84
Other	14	124	41	40	120	33	44	416
Total	91	473	210	252	504	185	232	1,947

Source: Directorate for Agricultural Engineering, Balochistan Province

Subsection 4.4.3: Status of Bulldozer Management and Usage

1) Details of Aid Provided by Japan

As can be seen from Table 4-23 below, Japan supplied 293 bulldozers and spare parts to Balochistan Province from the 1980s to the 1990s, via 2KR.

Table 4-23: Aid to the Directorate for Agricultural Engineering in Balochistan Province

Fiscal Year	Nature of Aid	Total Amount
1982-1983	Supplied 117 bulldozers via 2KR	¥1.98 billion
1987-1988	Supplied 86 bulldozers via 2KR	¥1.2 billion
1991-1992	Supplied 10 bulldozers via 2KR	¥170 million
1991-1992	Supplied spare parts via 2KR	¥200 million
1993-1994	Supplied 80 bulldozers via general grant	¥1.964 billion
1993-1994	Supplied spare parts via 2KR	¥160 million
1994-1995	Supplied spare parts via 2KR	¥150 million

Source: Directorate for Agricultural Engineering, Balochistan Province

2) Number of Bulldozers and Operational Status

Once monthly, reports on bulldozer rentals and income and expenditures for the repair facilities are submitted to the headquarters. These are recorded by equipment type using a computer. According to these records, 315 bulldozers are currently distributed among 34 offices. Although the number of bulldozers in operation decreases with each month due to the aging of the machines and consequent cycle of breakdowns and repairs, an average of 183 bulldozers are kept in operation on some level. The number of bulldozers per district in Balochistan Province is shown below.

Table 4-24: Number of Bulldozers Per District in Balochistan Province

(# of units)

Division	District	# of Bulldozers	Monthly Avg. Units in Operation* (July 2003-December 2003)
Quetta	Quetta	7	6.0
	Pishin	18	13.0
	Chaghi	13	7.3
	Killa Abdullah	10	5.2
Loralai	Loralai	12	6.2
	Zhob	11	7.3
	Killa Saifullah	11	6.2
	Barkhan	7	3.2
	Musakhel.	6	3.7
Sibi	Sibi / Harnai	12	9.2
	Ziarat	10	6.7
	Kohlu	11	3.8
	Dera Bugti	9	1.7
Khuzdar	Khuzdar - I	23	17.7
	Kalat - I	14	10.5
	Kharan	13	7.7
	Awaran	8	3.7
	Mastung	9	5.0
	Lasbella - II	15	9.7
J.M. Damali	Nasirabad - I	8	4.7
	Laffarabad	9	3.0
	Jhal Magsi	10	9.5
	Bolan - I	13	8.3
Turbat	Turbat - I	27	14.2
	Panjgur - II	16	6.8
	Gawadar	13	4.2
Total		315	184.2

*Average of units operated monthly, even if only for a short time. Determined by the Preparatory Study Team.

Source: Directorate for Agricultural Engineering, Balochistan Province

The bulldozers are used quite frequently and have an average operating time of 1,600 hours per year for each unit. The yearly average operating hours for operable bulldozers by division is shown below.

Table 4-25: Yearly Average Operating Time for Bulldozers in Balochistan Province (July 2003-December 2003)

Division	# of Bulldozers	Monthly Avg. # of Bulldozers in Operation	Yearly Avg. Operating Time for Operable Machines*
Quetta	48	32	1,614 hours
Loralai	47	27	1,400 hours
Sibi	42	21	1,855 hours
Khuzdar	82	54	1,259 hours
J. M. Damali	40	26	2,280 hours
Turbat	56	25	1,342 hours
Total/Average	315	184	1,572 hours

* Operating time for 6 months converted to yearly basis.

Source: Created by the Preparatory Study Team Based on Data from the Directorate for Agricultural Engineering, Balochistan Province

3) Bulldozer Users

Balochistan Province only monitors the number of hours of bulldozer use; it does not maintain data on the area of land prepared by bulldozer. Based on experience, we are using a value of approximately 6.6 hours per acre of land. There are no records kept on the number of users; in the course of our preparatory study, we confirmed a rough estimate of 100 hours per person from a loose sampling of all divisions.

The cumulative number of operating hours, the area of land prepared per person, and the number of users per area of land prepared for the past four years is shown below.

Table 4-26: Land Area Prepared by Bulldozers in Balochistan Province

Fiscal Year	Cumulative Hours of Operating Time	# of Users (Estimated)	Total Land Area Prepared (Estimated)
2000-2001	218,093 hours	2,200 people	33,044acres
2001-2002	243,899 hours	2,400 people	36,954acres
2002-2003	198,644 hours	2,000 people	33,107acres
2003-2004 (to December end)	144,621 hours	1,400 people	21,912acres
Yearly Average	237,469 hours	2,350 people	25,776acres

Source: Directorate for Agricultural Engineering, Balochistan Province

4) Bulldozer Waiting Time

Although data on the number of people waiting to use bulldozers is kept in Balochistan Province, this is not centrally organized. We can, however, roughly estimate waiting time from the prepayments made every six months. The waiting time for bulldozers in Balochistan Province is shown below. According to these data, the waiting time is extremely long at 9 to 11 months.

Table 4-27: Bulldozer Waiting Time in Balochistan Province

	Total Prepayments (Rs 000)	Monthly Average Operating Time	Average Waiting Time
As of June 2003	262,648	24,103 hours	10.9 months
As of December 2003	209,595		8.7 months

Source: Preparatory Study Team Based on data from the Directorate for Agricultural Engineering, Balochistan Province

Subsection 4.4.4: Financial Status

According to the Directorate of Agricultural Engineering in Balochistan Province, the current bulldozer rental fee has been set at a basic fee of Rs 700[6] per hour. However, politicians (the provincial governor, the chief minister, the provincial congress, etc.) may provide a subsidy of Rs 400 per hour to impoverished farmers, because they are the infrastructure supporting the local region. The Directorate of Agricultural Engineering can also provide a subsidy of Rs 220 per hour; so many farmers only pay the Rs 80 difference. Even farmers who cannot be accommodated under the political subsidy system can pay Rs 300 per hour, rather than Rs 700 per hour, so the system is somewhat complex. This makes the burden borne by farmers in Balochistan Province much less than that for farmers in other provinces. Bulldozer fees for Balochistan Province are shown below.

Table 4-28: Bulldozer Rental Fees in Balochistan Province[7]

	Impoverished Farmers	Farmers Not Living in Poverty
Burden Borne by Farmer	Rs 80/hour	Rs 300/hour
Allowance from Governor, Chief Minister or Congress	Rs 400/hour	-
Subsidy From Governmental Budget	Rs 220/hour	Rs 400/hour
Total:	Rs 700/hour	

Source: Directorate for Agricultural Engineering, Balochistan Province

The rental income received by the Directorate for Agricultural Engineering and the expenditures for the Directorate are shown below.

Table 4-29: Bulldozer Rental Income for Balochistan Province (Including Subsidies)

Fiscal Year	Cumulative # of Operating Hours	Income (Rs 000)
1999-2000	204,031	14,484
2000-2001	218,093	32,103
2001-2002	243,899	29,763
2002-2003	198,644	22,593

Source: Directorate for Agricultural Engineering, Balochistan Province

[6]According to the Directorate for Agricultural Engineering in Balochistan Province, this amount is the expense for bulldozer fuel and oil; however, actual expenditures run about Rs 500/hour.
[7]The Directorate for Agricultural Engineering assumes the expenses for transport.

Table 4-30: Budget for the Directorate for Agricultural Engineering, Balochistan Province

(Rs 000)

Fiscal Year	Wages/Benefits	Spare Parts	Fuel/Oil	Expenses for Energy, Communications, etc.	Total
1999-2000	114,275	22,782	76,257	4,561	217,875
2000-2001	115,372	23,872	99,196	5,738	253,178
2001-2002	119,827	39,888	135,300	7,958	302,973
2002-2003	130,498	32,646	108,823	7,405	279,372

Source: Directorate for Agricultural Engineering, Balochistan Province

Rental income from bulldozers for Balochistan Province has been insufficient over the past four years; unable to profit even from oil and gas fees, income has languished at 6 to 13 percent of expenses. It is by no means an exaggeration to say that almost all bulldozer rentals in Balochistan Province consist of subsidies; two-thirds to three-fourths of the income derives from subsidies distributed by the governor, chief minister, or congress or, in other words, the provincial budget.

Synthesizing the information above, we have produced a rough comparison of bulldozer rental prices and actual expenses for fiscal year 2002-2003 (expenses are cash expenses; depreciation is not included) below.

Table 4-31: Balochistan Province: Comparison of Current Bulldozer Rental Fees and Actual Expenses

	Rental Price	Notes
Current Rental Price	Rs 80/hour to Rs 300/hour	
Actual Expenses	Rs 1,406/hour	Rs 279,372,000 (yearly budget)/ 198,644 hours (operating time)

Source: JICA Preparatory Study Team

If depreciation were added to this, we estimate that the sustainable fee would be Rs 1,700/hour under the current organizational structure.

Section 4.5: Organization for Agricultural Engineering in the Northwest Frontier Province (NWFP)

Subsection 4.5.1: Organizational Structure

The Agriculture, Livestock and Cooperative Department for the NWFP is divided into three areas of agriculture, livestock, and cooperatives, and the corresponding support services. However, there is no supervising office for these; additional departments such as Agricultural Engineering are subsumed directly under the Secretary. An organizational diagram of the Agriculture, Livestock and Cooperative Department for the NWFP is shown below.

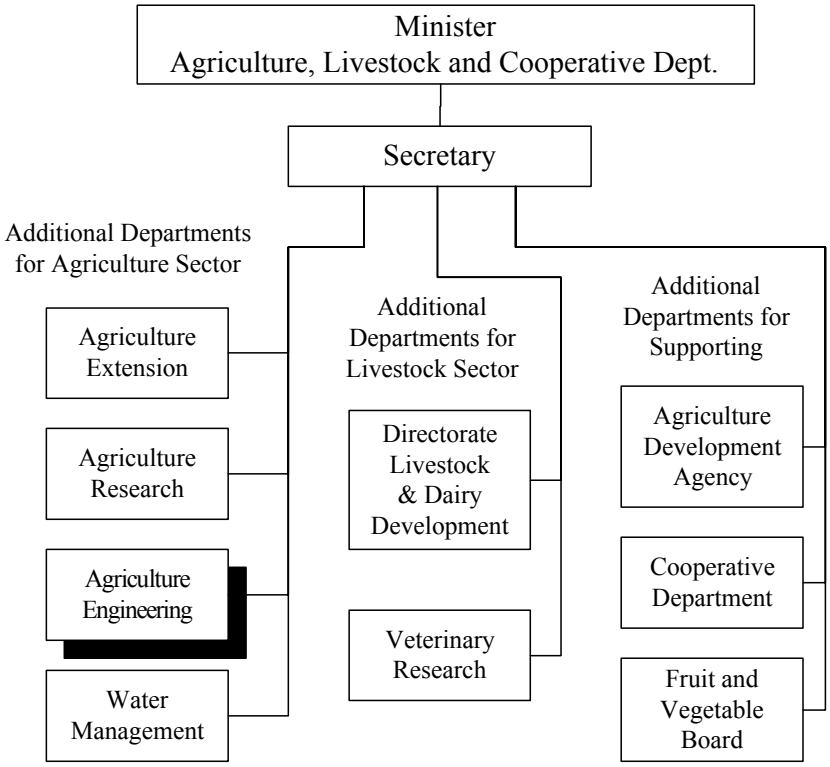


Diagram 4-8: Organizational Diagram of the Agriculture, Livestock and Cooperative Department for the NWFP

Source: Agriculture, Livestock and Cooperative Department, NWFP

The headquarters of the Agricultural Engineering Department of the Agriculture, Livestock and Cooperative Department is situated in Tarnab, about 3 kilometers from the central section of Peshawar toward Islamabad. There is one Director and one Deputy Director in the headquarters, both of whom are Agricultural Engineers. One Assistant Agricultural Engineer and 14 staff members work under them. This department operates the Tarnab and D.I. Khan repair facilities (workshops). Repair facility staff report to the Assistant Agriculture Engineers who oversee each repair facility; there are 88 staff members in Tarnab and 61 in D.I. Khan. The organizational diagram for the Agricultural Engineering Department is shown below.

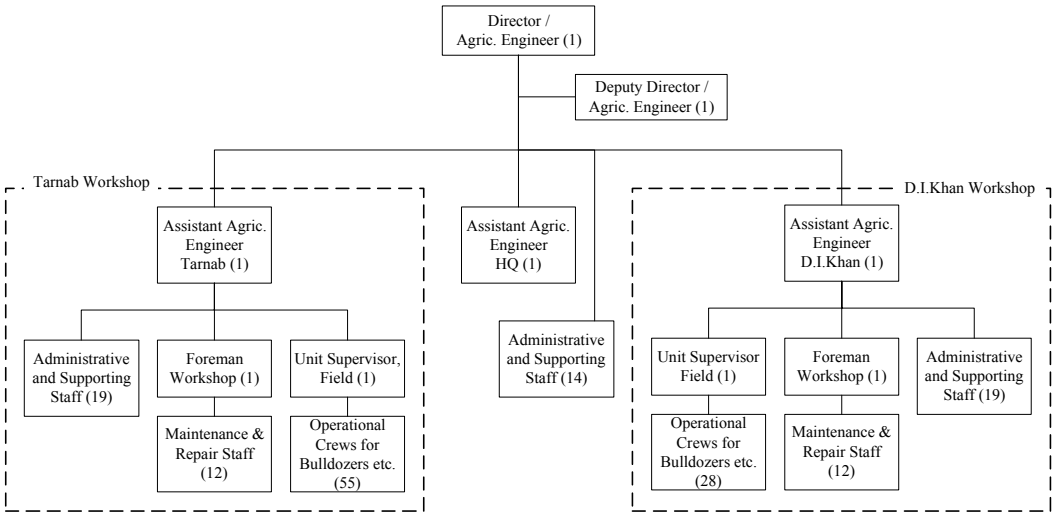


Diagram 4-9: Organizational Diagram of the Agricultural Engineering Department for the NWFP

Source: NWFP Agricultural Engineering Department

A decision was made to phase out the NWFP Agricultural Engineering Department from fiscal year 2001-2002 (ending June 2002) due to financial difficulties, but the department was reinstated in fiscal year 2003-2004 for political reasons. However, as noted below, 75 bulldozers were allocated among 19 districts in fiscal year 2001-2002 due to the nationwide regional devolution policy. Only the remaining 25 bulldozers were left in the possession of the Agricultural Engineering Department. Two of the four repair facilities were closed in conjunction with this; the department currently operates two repair facilities, in Tarnab and D.I. Khan.

Subsection 4.5.2: Personnel

In conjunction with the regional devolution and staged closings (afterward re-canted), personnel reductions were instituted for the NWFP Agricultural Engineering Department: the 1,159 employees as of June 2001 were reduced to 316 employees as of June 2002, and further yet to 168 employees as of July 2002.[8] The employees currently working in the department are shown below.

[8] Because governmental employees cannot be forcefully retired until age 60, the employees transferred out of the Agricultural Engineering Department became the surplus pool for the province; they were subsequently transferred to other divisions. Approximately one quarter of the employees remain in the surplus pool.

Table 4-32: Personnel Allocation for the NWFP Agricultural Engineering Department

	Headquarters	Tarnab Repair Facility	D.I .Khan Repair Facility	Total
Director, Agricultural Engineer	1	-	-	1
Deputy Director, Agricultural Engineer	1	-	-	1
Assistant Agricultural Engineer	1	1	1	3
Office Assistant	1	-	-	1
Foreman	-	1	1	2
Unit Supervisor	-	1	1	2
Power Driller	-	9	-	9
Assistant Power Driller	-	8	1	9
Mechanic	-	2	2	4
Senior Clerk	2	2	2	6
Bulldozer Operator	-	5	5	10
Senior Store Keeper	-	2	2	4
Mechanic Borer	-	10	4	14
Junior Storekeeper	-	2	2	4
Welder	-	1	1	2
Turner	-	1	1	2
Electrician	-	1	1	2
Junior Clerk	5	2	2	9
Truck Driver	-	2	2	4
Vehicle Driver	2	1	1	4
Assistant Mechanic Borer	-	7	7	14
Air Compressor Operator	1	-	1	2
Helper / Store Cleaner	-	7	7	14
Chowkidar	-	8	7	15
Sweeper	1	1	1	3
Truck Cleaner	-	2	2	4
Bulldozer Greaser	-	5	5	10
Driller Helper	-	7	2	9
Errand Boy	2	1	1	4
Total	17	89	62	168

Source: NWFP Agricultural Engineering Department

As we stated in Chapter 3, Table 3-8, the two repair facilities in the NWFP have almost no repair equipment and tools to use. Since there are only ten bulldozers currently in operation, many of the 168 employees have no work to do and many of these are simply collecting paychecks while waiting at home.

Subsection 4.5.3: Status of Bulldozer Management and Usage

In 1990, the NWFP received 114 bulldozers from USAID and began renting these to farmers. Japan has supplied spare parts twice via aid to increase food production (2KR).

Table 4-33: Overseas Assistance Provided to the NWFP Agricultural Engineering Department

Fiscal Year	Nature of Aid	Total Amount
1990-1992	114 bulldozers provided via USAID	US$3,963,698 = Rs 83 million (Rs 21/USD)
1992-1993	Spare parts provided by Japan via 2KR	¥100 million
1994-1995	Spare parts provided by Japan via 2KR	¥250 million

Source: Agricultural, Livestock & Cooperative Department, NWFP

After this, in the fiscal year from July 2001 to June 2002, bulldozers were transferred from the province to the districts in conjunction with regional devolution, and 75 of the 100 bulldozers that were operable out of the 114 bulldozers were allocated among 24 districts; only the 25 remaining bulldozers were left in the possession of the Agricultural Engineering Department.

Lacking a structure equivalent to that of the Agricultural Engineering Department at the district level, the bulldozers that were distributed were then used, not only for agricultural purposes, but for many other non-agricultural purposes such as road construction. These bulldozers were already old; the districts lacked the workshops and engineers to maintain them and, furthermore, did not have budgets for procuring spare parts. The distributed bulldozers consequently became inoperable, one by one, and there are currently only 36 operable bulldozers at the district level.[9] The 25 bulldozers still held at the provincial level also deteriorated and became uneconomical to operate due to excessive repair expenses; consequently, only ten of these are currently operable. The inoperable bulldozers from both the provincial and district levels have been sold as scrap.

The number of bulldozers held by the province and the cumulative operating time for these bulldozers is shown below; the number of bulldozers includes both operable and inoperable bulldozers that have not been sold as scrap. Since scrapping of inoperable bulldozers was carried out beginning in fiscal year 2002-2003, the yearly operating time per bulldozer for the remaining bulldozers now exceeds 1,000 hours/year. They have managed to maintain standard operational status despite the difficult maintenance required for the aging bulldozers.

[9]According to the provincial Agricultural Engineering Department, several of the bulldozers distributed to the districts were privately leased; however, as is the case with the bulldozers used by the province and districts, the private enterprises also lack the technology and facilities necessary for maintaining the machines, and they are no longer in operation.

Table 4-34: Bulldozer Operating Time for the NWFP Agricultural Engineering Department

Fiscal Year	# of Bulldozers*	Yearly Operating Time Per Bulldozer
Prior to Regional Devolution		
2000-2001	100	664 hours
After Regional Devolution		
2001-2002	25	597 hours
2002-2003	10	1,091 hours
2003-2004 (to May end)	10	1,099 hours

*Includes both operable and inoperable bulldozers (those not sold as scrap)

Source: Agricultural Engineering Department

Since the NWFP Agricultural Engineering Department currently has only ten bulldozers and these break down frequently, rentals are currently restricted to the 50-kilometer area surrounding the repair facility. Since there is little work for personnel other than those directly involved with bulldozer operation and maintenance, the morale of the employees is low and they are not working to accurately assess data on customers or machine usage conditions even though the number of operating bulldozers is limited.

Subsection 4.5.4: Financial Status

According to the NWFP Agricultural Engineering Department, the current fee for renting a bulldozer includes a basic fee of Rs 329 per hour, plus transport expenses of Rs 10 per kilometer. Since the 1990 bulldozer rental price (in rupees) has been maintained with no consideration given to current prices for spare parts and oil, to the subsequent currency devaluation, or to inflation, this price is far lower than market prices. The transport fee is also low in view of the fact that transport costs run Rs 15 per kilometer.

Bulldozer rental income for the Agricultural Engineering Department is as follows.[10] As can be seen from this table, rental income at the district level is far below that at the provincial level.

[10]Income records are unreliable, as they are hand-written and contain numerous transcription errors.

Table 4-35: Bulldozer Rental Income for the NWFP

	Province			District	
Fiscal Year	# of Bulldozers*	Total Operating Time	Income (Rs 000)	# of Bulldozers	Income (Rs 000)
2000-2001	100	66,365 hours	27,839	—	—
2001-2002	25	14,927 hours	6,788	75	7,597
2002-2003	10	10,909 hours	5,358	75	5,259
2003-2004 (to May end)	10	10,990 hours	3,832	N/A	N/A

Source: NWFP Agricultural Engineering Department

The NWFP budget consists of: 1) a non-development budget that includes general administrative expenses and recurrent costs and 2) development budgets for each project implemented. As in other provinces, recurrent costs are dispensed as part of the development budget during the initial one to two years after a project has commenced; after this point, recurrent costs are only dispensed from the non-development or general budget.

Bulldozer rental income is combined with other provincial income such as taxes and sent to the federal government, where they become income for the federal government. Since expenses for bulldozer preservation and maintenance are accounted for under the provincial budget and dispensed from this budget to the Agricultural Engineering Department (the majority of this is federal aid), the income and expenditures for bulldozer operation are not specifically linked. The budget for the NWFP Agricultural Engineering Department (= expenditures) is shown below.

Table 4-36: Budget for the NWFP Agricultural Engineering Department

(Rs 000)

	2002-2003 Financial Statement
Total budget for the Agricultural Engineering Department	21,618
・ Office Administrative Expenses (Personnel, Energy and Communications Expenses)	11,022
・ Fuel, Oil, Etc.	8,915
・ Spare Parts	2,107

Source: NWFP Agricultural Engineering Department

Since 60 percent of spare parts expenses are for bulldozers and the remaining 40 percent for other vehicles, the equivalent of Rs 1.2 million was spent on spare parts for the 10 bulldozers in fiscal year 2002-2003.

Synthesizing the above information, we have produced a rough comparison of bulldozer rental prices and actual expenses for fiscal year 2002-2003 below (these are cash expenses; depreciation is not included).

Table 4-37: Comparison of Bulldozer Rental Prices and Actual Expenses for the NWFP

	Fee	Notes
Current Rental Price	Rs 329 hours	Rental fees including fuel expenses
Actual Expenses	Rs 1,980/hours	Rs 21,618,000 (yearly budget)/ 10,909 hours (operating time)

Source: JICA Preparatory Study Group

Section 4.6: Conclusion

The following chart shows a comparison of operating conditions for bulldozers used to prepare agricultural land for the four provinces.

Table 4-38: Comparison of Operating Conditions for Bulldozers Used to Prepare Agricultural Land for the Four Provinces

	Punjab Province	Sindh Province	Balochistan Province	NWFP
Number of Bulldozers Owned	491	135	315	10
Number of Bulldozers in Operation	314	64	184	10
Total Yearly Operating Time	653,324 hours	47,366 hours	289,242 hours	10,990 hours
Number of Users Per Year	10,886 people	633 people	2,800 people	N/A
Area of Land Prepared Per Year	26,184 acres	10,216 acres	43,824 acres	N/A
Yearly Operating Time Per Operable Unit	2,081 hours	737 hours	1,572 hours	1,099 hours
Operating Time Per Acre of Land Area Prepared	25.0 hours	4.6 hours	6.6 hours	N/A
Hours of Use Per Person	60 hours	75 hours	100 hours	N/A
Area of Land Prepared Per Person	2.4 acres	16.1 acres	15.7 acres	N/A
Average Waiting Time	1.0 months	1.3 months	8.7 months	1 year to several years
# of Employees Involved in Agricultural Land Preparation	3,004	2,080	1,951	168
# of Employees Per Operable Bulldozer	9.6 people	32.5 people	10.6 people	16.8 people

	Punjab Province	Sindh Province	Balochistan Province	NWFP
Rental Income in Millions (Fiscal Year 2002-2003) (including aid funds)	Rs 209.356	Rs 6.416	Rs 22.593	Rs 5.358
Expenditures in Millions (Fiscal Year 2002-2003)	Rs 447.000	Rs 167.881	Rs 279.372	Rs 21.618
Income/Expenditures	47%	4%	8%	25%
Current Rental Fee for Farmers (Rupees/hour); Including Fuel Expenses	259-358	564	80-300	329
Current Expenses (Rupees/hour), Excluding Depreciation Expenses	739	4,619	1,406	1,980
Average Payment Per User	Rs 2,700	Rs 10,000	Rs 1,000	n.a.

Note: All data (except income) from the 2003-2004 fiscal year,

Although all four provinces depend on aid for the provincial budget to operate bulldozers, each has unique characteristics. Punjab has the most efficient operations of all four provinces, but the burdens of the farmers are still large due to poor land conditions. Although Sindh Province has set the highest fees of any province, its Agricultural Engineering Wing operations are extremely inefficient and costs are high, giving this division extremely poor profitability. Although Balochistan Province, which provides large subsidies to farmers, is on par with Punjab Province in terms of operational efficiency as judged by employee numbers, its costs are higher than those for Punjab Province due to high maintenance costs for bulldozers. The operational structure for the NWFP verges on death, with too few bulldozers and almost no equipment or tools for its repair facilities.

Japan's grant aid is predicated on bulldozers for agricultural land development being effectively and efficiently used in a sustainable manner, following more thorough equipping of the repair facilities. It is necessary to address the following two points in order to achieve this.

1) Contain Personnel Expenses

Although the provincial governments of Pakistan assert that bulldozer operation is inexpensive in the public sector due to low personnel costs, personnel expenses are putting pressures on profitability due to the sheer number of employees, although the cost per employee may be low. This trend is particularly evident in Sindh Province. This is one of the reasons why provinces cannot procure sufficient spare parts. Therefore, it is necessary to restrain personnel expenses by setting a standard for the appropriate number of employees per bulldozer and transfer all employees in excess of this to other areas.

2) Set Fees in Line with Goals and Avoid Competition with the Private Sector

According to the Pakistani Government, the reasons for offering subsidies for operating bulldozers for use in land development are as follows: 1) Preferential treatment enables the expansion of agricultural lands in regions with poor conditions; 2) this expands income-earning opportunities for the poor; and 3) this makes up for private companies being unable to invest in bulldozers. The results of our onsite surveys and interviews of concerned parties regarding this indicate: 1) The impoverished farmers, who are the original target, do not have the funds to rent bulldozers; as a result, those who are not impoverished are benefiting, including large land owners; 2) participation of the private sector is hindered because the price of bulldozers for agricultural development is kept at low levels through government subsidies; 3) private enterprises are being adversely impacted by the use of public bulldozers to prepare land that could be prepared with a regular tractor; and 4) private companies are investing in heavy construction equipment, so they clearly do not lack the funds to invest.

Even though it is difficult to target the poor due to the characteristics of bulldozer rental, the provision of subsidies in the form of low rental fees to large-scale land owners and the wealthy should be avoided. (Although each provincial government is disbursing these funds, this is made possible by grant aid from Japan.) Moreover, since operations are conducted with limited governmental funds and subsidies, the public sector should only provide services in regions where the provision of services by private companies is difficult. The public sector should withdraw operations in regions where the private sector can provide services at a reasonable price.

Given the above considerations, we feel that Japan should scrutinize local conditions more carefully when providing aid. Consideration should be given to imposing the following structural improvements on the provincial governments of Pakistan as requisite conditions for receiving aid.

Condition #1: <u>Clearly show the results and the impact agricultural development operations have had using the requested equipment</u>

In the course of the preparatory study, we confirmed water resource development plans for specific regions (areas where it is thought necessary to reclaim agricultural land), to be carried out in conjunction with water canal expansion, but the relationship of these plans to agricultural development plans was not clarified. Consequently, detailed data on the equipment to be used for agricultural land development, such as the land area and locations where it would be used, was not made clear in relation to the above-noted water resources development plan. It was therefore difficult to verify the basis for the requested numbers and whether this would be effective. Unlike assistance programs such as 2KR, general projects conducted with grant aid require that projects, goals, and results be set based on

concrete data regarding the land development operations, and that clear proof is given that the nature of the equipment, numbers, and use are necessary to achieving these goals. We, therefore, desire that agricultural land development operations for Pakistan be divided by the Pakistani government into projects according to the special characteristics, purpose (needs), and nature of the project; we also think it necessary for them to organize data and reference points that will enable the impact and results of these projects to be assessed. Since bulldozers, in particular, can be used for water resources development or for flood control measures, it is essential that efforts be made to clearly link these to agricultural land development by coordinating all departments involved during the organization of the data and during implementation.

Condition #2: Introduce a system of graduated rental fees in which fees are raised according to the usage time (i.e., decrease subsidies).

For example, impose fees close to market prices on wealthy individuals by charging the full fee, excluding depreciation, for usage exceeding 50 hours; and the full fee, including depreciation, for usage exceeding 100 hours. This would not only benefit the greatest number of poor; it would also enable private businesses to provide services to the wealthy. Raising rates will also allow the operations to approach independent profitability, enabling the procurement of more spare parts than is currently the case.

Condition #3: Require proof of land ownership

Although proof of land ownership must currently be submitted together with the rental application, its existence has not been required for rental[12], so this was treated as something that could be circumvented. When condition #1 is put in place, it can be expected that landowners will submit rental requests under many different names to avoid paying high usage fees for bulldozers. It is essential to prevent this type of dishonest behavior by requiring that proof of land ownership be submitted.

Condition #4: Apply subsidized rates only to land being newly developed

Much of the preparation of existing cultivable lands requires only light work and therefore could be accomplished with a tractor. It would be practical to restrict bulldozer use to the reclamation of uncultivated land as much as possible; this would facilitate the achievement of the governmental goal to "expand agricultural land"

[12]Since no one would go out of his or her way to develop another person's land, it is obvious that the person wishing to rent a bulldozer is the owner of the land.

with a limited federal budget and a limited amount of subsidized funds. Furthermore, uncultivated land is uncultivated due to inferior land conditions, and funds to aid in lightening the initial investment burden are appropriate. In contrast to this, previously cultivated land has already produced agricultural income, so funds to aid in the preparation of this land are unnecessary. In other words, it is uneconomical to use land that cannot be prepared at market rates because the productivity of the land is low. Due to these factors, applying a subsidized rate only to land that is being newly developed and market rates to previously cultivated land will ensure that aid is used for appropriate purposes and will simultaneously enable private businesses to participate in the preparation of previously cultivated land.

Condition #5: Examine funding structures that would enable repair facilities to operate independently

As stated above, it is desirable for repair facilities operated by the Agricultural Engineering Departments to be independently profitable. However, it would be beneficial for the government to provide financial and material aid as well as human resources en route to achieving independent organizational management. Systems such as the reserve fund system for 2KR should be considered for introduction as a prerequisite condition for implementing these measures. Such a system would secure operating funds. For example, if a standard amount such as the FOB amount were reserved and part, or all, of this used to help repair facility operations become independent, we could expect more effective use of equipment and more sustainable management. We believe it would be beneficial to establish a public agreement in writing between the countries of Japan and Pakistan to introduce this type of funding system in order to achieve independence and sustainability for the current project.

CHAPTER V: TASKS FOR IMPLEMENTING THE PROPOSAL

Section 5.1: Regarding the Appropriateness of Providing Grant Aid

Subsection 5.1.1: Agricultural Land Development

The development of agricultural land is one facet of the national development plan. As can be seen below, there is much privately owned cultivable land that requires the use of bulldozers for development:

a)	Punjab Province:	455,939 ha
b)	Sindh Province:	303,313 ha
c)	Balochistan Province:	1,109,926 ha
d)	North-West Frontier Province:	206,604 ha

Although being separately developed, the "Water Resource Development Project" and the "Project to Distribute Nationally-held Land to Landless Farmers" are candidates for offering clear proof of agricultural land development plans, as well as the locations and areas to be developed. This could verify the appropriateness of the requests (scale, number of units, and so on). However, there was no sufficiently specific link between these and the current requests. Consequently, achievable results could not be demonstrated, making it difficult to show that providing aid is appropriate at this stage.

However, as we stated in Chapter 2, large-scale facilities for securing water sources will be completed in eight locations from 2006 to 2008. The construction of these facilities is expected not only to stimulate interest among farmers in the surrounding areas in developing agricultural land, but the volume of water secured by the completed facilities for the surrounding areas also makes it possible to specify which lands can be converted to agricultural land. If these plans are concretely reflected in agricultural land development plans, we think this will enable us to establish the position of agricultural land development projects to be executed by the Agricultural Departments.

If the Agricultural Department of each province creates a plan for agricultural land development encompassing the entire province, linked with such projects as water resources development and the distribution of nationally-held lands to landless farmers, and clearly lays out the specific results and impact expected from agricultural land development, it will be possible to verify what types of grant aid are appropriate.

Subsection 5.1.2: Improving Repair Facilities

There are 13 repair facilities nationwide for which improvements have been requested. The breakdown is as follows:

a) Punjab Province: 5 locations
b) Sindh Province: 3 locations
c) Balochistan Province 3 locations
d) FATA Region[NSH1]: 2 locations

There are large differences in the degree to which each repair facility is equipped; furthermore, no repair facility is equipped to overhaul bulldozers. The repair equipment at all facilities was introduced from the latter half of the 1960s to the latter half of the 1970s; nearly 40 years ago. There are no cranes for removing and installing engines at the servicing sites (those that do exist are extremely old), so there is concern over the safety of the work. Consequently, there is an urgent need to improve repair facilities in conjunction with the proper pursuit of further land development with bulldozers, especially if Japan is to provide aid for this undertaking.

Moreover, bulldozers are being serviced and effectively used to the extent possible, given the limited numbers and aged equipment. However, should equipment be updated, the current level of welding technology and basic knowledge will not be sufficient for properly operating and providing ongoing maintenance for the upgraded equipment. We also have lingering doubts about quality control for servicing skills and the systems operations at repair facilities. It is essential to simultaneously improve the operation and management of facilities as well as servicing skills if we are to provide funds and equipment through grant aid.

Given the prospective workloads and considering of the number of bulldozers currently owned, it is not necessary to equip every repair facility for which requests were made, except for supplying certain equipment such as trucks for transport. We believe it would be beneficial to designate certain repair facilities and equip these according to their functions.

Subsection 5.1.3: The Necessity of Bulldozers for Agricultural Land Development

Given the remaining lifespan of the existing bulldozers targeted for repair, the area of land that can be developed is projected as follows:

a) Punjab Province: 25,880 ha
b) Sindh Province: 51,040 ha
c) Balochistan Province: 138,623 ha
d) North-West Frontier Province: almost none

There is a large discrepancy between the development noted above and the area of land needed. Given the limited budgets, personnel and equipment, bulldozers are being serviced well; some bulldozers are being used for 30,000 to 40,000 hours, far past their useful economic life. Although this is not efficient in economic terms, it is difficult to purchase new machines from a fiscal standpoint and it costs less to procure replacement parts. Given these circumstances, the aged bulldozers must be used while maintaining them to the extent possible. Furthermore, at present we cannot expect private companies to offer rental services for the small- to medium-sized bulldozers used for land development. This is due to the following factors: The private companies that could provide this service are construction companies, which own mostly large bulldozers; these companies also cannot compete with the subsidized rates offered for public rentals. This results in continued high demand for bulldozers to be used in the development of agricultural land.

Although the majority of those using rented bulldozers are small-scale farmers (5 hectares or fewer) in terms of absolute numbers, the percentage of usage rises with the size of the farm when viewed by the size of the agricultural land owned. The wealthy are deriving more benefit than the poor. It is difficult for poor farmers and small-scale farmers (5 hectares or fewer) to develop with bulldozers all of the agricultural land they own at one time, even with low rental fees. Most either develop the land bit by bit over a long period of time, or pursue development in cooperation with several farming households. To begin with, many of the poor are landless farmers. Although the poor can be expected to benefit indirectly from the development of agricultural land of a certain scale by bulldozer, because this will lead to more employment opportunities where the poor can participate in the preparation of agricultural land, or cultivate the agricultural land which has been developed, it is difficult for the poorest classes to benefit directly from bulldozer rentals. It is essential to give more consideration to the poor when providing grant aid; at the very least, the bulldozer rental system should be re-evaluated with an eye towards providing greater benefits to small-scale farmers.

Poor farmers and small-scale farmers (5 hectares or fewer) live on lands that are unproductive to begin with; this land is in remote locations and it is difficult to obtain water by irrigation. Rainfall is an essential water source for regions that lack sufficient water from irrigation, and facilities such as reservoirs or embankments made of earth and stone must be built to retain water and for water and soil conservation. It is difficult to provide private rental services in remote areas (regions). There is great necessity for the Agricultural Departments to provide bulldozer rental services (public services) in these circumstances. It would be fitting to provide aid for the procurement of new bulldozers and spare parts to increase the number of operable bulldozers, if specific plans were made for agricultural land development in regions designated essential and if this type of public service for bulldozer rentals was provided in an appropriate manner, to ensure that the small-scale farmers benefit.

Subsection 5.1.4: Ongoing Maintenance and Sustainability

Bulldozers are being rented at inexpensive, subsidized rates; however, these subsidized rates make it difficult to procure sufficient replacement parts. At present, there is no structure in place to enable proper ongoing maintenance to be performed, even if new bulldozers and parts were to be procured through grant aid.

Moreover, as we have noted above, even the current inexpensive rental fees impose a large burden on small-scale farmers, making it difficult for them to rent bulldozers for a sufficient amount of time to convert all of the land they own into agricultural land, even though it is small in scale. It is the relatively wealthy farmers who are benefiting the most from the subsidized rates. The application of the same subsidized rates to all farmers is hindering the procurement of parts for the repair facilities.

Although we were able to confirm that the Agricultural Department of each province and related governmental agencies were aware of the need to consider cooperative arrangements with private services or partial privatization in the future; those in private enterprises in each province asserted that, even in regions where profitability could be anticipated, they could not enter the agricultural land development business because they could not compete with the subsidized rates. Therefore, we believe considerable effort will be required to establish effective operations via affiliations with private services in the future (see Chapter 4, 4-6.2).

Ongoing, sustainable management must be incorporated with parts procurement in the event that grant aid is provided. It is essential for each province to establish a structure to carry out operations properly so that more efficient, sustainable management of equipment can be performed in the future, keeping the possibility of cooperative arrangements with private businesses in mind.

Section 5.2: Foreseeable Types of Aid

Although we foresee continued demand among farmers for the development of agricultural land with bulldozers, it will be necessary to supply new bulldozers in the future, since bulldozers are expendable products. Despite this, current conditions give us cause for concern regarding the sustainability of this machinery, even if it were provided. Because it will be difficult to meet the projected demand for agricultural land development with the bulldozer operating time, it is appropriate to address future bulldozer demand through performing better repairs of bulldozers that have not surpassed their useful economic lifespan.

Specifically, pursuing cooperation via the following steps would be beneficial:

Step 1: Establish an infrastructure through which Japan can provide aid (to be implemented by Pakistan)
1. Create agricultural land development plans that designate specific areas of land and beneficiaries
2. Establish policies that will ensure small-scale farmers benefit from agricultural land development
3. Re-evaluate finances so that facilities can be sustainably managed and replacement parts can be procured under the independent budgets of the repair facilities (including the bulldozer rental system)
Step 2: Improve technical skills needed for the supply of funds and equipment (Pakistan will implement this; Japan will provide technological aid)
1. Strengthen the systems operation for repair facilities
2. Improve equipment repair and maintenance skills
Step 3: Provide funds and equipment (Japan will provide technological aid and grant aid)
1. Procure replacement parts necessary for the repair of bulldozers currently owned
2. Procure equipment for bulldozer repair and maintenance
3. Procure new bulldozers

Step 1 will be a prerequisite for Step 2, and Step 2 will be a prerequisite for Step 3. The details regarding each of these steps are presented below.

At the time discussions were held during the course of the preparatory study, Pakistan assumed that aid would be provided to all four provinces simultaneously, based on Pakistan's initial requests. However, it would be beneficial to create a separate plan for each province in order to address the precise needs of each province and for the provincial Agricultural Departments to take the lead in implementing these plans efficiently. Moreover, it is possible that the Pakistani government may request a new plan restricted to one province or several plans, depending on the results of cooperative discussions with the current study team. Since the conditions for providing aid under the above framework are the same, regardless of whether several provinces are targeted simultaneously or whether they are addressed separately, we believe it is appropriate to determine whether to mopve forward and conduct a full-scale study on grant aid, having verified efforts made with regard to the above steps for each province.

Subsection 5.2.1: Putting in Place the Infrastructure for Japan to Provide Aid

1) Establishing Plans for the Development of Agricultural Lands

While the national government has designated agricultural land development as an important issue, agricultural land development plans have not been sufficiently organized in each province and do not clearly or accurately specify the regions to be developed, the area of agricultural land developed, the location of this land, or the beneficiaries.

Although it is possible to establish specific agricultural land development plans that accompany the establishment of facilities to secure water sources, these would require cooperation and joint scheduling between departments responsible

for irrigation and those responsible for agricultural land development. Consequently, it will be difficult to implement this unless the government of Pakistan actively works to establish these plans. Therefore, we believe it is best to encourage the independent initiative of the Pakistani government in establishing these plans by making this a prerequisite for Japan to provide grant aid.

Moreover, plans for the distribution of nationally held land to landless farmers and the strengthening of all aspects of bulldozer utilization are necessary as measures to ensure that small-scale farmers benefit from agricultural land development. Furthermore, as we noted in previous chapters, bulldozer rentals have tended to benefit the wealthy; it is thus necessary to restructure the rental system so small-scale farmers can benefit.

As mentioned in Chapter 4, it is essential that the following improvements be made by Pakistan, not only to benefit the small-scale farmers, but also to ensure the sustainable management of repair facilities, including the procurement of replacement parts.

(1) Establish a system of graduated fees according to bulldozer usage time.
(2) Require that proof of land ownership be submitted when applying for bulldozer rental.
(3) Apply subsidized rates only to bulldozers rented for new land reclamation.

These conditions will require changes in Pakistan's organizations and systems; there are many issues regarding the scope of technological cooperation to be provided in conjunction with the introduction of technology. It is possible that the Foreign Ministry, JICA, and others who are involved locally will need to put pressure on Pakistan; however, the above system must be fully established prior to beginning these projects.

Subsection 5.2.2: Technological Updates Needed for the Supply of Funds and Equipment

The following steps must be taken for the supply of funds and equipment: 1) Technical skills must be improved, including skills related to repair facility operational systems; and 2) finances must be re-evaluated and rental fees set at levels that will enable the replacement of wearable parts. After concrete agricultural land development plans which designate specific regions and fiscal strengthening of repair facilities has been completed to a certain degree, as noted in Subsection 5.2.1, it will be necessary to provide the technological assistance necessary for sustainable management and to appropriately utilize supplied funds and equipment for even greater renovations. Those involved at JICA will still need to examine potential methods for providing technological assistance; assistance directed at on-the-job training for improving technical skills, including systems operation, is likely to be provided, and the means for supplying essential repair equipment and parts in conjunction with technical assistance will also

be considered. We estimate that acquiring technical skills for systems operation through on-the-job training will require one year, at minimum; it will be necessary to improve the following areas.

(1) Strengthen plant systems operations
(2) Transfer the technology necessary for bulldozer repair (for machining, welding, assembly, and quality control)

For technical assistance, it would be appropriate to send someone who is a technical expert on the projects that require the assistance, along with engineers from Japan as junior volunteers and to determine what seminars will be needed. For example, it would be beneficial to study the plant management systems of Japan as well as learn at the actual plant sites, since examples of fully equipped repair facilities are a rarity in Pakistan.

Domestic seminars should be held in facilities that simulate local plant conditions. It will be necessary to determine what means will be effective, whether this means designating one repair facility in each province as a seminar site or gathering all concerned personnel from all concerned provinces for a seminar at one site. Methods to be considered include the provision of technical assistance to one location as the main repair facility, intending to supply indirect assistance to other candidate facilities by arranging technical tie-ups with the main facility as the assisting institution. The following repair facilities are considered candidates for technical assistance, based on potential future workload (the area of developable land), the number of bulldozers targeted for repair, existing plant management skills (systems operation, management of repair equipment, repair skills), and geographical location. Table 5-3 details the individual characteristics of each repair facility.

Table 5-1: Technology Transfers to Targeted Repair Facilities

	Repair Facility	Technology to be Transferred	Notes
Punjab Province			
1.	Bahawalpur	・ Engine overhaul technology	It would also be possible to provide both technologies to either Bahawalpur or Multan
2.	Multan	・ Re-welding technology (for suspensions)	
3.	Faisalabad	・ Engine overhaul technology ・ Re-welding technology (for suspensions)	
Sindh Province			
4.	Hyderabad	・ Re-welding technology (for suspensions)	
Balochistan Province			
5.	Quetta	・ Engine overhaul technology ・ Re-welding technology (for suspensions)	

The Construction Machinery Training Institute (CMTI) in Pakistan is an appropriate location, since it is fully equipped and has dormitories as well. However, the supervising authority of CMTI is the Ministry of Information Technology. Since cooperative ventures involving different ministries are difficult to arrange in Pakistan, this will require appeals by the Foreign Ministry or JICA.

It is essential to proceed with caution due to the many factors that will need to be confirmed in advance. Such factors include the designation of appropriate counterparts, a firm commitment from Pakistan (with respect to the assignment of exclusive counterparts, facilities, project management expenses, etc.), security, and other issues.

Subsection 5.2.3: Provision of Funds and Equipment

With respect to the provision of funds and equipment, it is possible to consider aid for the procurement of new bulldozers once the following things have been completed: 1) Aid has been provided in conjunction with technical assistance for the procurement of replacement parts and repair equipment to ensure efficient utilization of existing equipment, and 2) technical skills have been improved, including skills for systems operation.

The abovementioned establishment of infrastructure for providing aid and making improvements on the technical front are prerequisites for both of these. By supplying funds and equipment in accordance with these procedures, we can ensure that Japan's international cooperation is sustainable and can anticipate the advancement of agricultural land development that will benefit small-scale farmers.

Furthermore, we must take the following points into consideration when determining the number of bulldozers to be targeted for repairs and how many new bulldozers it is appropriate to provide; as well as what repair equipment is needed for bulldozers and how much of this to provide.

(1) The total number of bulldozers targeted for repairs under the requests is 943 units; however, 513 bulldozers should be targeted for repairs once a useful economic life of 25,000 hours is taken into consideration.
(2) The average remaining useful life of the 513 bulldozers targeted for repair in point (1) above is 4.7 years.
(3) The replacement parts expense for these 513 bulldozers amounts to approximately ¥800 million per year; the total amount for 4.7 years is ¥3.9 billion. Although the projected cost of purchasing new models to replace these 513 bulldozers is around ¥6.4 billion, the depreciation expense for a period equivalent to the remaining useful life of the bulldozers (4.7 years) is around ¥1.8 billion. (Once the initial investment is made, maintenance costs would be cheap.)

(4) It is possible to procure parts used for maintenance and repairs locally. It is possible to procure parts made in Italy, China, and Pakistan that are substantially cheaper than the authorized parts. However, authorized parts must be procured from Japan. It takes about one month to procure parts from Japan, from order to receipt.

The charts on the following pages present the components of support for the three steps current considered feasible, as well as their advantages and drawbacks.

Table 5-2: Components of Support Being Considered

	Components	Advantages	Drawbacks	Notes
1.	Provide technical assistance in conjunction with the necessary funds and equipment. (Provide the same level of technical assistance to all repair facilities that have requested it.)	・ Little initial investment. ・ Possible to transfer technology premised on the procurement of new bulldozers in the future.	・ As has been noted, it would be possible to reform a large system, but the issue is whether Pakistan would agree to this. ・ There would be difficulties with measures on the Japanese side (the health of the dispatched experts, living arrangements, maintaining their safety, etc.)	Since we anticipate that the maintenance and repair for almost all bulldozers in Pakistan would be possible by updating the repair technology, improving the system, and improving maintenance and repair skills for the targeted facilities, the current number of repair facilities and personnel would no longer be necessary and streamlining of facility management could be expected.
2.	Same as above (Designate 3 to 4 repair facilities out of all repair facilities requesting assistance and provide technical assistance to these.)	・ Effective assistance can be expected, since both the nature of the assistance and the facilities targeted for assistance would be restricted. ・ Funds and equipment can be specified from an on-the-job training course run by a technical expert.	・ Must obtain Pakistan's approval before initiating a study on what types of assistance to restrict. ・ Must exercise utmost caution in setting the standards for determining which will be the main repair facilities. ・ Since funds and equipment will be given only to the designated repair facilities, it will be necessary to consider what steps to take to address the difference in status between facilities.	Due to the geographical locations of the repair facilities noted above, transport trailers would need to be provided.

	Components	Advantages	Drawbacks	Notes
3.	Bundle technical assistance and the procurement of repair equipment and parts under grant aid. (Provide an equivalent amount to all of the repair facilities requesting it.)	・ Can use a holistic approach toward problems faced by agricultural repair facilities in Pakistan.	・ As stated, there is the possibility of reforming a large system, but the issue is whether Pakistan would agree to this. ・ The initial investment is large compared to that of option 1. ・ If funds and equipment were provided before thorough upgrading of the organization and management structure of the repair facilities and the preparation of plans for agricultural land development, it would be difficult to specify what equipment was required. The burden of providing technical assistance would also be great, so careful consideration in establishing the timing for providing technical assistance would be necessary. ・ Must coordinate technical assistance and grant aid. ・ There would be difficulties with measures on the Japanese side (the health of the dispatched experts, living arrangements, maintaining their safety, etc.)	Maintenance and repair for almost all bulldozers in Pakistan would be possible by updating the repair technology, improving the system, and improving maintenance and repair skills for the targeted facilities. Current repair facilities and personnel are likely to become redundant with the streamlining of repair facility operations.

	Components	Advantages	Drawbacks	Notes
4.	Same as above (Designate 3 to 4 repair facilities as model facilities out of all those requesting assistance, and provide technical assistance to these.)	・ Can use a holistic approach toward problems faced by agricultural repair facilities in Pakistan. ・ Effective assistance can be expected, since both the nature of the assistance and the facilities targeted for assistance would be restricted.	・ The initial investment would be large compared with option 2. ・ If funds and equipment were provided before thorough upgrading of the organization and management structure of the repair facilities and the preparation of plans for agricultural land development, it would be difficult to specify what equipment was required. The burden of providing technical assistance would also be great, so careful consideration in establishing the timing for providing technical assistance would be necessary. ・ Must coordinate technical assistance and grant aid.	Due to the geographical locations of the repair facilities noted above, transport trailers would need to be provided.
5.	Supply only repair equipment and parts through grant aid. (Provide an equivalent amount to all of the repair facilities requesting it.)	・ This would not require coordination with any other plans; it would be easy to determine the type of aid.	・ The level of repair skills and management systems at repair facilities tend to be poor, so the supply of only funds and equipment might result in inefficient use of these resources. A reinforced infrastructure and improved technology are indispensable to carrying out the abovementioned coordination.	
6.	Supply only repair equipment and parts through grant aid. (Designate 3 to 4 repair facilities out of all those requesting assistance and equip them to perform all repairs.)	・ This would not require coordination with any other plans; it would be easy to determine the type of aid. ・ By restricting the facilities targeted for aid, it would be concentrated and effective.	Same as above	Due to the geographical locations of the repair facilities noted above, transport trailers would need to be provided.

	Components	Advantages	Drawbacks	Notes
7.	Supply repair equipment and parts through grant aid and implement "soft" components.	・ This would not require coordination with any other plans; it would be easy to determine the type of aid.	・ Since there are restrictions on providing technical assistance on "soft" components, such as budgetary restraints (in general, a maximum of ¥20 million), time constraints (impossible to match timing with government bonds), limits on the scope of technological transfer that can occur (this is "supplemental support" for the utilization of equipment supplied via grant aid; a consultant responsible for grant proposals who specializes in equipment provision will provide this), this will not improve the technology. ・ It will be difficult to provide aid that benefits small-scale farmers unless the bulldozer rental system is restructured.	
8.	Supply new bulldozers.		・ Unless technology is updated and the management systems for the facilities are restructured, the same problems are very likely to occur in ten years' time.	

Table 5-3: Individual Repair Facilities and their Unique Characteristics *BD=Bulldozers

No.	Repair Facility	# of Districts Under Jurisdiction	# of BD* Targeted for Repair	Unused Cultivable Land Owned by Farmers		Water Resource Development	Current State of Repair Facilities	Technical Skills of Employees	Other Points to Note
				# of Farming Households	Area (ha)				
1. Punjab Province									
(1)	Multan	10*	68	74,758	151,096	・Greater Thal Canal project (completion: Stage 1 in June 2005; Stage 2 in June 2008) ・One out of 4 districts under jurisdiction lies in an irrigated region.	14 out of 23 machine tools owned are operable. *For bulldozer engines:* 4 out of 9 machines are operable. *For suspensions:* 7 out of 9 machines are operable.	・Plant management skills are high. ・Repair equipment management and repair skills are medium. ・Welding equipment management and welding skills are high.	
(2)	Faisalabad	7	52	49,601	89,883	・Greater Thal Canal project (completion: Stage 1 in June 2005; Stage 2 in June 2008) ・3 out of 4 districts under jurisdiction lie in an irrigated region.	17 out of 29 machine tools are operable. *For bulldozer engines:* 3 out of 9 machines have the necessary functions. *For suspensions:* 6 out of 9 machines have the necessary functions.	・Plant management skills are medium. ・Repair equipment management and repair skills are medium. ・Welding equipment management and welding skills are high.	

No.	Repair Facility	# of Districts Under Jurisdiction	# of BD* Targeted for Repair	Unused Cultivable Land Owned by Farmers		Water Resource Development	Current State of Repair Facilities	Technical Skills of Employees	Other Points to Note
				# of Farming Households	Area (ha)				
(3)	Talagang	3	40	45,056	82,454		17 out of 54 machine tools owned are operable. *For bulldozer engines:* 5 out of the 9 machines have the necessary functions. *For suspensions:* 9 out of the 9 machines have the necessary functions.	・Plant management skills are medium. ・Repair equipment management and repair skills are medium. ・Welding equipment management and welding skills are medium.	
(4)	Lahore	10	40	44,793	63,364		17 out of 28 machine tools owned are operable. *For bulldozer engines:* 3 out of 9 machines have the necessary functions. *For suspensions:* 4 out of 9 machines have the necessary functions.	・Plant management skills are medium. ・Repair equipment management and repair skills are medium. ・Welding equipment management and welding skills are medium.	

No.	Repair Facility	# of Districts Under Jurisdiction	# of BD* Targeted for Repair	Unused Cultivable Land Owned by Farmers		Water Resource Development	Current State of Repair Facilities	Technical Skills of Employees	Other Points to Note
				# of Farming Households	Area (ha)				
(5)	Bahawalpur	3	6	35,281	54,028		14 out of 23 machine tools owned are operable. The 8 lathes are operable. *For bulldozer engines:* 3 out of 9 machines have the necessary functions. *For suspensions:* 4 out of 9 machines have the necessary functions.	・Plant management skills are high. ・Repair equipment management and repair skills are high. ・Welding equipment management and welding skills are medium.	
2. Sindh Province									
(1)	Hyderabad	3	35	40,575	178,738		35 out of 71 machine tools owned are operable. *For bulldozer engines:* 5 out of 9 machines have the necessary functions. *For suspensions:* 4 out of 9 machines have the necessary functions.	・Plant management skills are low. ・Repair equipment management and repair skills are low. ・Welding equipment management and welding skills are medium.	A security escort was necessary at the time of the study.
(2)	Kairpur	3	15	37,533	91,672		Currently building a new facility. Equipment owned is from the late 1960s.	Unable to determine.	A security escort was necessary at the time of the study.

No.	Repair Facility	# of Districts Under Jurisdiction	# of BD* Targeted for Repair	Unused Cultivable Land Owned by Farmers		Water Resource Development	Current State of Repair Facilities	Technical Skills of Employees	Other Points to Note
				# of Farming Households	Area (ha)				
(3)	Sukkur	4	14	15,424	32,903	・Rainee water canal project (Completed December 2002) ・1 out of 2 districts under jurisdiction lie in an irrigated region.	26 out of 42 machine tools owned are operable. *For bulldozer engines:* 5 out of 9 machines have the necessary functions. *For suspensions:* 4 out of 9 machines have the necessary functions.	・Plant management skills are low. ・Repair equipment management and repair skills are low. ・Welding equipment management and welding skills are low.	A security escort was necessary at the time of the study.
3. Balochistan Province									
(1)	Quetta	17	113	67,190	566,463	・Kachi Canal project (Completion: June 2007) ・Sabakzai Dam (Completion: June 2005)	21 out of 35 machine tools owned are operable. *For bulldozer engines:* 3 out of 9 machines have the necessary functions. *For suspensions:* 5 out of 9 machines have the necessary functions.	・Plant management skills are medium. ・Repair equipment management and repair skills are medium. ・Welding equipment management and welding skills are medium.	
(2)	Khuzdar	6	75	50,886	448,703		Unable to survey, so unclear Judging from the pictures, 5 or 6 of the general-purpose machines were operable. For bulldozer engines: Only 1 was operable.	Unclear	A site survey was impossible due to political unrest.

No.	Repair Facility	# of Districts Under Jurisdiction	# of BD* Targeted for Repair	Unused Cultivable Land Owned by Farmers		Water Resource Development	Current State of Repair Facilities	Technical Skills of Employees	Other Points to Note
				# of Farming Households	Area (ha)				
(3)	Turbat	3	32	11,775	94,760	・Mini dam project (June 2006)	Only a building and a few units of repair equipment	Plant management skills and repair skills are both low.	A security escort was necessary at the time of the study.
4. North-West Frontier Province									
(1)	D. I. Khan	6	0	32,795	197,923	・Kurram Tangi Project (June 2006) ・Gomal Zam Dam (June 2006)	Only a building with no repair equipment	Unclear	A site survey was impossible due to political unrest.
(2)	Peshawal	8	0	16,174	16,536		Only a building with no repair equipment	Unclear	

Note: *The De-Ex. area of Rajanpur is included in Rajanpur District. The De-Ex. Area of D.G. Khan is included in D.G. Khan District. Cholistan has been divided into the three districts of Bahawalpur, Rahim Yar Khan, and Bahawalnagor.
Employee skill levels: “High” means they have plant management capabilities; “Medium” means plant management capabilities are insufficient; “Low” means there are problems with the plant management systems.

Appendices

Appendix 1: Land Distributed to Landless Farmers in Punjab Province

Workshop Province		Ministry of Agriculture area of planned distribution (ha) (BOR plans as of 9/27/03)	Village distribution area per BOR register (ha) (as of 11/21/03)	Ministry of Agriculture, Land Division measurements (ha)	Unsuitable farming land (ha)	Suitable farming land (ha)	Cultivated land (ha)	Land required for development (ha)	Bulldozer hours required for development (hr/ha)	Total work hours (hr) (note 1)	Bulldozer rental fees (Rs/hr)	Land development cost (Rs)	Draw water from irrigation lines?	Depth to groundwater (m)	Ground water quality	Pipe wells needed (centrifuge and turbine)
Bahawalpur																
10	B/pur	7,731	1,445	1,445	0	1,445	0	1,445.2	271.7	392,810	358	140,625,980	Y	7.9 - 10.7	Poor	143
8	B/nagar	1,301	1,301	1,301	42	1,258	0	1,258.2	247.0	310,900	358	111,302,200	N	21.4 - 39.7	Poor	124
18	R.Y Khan	6,018	6,651	6,651	4,532	2,119	0	2,118.6	321.1	680,550	358	243,636,900	N	7.6 - 12.2	Poor	209
	Subtotals	**15,050**	**9,397**	**9,397**	**4,574**	**4,822**	**0**	**4,822.0**		**1,384,260**		**495,565,080**				**476**
Multan																
1	Multan	202	41	41	0	41	0	41.3	111.2	4,590	358	1,634,220	N	12.2 >	Mid	4
15	Khanewal	863	997	997	0	997	0	996.8	197.6	197,040	358	70,540,320	Y	7.6 - 12.2	Mid-poor	99
9	Vehari	81	41	41	0	41	0	41.3	205.0	8,466	358	3,030,828	Y	12.2 - 15.3	Poor	4
2	Lodhran	162	160	160	0	160	0	160.3	98.8	15,840	358	5,670,720	N	12.2 >	Mid	16
14	Pakpattan	202	115	115	0	115	0	114.9	128.4	14,768	358	5,286,944	N	7.6 - 15.3	OK	11
5	D.G.Khan	5,788	4,610	4,610	126	4,484	0	4,484.5	148.2	664,860	358	238,019,880	N	24.4 - 36.6	Mid	443
7	M/garh	5,440	5,442	5,442	0	5,442	2,160	3,282.5	158.1	519,104	358	185,839232	N	9.2 - 12.2	Poor-mid	538
6	Rajanpur	4,143	4,049	4,049	36	4,012	0	4,012.2	61.8	247,850	358	88,730,300	N	5.5 - 36.6	OK	397
17	Layyah	4,047	4,142	4,142	416	3,726	1,514	2,211.7	49.4	109,300	358	39,129,400	Y	12.2 - 19.8	Mid	368
	Subtotals	**20,928**	**19,597**	**19,597**	**578**	**19,018**	**3,674**	**15,345.5**		**1,781,818**		**637,881,844**				**1,880**
Faisalabad																
11	Faisalabad	1,232	1,129	1,119	63	1,057	0	1,056.7	93.9	99,218	358	35,520,044	Y	12.2 - 18.3	Mid-poor	104
4	Jhang	4,109	3,917	3,917	238	3,679	3,100	578.3	123.5	71,450	358	25,579,100	Y	4.6 - 15.2	OK	364
19	Sargodha	2,024	76	76	0	75	44	31.6	44.5	1,404	358	502,632	N	15.3 - 36.6	OK	7
13	Khushab	809	914	914	69	845	0	845.4	96.3	81,471	358	29,166,618	N	15.3 - 30.5	OK	84

Workshop Province		Ministry of Agriculture area of planned distribution (ha) (BOR plans as of 9/27/03)	Village distribution area per BOR register (ha) (as of 11/21/03)	Ministry of Agriculture, Land Division measurements (ha)	Unsuitable farming land (ha)	Suitable farming land (ha)	Cultivated land (ha)	Land required for development (ha)	Bulldozer hours required for development (hr/ha)	Total work hours (hr) (note 1)	Bulldozer rental fees (Rs/hr)	Land development cost (Rs)	Draw water from irrigation lines?	Depth to groundwater (m)	Ground water quality	Pipe wells needed (centrifuge and turbine)
12	Mianwali	809	905	905	178	727	0	726.8	24.7	17,960	358	6,429,680	N	3.1 - 4.6	OK	72
	Subtotals	**8,983**	**6,941**	**6,931**	**548**	**6,383**	**3,144**	**3,238.8**		**271,503**		**97,198,074**				**631**
Lahor																
3	Okara	571	266	266	0	266	0	266.3	148.2	39,480	358	14,133,840	Y	13.7 - 18.3	Mid	26
16	Sheikupura	548	437	437	70	367	49	318.1	61.8	19,650	358	7,034,700	N	15.3 - 27.5	Mid	36
	Subtotals	**1,119**	**703**	**703**	**70**	**633**	**49**	**584.4**		**59,130**		**21,168,540**				**62**
	Totals	**46.080**	**36,638**	**36,628**	**5770**	**30,856**	**6,867**	**23,990.6**		**3,496,711**		**1,251,822,538**				**3,049**

Source:`Punjab Province Ministry of Agriculture materials, converted from acres into hectares by the research group.

Note 1: Due to area unit conversions, these do not coincide with calculated values.

BOR: Board of Revenue

Appendix 2: Existing Equipment and its Condition for Each Repair Facility in Punjab Province

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
(1) Bahawalpur								
	1)	Lathe (USSR-made)	General processing	8	7		1	Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Lathe (Japan-made)	General processing	1	1			Mills outer diameter of wooden poles, etc.; drills holes.
	3)	Radial drill press (USSR-made)	General processing	1			1	Drill press whose main axis can move radially.
	4)	Upright drill press (USSR-made)	General processing	2			2	Drill with a fixed main axis. Also called a vertical drill press.
	5)	Milling machine (USSR-made)	General processing	2			2	Produces various shapes with a rotary cutter.
	6)	Valve grinder (USSR-made)	General processing	1			1	Grinds engine intake and exhaust valves.
	7)	Crankshaft grinder	Bulldozers only	1	1			Repairs warped or worn crankshafts.
	8)	Compressor	General processing	1	1			Produces compressed air.
	9)	Track link press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	10)	Shaper	General processing	1		1		Reciprocating blades produce various two-dimensional shapes. (A.K.A. two-dimensional shaper)
	11)	Saw press	General processing	1		1		Mills poles and lumber.
	12)	Fuel injection tester	Bulldozers only	1	1			Measures fuel injection quantity in diesel engines.
	13)	Track link refitter	Bulldozers only	1	1			Disassembles/refits underbodies (links, bushings).
	14)	Welding machine	Bulldozers only	1	1			Electrically welds together metal (iron).
		Total:		**23**	**14**		**7**	

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
(2) Multan								
	1)	Lathe (including turret lathes)	General processing	6	5	1		Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Bench tester	General processing	1				Tabletop testing machine.
	3)	Milling machine	General processing	1		1		Produces various shapes with a cutter.
	4)	Shaper	General processing	1		1		Reciprocating blades produce various two-dimensional shapes.
	5)	Drill press	General processing	1	1			Drills holes. Available in various sizes.
	6)	Universal electric drill	General processing	1	1			A type of tabletop drill press. Usually portable.
	7)	Radial drill press	General processing	1			1	Drill press whose main axis can move radially.
	8)	Electric hammer	General processing	1	1			A hammer that uses a motor instead of hydraulics. Outdated.
	9)	50-ton hydraulic press	Bulldozers only	1	1			Corrects warping in steel sheeting, wooden poles, etc.
	10)	Saw press	General processing	2	1		1	Mills poles and lumber.
	11)	Crankshaft grinder	Bulldozers only	1			1	Repairs warped or worn crankshafts.
	12)	Universal conrod lathe	Bulldozers only	1	1			Produces/processes various connection rods.
	13)	Cylinder interior finisher	Bulldozers only	1	1			Approximately the same as a cylinder grinder.
	14)	Upper/lower surface grinder	Bulldozers only	1	1			Grinds top and bottom of cylinder heads/blocks.
	15)	Surface grinder	General processing	1		1		Grinds/finishes steel surfaces.
	16)	Valve grinder	Bulldozers	1	1			Grinds engine intake and exhaust valves.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
			only					
	17)	Fuel pump tester	Bulldozers only	2	1	1		Measures fuel injection quantity in diesel engines.
	18)	Track link press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	19)	Oxygen welding machine	General processing	1			1	Uses oxygen and propane to weld iron.
	20)	Semi-automatic welding machine	Bulldozers only	1	1			Uses carbon dioxide and electricity to weld steel.
	21)	Electric testing device	General processing	1	1			Measures voltage, current, etc.
	22)	Welding machine	General processing	2	1		1	Electrically welds together metal (iron).
	23)	Other		6	5		1	
		Total:		**36**	**24**		**6**	
(3) Faisalabad								
	1)	Lathe	General processing	8	6	2		Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Thread-cutting lathe	General processing	1				Functions in the same way as a regular lathe. Can manufacture high-precision screws.
	3)	Shaper	General processing	2		2		Reciprocating blades produce various two-dimensional shapes.
	4)	High-speed drill press	General processing	1		1		Functions in the same way as a drill press. Can operate at speeds of 1800 rpm and above.
	5)	Radial drill press	General processing	1			1	Drill press whose main axis can move radially.
	6)	Tool grinder	General processing	1			1	Sharpens the cutting surfaces of drills, cutters, etc.
	7)	Saw press	General processing	1		1		Mills poles and lumber.
	8)	Crankshaft grinder	Bulldozers only	1	1			Regrinds/repairs warped or worn crankshafts.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
	9)	Upper/lower surface grinder	Bulldozers only	1	1			Grinds top and bottom of cylinder heads/blocks.
	10)	Valve grinder	Bulldozers only	1	1			Grinds engine intake and exhaust valves.
	11)	Cylinder reamer	Bulldozers only	1	1			Used chiefly to mill interior diameter of cylinder blocks.
	12)	Conrod reamer	Bulldozers only	1	1			Mills inner diameter of connecting rods.
	13)	60-ton hydraulic press	Bulldozers only	1	1			Corrects warping in steel sheeting, wooden poles, etc.
	14)	Track welder/refitter	Bulldozers only	1	1			Welds/refits track links (bulldozer underbodies).
	15)	Track link press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	16)	Link assembly press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	17)	Nut assembler	Bulldozers only	1	1			Same as above.
	18)	Oxygen welding machine	General processing	1			1	Welds with oxygen and propane.
	19)	Welding machine	General processing	2	1		1	Electrically welds together metal (iron).
	20)	Painter	General processing	1			1	Applies anti-rust paint to completed components.
		Total:		29	17		5	
(4) Talagang								
	1)	Lathe (USSR-made)	General processing	4	2		2	Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Turret lathe (USSR-made)	General processing	2		1	1	Lathe with rotary blades; can perform combined machining.
	3)	Universal milling machine	General processing	1		1		Produces various shapes with a rotary cutter.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
	4)	Gear-cutting machine/shaper (USSR-made)	Bulldozers only	1			1	Can produce stepped gears. An expensive machine.
	5)	Slotter (fluting machine)	General processing	1			1	Mills keyways, etc. (USSR-made)
	6)	Drill press	General processing	2		2		Drills holes. Available in various sizes.
	7)	Universal grinder	General processing	1			1	Grinds inner and outer surfaces. (USSR-made)
	8)	Inner/outer grinder (Czech-made)	Bulldozers only	1			1	Grinds top and bottom of cylinder heads/blocks.
	9)	Honing machine (USSR-made)	Bulldozers only	1			1	Cuts crosses into cylinder interiors.
	10)	Surface grinder (Czech-made)	Bulldozers only	1			1	Grinds/finishes steel surfaces.
	11)	Piston turner/grinder	Bulldozers only	1			1	Mills/polishes outer diameter of pistons.
	12)	High-speed drill press (USSR-made)	General processing	1			1	Functions in the same way as a drill press. Can operate at speeds of 1800 rpm and above.
	13)	Hydraulic shaper (USSR-made)	General processing	1			1	Shaping machine. Works faster than mechanical models.
	14)	Duplex grinder	General processing	1	1			Has grindstones on either side of the motor for all-in-one roughening and finishing.
	15)	Saw press	General processing	2	2			Mills poles and lumber.
	16)	Cutter	General processing	1	1			Upper and lower blades cut steel sheets.
	17)	Power hammer	General processing	2	1			Mechanical hammer. Comes in hydraulic, pneumatic, and electric models.
	18)	Radial drill press	General processing	1	1		1	Drill press whose main axis can move radially.
	19)	Table drill press	General processing	2	1			Compact drill press.
	20)	Welding machine	Bulldozers	2	2			Electrically welds together metal (iron).

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
			only					
	21)	Crankshaft grinder	Bulldozers only	1			1	Repairs warped or worn crankshafts.
	22)	Valve grinder	Bulldozers only	1	1			Grinds engine intake and exhaust valves.
	23)	Honing machine (USSR-made)	Bulldozers only	1	1			Cuts crosses into cylinder interiors.
	24)	Universal grinder	General processing	1	1			Grinds inner and outer surfaces.
	25)	Drill press	General processing	1	1			Drills holes. Available in various dimensions.
	26)	40-ton hydraulic press	General processing ・Bulldozers only	1	1			Corrects warping in steel sheeting, wooden poles, etc. Hydraulic.
	27)	Track link press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	28)	Track link refitter press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	29)	Crane	General processing	1	1			Hoister. (USSR-made)
	30)	Hydraulic pump tester	Bulldozers only	2	1		1	Tests fuel injection pump.
	31)	Fuel emission tester	Bulldozers only	2	1		1	Grinds engine fuel injection nozzles.[NSH1]
	32)	Other		12				
		Total:		**54**	**19**		**16**	
(5) Lahole								
	1)	Lathe	General processing	6	4	1	1	Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Welding machine	General processing ・	2	2			Electrically welds together metal (iron).

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
			Bulldozers only					
	3)	Engine surface grinder	Bulldozers only	1	1			Grinds top and bottom of cylinder heads/blocks.
	4)	Molding block	General processing	1	1			Standard block used when bending steel plates.
	5)	Tabletop tool grinder	General processing	1	1			Compact tool grinder.
	6)	Radial drill press	General processing	1			1	Can drill into any part of a fixed and stabilized object.
	7)	Table drill press	General processing	1	1			Compact drill press. (A.K.A. bench drill)
	8)	Electric drill press (compact)	General processing	1	1			Portable drill press.
	9)	Drill press	Bulldozers only	1		1		Drills holes. Available in various sizes.
	10)	Platen	General processing	1	1			Standard stone slab used for assembly/repair work.
	11)	Valve grinder	Bulldozers only	1			1	Grinds engine intake and exhaust valves.
	12)	Electric drill press (midsize)	General processing	1		1		Same as a table drill press.
	13)	Manual cutter	General processing	1		1		Cuts steel sheeting. Controlled manually.
	14)	Drill press	General processing	1	1			Drills holes. Available in various sizes.
	15)	Crankshaft grinder	Bulldozers only	1			1	Repairs warped or worn crankshafts.
	16)	Milling machine	General processing	1		1		Produces various shapes with a rotary cutter.
	17)	Slotter	General processing	1			1	Slotting machine.
	18)	Saw press	General	1	1			Mills poles and lumber.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
			processing					
	19)	Fuel injection gauge	Bulldozers only	2	2			Measures fuel injection quantity in engines.
	20)	Track link press	Bulldozers only	1	1			Press for assembling track links (bulldozer underbodies).
	21)	Other service tools	General processing・Bulldozers only	1	1			
		Total:		28	18		5	

Note: Fair = usable; Poor = some features usable; Out of Order = unusable

= Devices required for bulldozer repair

Appendix 3: Existing Equipment and its Condition for Each Repair Facility in Sindh Province

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
(1) Hyderabad								
	1)	Lathe	General processing	12	6		6	Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Thread-cutting lathe	General processing	1	1			Functions in the same way as a regular lathe. Can manufacture high-precision screws.
	3)	Saw press	General processing	2			2	Mills poles and lumber.
	4)	Milling machine (USSR-made)	General processing	2	1		1	Produces various shapes with a cutter.
	5)	Shaper	General processing	2	1		1	Shaping machine. Hydraulic models work faster than mechanical ones.
	6)	Planer	General processing	1			1	Surface miller.
	7)	Portable drill	General processing	1			1	Portable drill press.
	8)	Radial drill press	General processing	1	1			Can drill into any part of a fixed and stabilized object.
	9)	Table drill press	General processing	1	1			Compact drill press.
	10)	Compressor	General processing	1			1	Compressor.
	11)	Electric grinder	General processing	1	1			Uses electrolysis to remove debris from surfaces.
	12)	Duplex grinder	General processing	1			1	Has grindstones on either side of the motor for all-in-one roughening and finishing.
	13)	Slotter (USSR-made)	General processing	1			1	Mills keyways, etc.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
	14)	Crankshaft grinder	Bulldozers only	1			1	Repairs warped or worn crankshafts.
	15)	Surface grinder	Bulldozers only	1			1	Planes steel sheeting surfaces.
	16)	Honing machine	Bulldozers only	1			1	Cuts crosses into cylinder interiors.
	17)	Electrolytic valve grinder	Bulldozers only	1			1	Electrolytically grinds engine intake and exhaust valves.
	18)	Rotating drum	Bulldozers only	1	1			Removes burrs.
	19)	Cylinder grinder	Bulldozers only	1			1	Grinds outer surface of wooden poles.
	20)	Universal grinder	Bulldozers only	1	1			Grinds inner/outer surfaces of wooden poles.
	21)	Conrod turning machine	Bulldozers only	1			1	Mills inner diameter of connecting rods.
	22)	Conrod polisher	Bulldozers only	1			1	Polishes inner diameter of connecting rods.
	23)	Piston turner/grinder	Bulldozers only	1			1	Mills/polishes inner diameter of pistons.
	24)	Cylinder boring machine	Bulldozers only	2			2	Polishes inner diameter of cylinders.
	25)	Line boring machine	Bulldozers only	1			1	Corrects crankshaft hole eccentricities.
	26)	Valve grinder	Bulldozers only	1			1	Grinds engine intake and exhaust valves.
	27)	Compact electric welding machine	Bulldozers only	1			1	Electrically welds together metal (iron).
	28)	Diesel-powered welding machine	Bulldozers only	1			1	Generator/welding machine combo. Used for outside welding work.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
	29)	Fuel pump tester	Bulldozers only	1			1	Measures fuel injection quantity in engines.
	30)	Nozzle grinder	Bulldozers only	1			1	Grinds/corrects engine fuel injection nozzles.
	31)	Pressure washer	Bulldozers only	1			1	Cleans oil- and grease-stained components.
	32)	Engine generator set	Bulldozers only	2			2	Engine/generator combo.
	33)	Welding materials	Bulldozers only	1	1			Various materials used in welding.
	34)	Other		22	20		2	(omitted)
		Total:		**71**	**35**		**36**	
(2) Sukkur								
	1)	Lathe	General processing	9	6		3	Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Pin grinder	Bulldozers only	1	1			Grinds piston pins.
	3)	Crankshaft grinder	Bulldozers only	1		1		Repairs warped or worn crankshafts.
	4)	Radial drill press	General processing	1		1		Can drill into any part of a fixed and stabilized object.
	5)	Vertical drill press	General processing	1			1	Same as an upright drill press.
	6)	Saw press	General processing	1	1			Mills poles and lumber.
	7)	Emission pump tester (USSR-made)	Bulldozers only	1	1			
	8)	Hydraulic press	Bulldozers・General processing	2	2			Corrects warping in steel sheeting, wooden poles, etc.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
	9)	Shaper	General processing	1	1			Produces various shapes with a cutter.
	10)	Milling machine (USSR-made)	General processing	2			2	Produces various shapes with a rotary cutter.
	11)	Slotter (USSR-made)	General processing	3	2	1		Mills keyways, etc.
	12)	Table drill press	General processing	1			1	Drills holes. Compact. Available in various sizes.
	13)	Specialized drill press	Bulldozers only	1			1	Drills holes. Available in various sizes.
	14)	Honing machine	Bulldozers only	1			1	Cuts crosses into cylinder interiors.
	15)	Valve grinder	Bulldozers only	1			1	Grinds engine intake and exhaust valves.
	16)	Circular saw	General processing	1		1		Cutting machine featuring a circular saw.
	17)	Hydraulic oil temperature tester	Bulldozers only	1			1	Oil tester.
	18)	Conrod processing machine	Bulldozers only	1		1		Mills/grinds inner diameter of connecting rods.
	19)	Multipurpose grinder	General processing	2	1		1	Manual universal grinder.
	20)	Electric discharge machine	General processing	1		1		Uses electrodes to drill holes of various shapes.
	21)	Hammer	General processing	1	1			Mechanical hammer. Comes in hydraulic, pneumatic, and electric models.
	22)	Direct-current welding machine	General processing	1			1	Electrically welds together metal (iron).
	23)	Armature tester	General processing	1	1			Tests armatures.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
	24)	Emergency generator	General processing	1			1	Electric generator for emergency use.
	25)	Compressor	General processing	1			1	Produces compressed air.
	26)	Engine surface grinder	Bulldozers only	1	1			Grinds top and bottom of cylinder heads/blocks.
	27)	Fuel injection tester	Bulldozers only	3	2		1	Tests injection pump performance.
		Total:		42	20		16	
(3) Khairpur								
		A portion of the building had collapsed due to age; entry was not permitted. Unable to survey.						

Note: Fair = usable; Poor = some features usable; Out of Order = unusable

= Devices required for bulldozer repair

Appendix 4: Existing Equipment and its Condition for Each Repair Facility in Balochistan Province

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
(1) Quetta								
	1)	Lathe	General processing	5	5			Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Inner/outer grinder	General processing	2	1	1		Mills outer diameter of wooden poles, etc.; drills holes.
	3)	Certa	General processing	1	1			Shaper.
	4)	Milling machine	General processing	1	1			Produces various shapes with a cutter.
	5)	Skipper	General processing	1			1	Snagging machine.
	6)	Saw press	General processing	2	1		1	Mills poles and lumber.
	7)	Tuzret machine	General processing	0	0		0	Not available.
	8)	Drill press	General processing	2	1		1	Drills holes. Available in various sizes.
	9)	Upright drill	General processing	1		1		Vertical drill press for drilling through thicker surfaces. Usually contains a 5 hp motor.
	10)	Table drill press	General processing	2	2			Smaller drill press for small jobs and lighter-duty work.
	11)	Valve grinder	Bulldozers only	1	1			Grinds engine intake and exhaust valves.
	12)	Conrod polisher	Bulldozers only	1	1			Polishes bearing portions of connecting rods.
	13)	Reamer	Bulldozers only	1		1		Enlarges drilled holes.
	14)	Cylinder reamer	Bulldozers	1	1			Enlarges liner portions within engines.

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
			only					
	15)	Engine surface grinder	Bulldozers only	2	1			Grinds top and bottom of cylinder heads/blocks.
	16)	Cylinder grinder	Bulldozers only	1		1		Functions approximately similar to the engine reamer.
	17)	Tool grinder	General processing	2			2	Sharpens the cutting surfaces of drills, cutters, etc.
	18)	Vertical hydraulic press	Bulldozers・General processing	1	1			Corrects warping in steel sheeting, wooden poles, etc.
	19)	Conrod level	Bulldozers only	1		1		Ensures a level center hole in connecting rods.
	20)	Shaft grinder	Bulldozers only	1	1			Grinds crankshafts, etc.
	21)	Fuel injection tester	Bulldozers only	2	2			Tests injection pump performance.
	22)	Nozzle grinder	Bulldozers only	1	1			Grinds engine fuel injection nozzles.
	23)	Tester	Bulldozers only	2	2			Automatic fuel tester.
	24)	Slotter	Bulldozers only	1	1			Vertical slotter (not recorded in log).
		Total:		35	24		5	

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
(2) Khuzdar								
	1)	Lathe	General processing	5		Not yet surveyed		Mills outer diameter of wooden poles, etc.; drills holes.
	2)	Surface grinder	General processing	3				Planes steel sheeting surfaces.
	3)	Surface miller	General processing	1				Planer: planes large steel sheeting surfaces.
	4)	Milling machine	General processing	1				Produces various shapes with a cutter.
	5)	Cylinder reamer	Bulldozers only	1				Functions approximately similar to the engine reamer.
	6)	Engine surface grinder	Bulldozers only	1				Grinds top and bottom of cylinder heads/blocks.
	7)	Tool grinder	General processing	1				Sharpens the cutting surfaces of drills, cutters, etc.
	8)	Cylinder grinder	General processing	1				Grinds outer diameter of wooden poles.
	9)	Vertical hydraulic press	Bulldozers・General processing	2				Corrects warping in steel sheeting, wooden poles, etc.
	10)	Fuel injection tester	Bulldozers only	3				Tests injection pump performance.
	11)	Nozzle grinder	Bulldozers only	1				Grinds engine fuel injection nozzles.
	12)	Welding machine	General processing	2				Electrically welds together metal (iron).
	13)	Surface grinder	Bulldozers only	1				Grinds surfaces.
	14)	Electric drill	General processing	1				Portable drill.
	15)	Other		3				

Repair Facility		Device	Application	No.	Condition			Notes
					Fair	Poor	Out of Order	
		Total:		27				
(3) Turbat								
		Office machinery only		2				
		Saw press		1				
		Drill press		1				
		No machine tools						

Note: Fair = usable; Poor = some features usable; Out of Order = unusable

= Devices required for bulldozer repair

Appendix 5:Bulldozer Repair Log

Repair Facility	Machine No.	Economic Life	Total Hours	Hours Left	Repair Log (x 1000 hours)											
					8 Hr	10 Hr	12.5 Hr	15 Hr	17.5 Hr	20 Hr	22.5 Hr	25 Hr	27.5 Hr	30 Hr	35 Hr	40 Hr
1. Lahore Repair Facility																
(1)	NKD16	36,000	35,125	875			E.OH	E.OH	E.OH		E.OH	E.OH		E.OH	E.OH	
												UC Rep				
(2)	NKD56	25,000	23,759	1,241	G. OH	G. OH	G. OH		G. OH	G. OH						
(3)	NKD109	25,000	23,892	1,108	G. OH			G. OH								
(4)	NKD129	40,000	39,492	508	UC Rep		UC Rep	E.OH	E.OH	UC Rep	UC Rep		UC Rep	E.OH	E.OH	E.OH
	NKD151	25,000	23,567	1,433				E.OH	UC Rep		E.OH					
(6)	NKD153	32,000	31,659	341	UC Rep		UC Rep	E.OH			UC Rep		E.OH			
							E.OH	UC Rep			Cl & St		E.OH			
(7)	NKD160	28,000	27,703	297					E.OH	UC Rep			E.OH			
									UC Rep							
(8)	NKD216	30,000	29,049	951	E.OH		E.OH	E.OH	E.OH	E.OH	E.OH	E.OH				
					E.OH				UC Rep		UC Rep					
(9)	NKD219	25,000	22,019	2,981			G. OH		G. OH	G. OH						
							UC Rep			UC Rep						
(10)	(NKD220)	17,000	16,478	522	E.OH	G. OH			G. OH							
					E.OH	UC Rep	UC Rep									
					E.OH											
(11)	NKD221	25,000	21,292	3,708			UC Rep	E.OH	UC Rep	Cl & St						
							E.OH		E.OH		E.OH					
(12)	NKD222	25,000	19,002	5,998	E.OH	E.OH	G.OH	E.OH	E.OH	G.OH						
							E.OH	UC Rep								
(13)	NKD223	25,000	23,813	1,187	G. OH		UC Rep	Cl & St								
								G. OH								

Repair Facility	Machine No.	Economic Life	Total Hours	Hours Left	Repair Log (x 1000 hours)											
					8 Hr	10 Hr	12.5 Hr	15 Hr	17.5 Hr	20 Hr	22.5 Hr	25 Hr	27.5 Hr	30 Hr	35 Hr	40 Hr
(14)	NKD224	25,000	16,788	8,212	G. OH	UC Rep	G. OH	Cl & St								
(15)	NKD226	25,000	17,912	7,088	G. OH	G. OH		UC Rep G. OH								
(16)	NKD227	25,000	16,494	8,506	G. OH G. OH	UC Rep	UC Rep G. OH	G. OH								
(17)	NKD228	25,000	15,896	9,104	E. OH	E. OH E. OH	E. OH UC Rep									
(18)	(NKD229)	19,000	17,247	1,753	E. OH E. OH E. OH	E. OH E. OH	E. OH E. OH	E. OH								
Total			**421,187**	**55,813**												
Lahore Repair Facility: Average Total Hours Remaining				**3,101**												
2. Faisalabad Repair Facility																
(1)	NKD253	25,000	23,983	1,017	G. OH		G. OH	UC Rep	G. OH		E. OH					
(2)	NKD255	31,000	30,551	449				E. OH		G. OH		UC Rep		G. OH		
(3)	NKD256	25,000	22,593	2,407				G. OH UC Rep			G. OH					
(4)	NKD259	25,000	24,410	590						G. OH UC Rep	G. OH					
(5)	NKD316	25,000	23,585	1,415			UC Rep E. OH	E. OH UC Rep		E. OH						
(6)	NKD348	25,000	22,745	2,255				G. OH	UC Rep G. OH		E. OH					

Repair Facility	Machine No.	Economic Life	Total Hours	Hours Left	Repair Log (x 1000 hours)											
					8 Hr	10 Hr	12.5 Hr	15 Hr	17.5 Hr	20 Hr	22.5 Hr	25 Hr	27.5 Hr	30 Hr	35 Hr	40 Hr
(7)	NKD351	25,000	22,002	2,998			G. OH	E.OH								
							UC Rep									
(8)	NKD352	27,000	26,418	582		E.OH	E.OH		E.OH	E.OH		E.OH				
										UC Rep						
(9)	C-494	25,000	17,223	7,777	E.OH		E.OH									
					E.OH											
					Up 8Hr	10Hr	12.5Hr	15Hr	17.5Hr	20Hr	22.5Hr	25Hr	27.5Hr	30Hr	35Hr	37.5Hr
(10)	C-538	25,000	16,648	8,352			E.OH	UC Rep								
(11)	(C-542)	12,000	11,834	166	G. OH	G. OH	G. OH									
					G. OH	UC Rep	UC Rep									
					G. OH		G. OH									
					G. OH											
(12)	(C-568)	16,000	15,143	857	E.OH	E.OH										
					E.OH	UC Rep										
					E.OH											
					E.OH											
(13)	(C-575)	13,000	12,520	480	E.OH											
					E.OH											
					E.OH											
					UC Rep											
					Cl & St											
(14)	C-571	25,000	14,282	10,718	G.OH	UC Rep										
					UC Rep	G.OH										
(15)	C-577	25,000	14,728	10,272	E.OH	E.OH	UC Rep									
(16)	(C-560)	14,000	13,394	606	E.OH	E.OH										

Repair Facility	Machine No.	Economic Life	Total Hours	Hours Left	Repair Log (x 1000 hours)											
					8 Hr	10 Hr	12.5 Hr	15 Hr	17.5 Hr	20 Hr	22.5 Hr	25 Hr	27.5 Hr	30 Hr	35 Hr	40 Hr
					E. OH	UC Rep										
					E. OH											
					E. OH											
	(17)	C-561	25, 000	17, 954	7, 046		E. OH	E. OH	UC Rep							
									G. OH							
	Total			**330, 013**	**57, 987**											
	Faisalabad Repair Facility: Average Total Hours Remaining				**3, 411**											
35 machines		Bulldozers			35											
		Total hours remaining			113, 800											
		Average total hours remaining			3, 251											

Note: E.OH = engine overhaul; UCRep = undercarriage repair/replacement; Cl&St: clutch and steering

Machine Nos. NDK229,220 and C-542,568,575 have many logs within 8,000 hours. Internal defects are suspected; these machines are not subject to repair.

MINUTES OF DISCUSSIONS
PREPARATORY STUDY
ON THE PROJECT FOR IMPROVEMENT OF PROVINCIAL AGRICULTURE ENGINEERING WORKSHOPS
IN THE ISLAMIC REPUBLIC OF PAKISTAN

In response to a request from the Government of the Islamic Republic of Pakistan (hereinafter referred to as "the Pakistan"), the Government of Japan (hereinafter referred to as "GOJ") decided to conduct a Preparatory Study on the Project for Improvement of Provincial Agriculture Engineering Workshops (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA") .

JICA sent to the Pakistan the Preparatory Study Team (hereinafter referred to as "the Team"), which is headed by Kyojin Mima, Group Director, Project Management Group II, Grant Aid Department, JICA and is scheduled to stay in the country from 13th June to 16th July, 2004.

The Team held discussions with the officials concerned of the Government of Pakistan described in Annex-1 and conducted a field survey.

In the course of discussions and field survey, both parties confirmed the main items described in the attached sheets.

Islamabad, 22nd June

Kyojin Mima
Leader
Preparatory Study Team
Japan International Cooperation Agency

Mumtaz Ahmad
Additional Secretary
Ministry of Food, Agriculture and Livestock

Muhammad Ashraf Khan
Joint Secretary
Economic Affairs Division,
Ministry of Economic Affairs and Statistics

ATTACHMENT

1. Modification of the contents of the request

The Pakistan side informed that due to restructuring of Agricultural Engineering Unit in Federal Administrative Tribal Areas (FATA), their request shall be considered as withdrawn. However, due to reactivation of Agricultural Engineering Department in the North West Frontier Province (NWFP), the Pakistan side requested to include NWFP workshops in the proposal.

2. Objective of the Project

The Pakistan side explained that the overall goal of the project is to achieve self-sufficiency in food grains while increasing farmers' income by reclaiming/developing cultivable waste land of Pakistan through use of bulldozers (the total size of the cultivable waste land is 9.9 million hectares). Although approximately a total of 70,000 hectares of land is developed in Punjab, Sindh, Balochistan and NWFP provinces every year, it is becoming more and more difficult to keep pace with the high demand of land reclamation/development since most of the bulldozers are old and thus require intensive maintenance. The project is aimed at upgrading main workshops including provision of spare parts for the bulldozers in the four provinces so that the provinces are able to maintain the current level of operation.

The Japanese side requested the background data for the target of bulldozer hours among provinces/districts in order to estimate the target area for the Project.

3. Responsible and Implementing Agency

The responsible agency is Ministry of Food, Agriculture and Livestock.

The implementing agencies are Departments of Agriculture in Punjab, Sindh, Balochistan and NWFP.

4. Target Area

The target area of the Project requested by the Pakistan side is described in Annex-2.

5. Japan's Grant Aid Scheme

5-1 The Pakistan side understands the Japan's Grant Aid Scheme explained by the Team, as described in Annex-3.

5-2 The Pakistan side will take the necessary measures, as described in Annex-4, for smooth implementation of the Project, as a condition for the Japanese Grant Aid to be implemented.

6. Other Relevant Issues

6-1 Counterpart Fund of 2KR

The issue of the utilization of Counterpart Fund of 2KR provided from 1992 to 1998 was discussed. Since the Government of Pakistan is required to report to the Government of Japan on the utilization of the counterpart fund, each province will investigate how the reallocated money was utilized and report the results to the study team by the 16th of July, 2004.

6-2 Sustainability of the Project

The issue of sustainability of the Project was discussed in detail to ensure investment

viability. The provinces were requested to submit concrete proposals to ensure the proper utilization of upgraded workshops through allocation of adequate funds for procurement of spare parts from local resources so as to supplement spare parts proposed under the Project.

The role of private sector in effective and efficient bulldozer operation was acknowledged. It was agreed that the federal as well as provincial governments should take necessary steps to encourage and introduce a self supporting system for bulldozer operation with a view to increasing institutional efficiency in the long run.

6-3 Technical Assistance

The Pakistan side requested that if workshops are upgraded in the framework of the Project, technical assistance such as on-the-job training be provided by JICA in order to make sure of proper utilization of the procured machinery/equipment.

6-4 Farmland Development

The Japanese side suggested that availability of water resources be taken into consideration in farmland reclamation and development. In order to efficiently utilize limited water resources, water saving irrigation techniques and facilities to conserve rains fall or flood water should be widely introduced.

6-5 Distribution of land for landless peasants

The provinces shall provide the plan, if any, of distribution of land to landless peasants along with the details of development for sustainability of the program by the 16th of July, 2004.

6-6 Evaluation of the Request

JICA will assess the appropriateness of the request based on the results of the Study by consultants conducted until 16th of July and will report the findings to the Government of Japan.

ANNEXES:

Annex-1 List of Participants of the Meeting on Minutes of Discussion
Annex-2 Requested Target Area of the Project
Annex-3 Japan's Grant Aid
Annex-4 Major Undertakings to be taken by Each Government

Annex-1 List of Participants

Pakistan Side

1. Mr. Mumtaz Ahmad
   Additional Secretary, Ministry of Food, Agriculture and Livestock (MINFAL)
2. Mr. Abdul Karim Chaudhry
   Director General, MINFAL
3. Dr. Muhammad Rafiq-ur-Rafman
   Director General, Department of Agriculture, Punjab
4. Mr. Saifullah Khan
   Director, Agricultural Engineering, NWFP
5. Mr. Abdul Razaque Langove
   Superintending Engineer, Agricultural Engineering Department, Balochistan
6. Mr. Irsad Ahmed Ansari
   Deputy Director, Agricultural Engineering, Sindh

Japanese Side

1. Mr. Kyojin Mima
   Leader, Preparatory Study Team
2. Ms. Yoko Maeda
   Project Coordinator, Preparatory Study Team
3. Mr. Hiroei Ishihara
   Farm Land Development Plan, Preparatory Study Team
4. Mr. Akira Mutsuda
   Workshop and Machinery Survey, Preparatory Study Team
5. Mr. Shinichi Mori
   Maintenance and Management Planning, Preparatory Study Team
6. Mr. Mahmood A. Jilani
   Deputy Resident Representative/ Chief Programme Officer, JICA Pakistan Office

Annex-2 Requested Target Area of the Project

Punjab Province

Name of workshops proposed to be upgraded	Area (districts) of bulldozer operation to be served by the workshop
Bahawalpur	Bahawalpur
	Rahim Yar Khan
	Bahawalnagor
Multan	Multan
	Khanewal
	Vehari
	Sahiwal
	Lodhran
	Pakpattan
	Dera.Ghazi. Khan (D.G.Khan)
	Muzaffargarh
	Rajanpur
	Layyah
Faisalabad	Faisalabad
	Jhang
	Toba Tek Singh
	Sargodha
	Khushab
	Bakkar
	Mianwali
Lahore	Lahore
	Sheikhupura
	Kasur
	Okara
	Gujranwala
	Hafizabad
	Mandi Bahauddin
	Sialkot
	Gujrat
	Narowal

Talagang	Chakwal
	Jhelum
	Attock

Sindh Province

Name of workshops proposed to be upgraded	Area (districts) of bulldozer operation to be served by the workshop
Hyderabad	Hyderabad
	Sanghar
	Mirpurkhas
Khairpur	Khairpur
	Nawabshah
	Nausharo-feroz
Sukkur	Sukkur
	Shikarpur
	Landhkot
	Jacobabad
	Ghotki

Balochistan Province

Name of workshops proposed to be upgraded	Area (districts) of bulldozer operation to be served by the workshop
Quetta	Quetta
	Pishin
	Killa Abdullah
	Chaghi
	Loralai
	Barkhan
	Musa Kheli
	Zhob
	Killa Saifullah
	Sibi
	Ziarat
	Kohlu
	Dera Bugti

	Nasirabad
	Jaffarabad
	Jhal Magsi
	Bolan(Kachhi)
Khuzdar	Mastung
	Kalat
	Khuzdar
	Awaran
	Kharan
	Lasbela
Turbat	Turbat
	Gawadar
	Panjgur

North West Frontier Province (NWFP)

Name of workshops proposed to be upgraded	Area (districts) of bulldozer operation to be served by the workshop
Tarnab	Peshawar
	Nowshera
	Charsadda
	Mardan
	Swadi
	Haripur
	Malakand
	Swat
Dera Ismail Khan (D.I.Khan)	D.I. Khan
	Tank
	Lakki
	Bannu
	Karak
	Kohat

Annex-3 Japan's Grant Aid

The Grant Aid Scheme provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid procedures

Japan's Grant Aid Scheme is executed through the following procedures:

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Government of Japan and the recipient country)

Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.

Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).

Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Scheme, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.

Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes (E/N) signed by the Government of Japan and the recipient country.

Finally, for the smooth implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

1) Contents of the Study

The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

- Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
- Confirmation of items agreed upon by both parties concerning the basic concept of the Project.
- Preparation of a Basic Design of the Project
- Estimation of cost of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid Project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.

The Government of Japan requests the Government of the recipient country to take whatever measures is necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firm(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is (are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

1) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

2) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as natural disaster, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

3) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

4) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

5) Undertakings required to the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

① To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction,

② To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

③ To secure buildings prior to the procurement in case the installation of the equipment,

④ To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.

⑤ To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified contracts.

⑥ To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

6) "Proper Use"

The recipient country is required to operate and maintain the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

7) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

8) Banking Arrangements (B/A)

a) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

Annex-4 Major Undertakings to be taken by Each Government

№	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To bear following commissions to the Japanese bank for banking services based upon the B/A		
	1) Advising commission of A/P		●
	2) Payment commission		●
2	To ensure unloading and customs clearance at port of disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan the recipient	●	
	2) Tax exemption and custom clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	(●)	(●)
3	To accord Japanese nationals, whose service may be required in connection with the supply of the products and the services under the verified contract, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work		●
4	To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the supply of the products and services under the verified contracts		●
5	To maintain and use properly and effectively the facilities contracted and equipment provided under the Grant Aid		●
6	To bear all the expenses, other than those to be borne by the Grant Aid, necessary for the transportation and installation of the equipment		●