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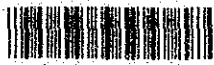
BASIC DESIGN STUDY REPORT
ON
THE PROJECT
FOR
AGRICULTURAL DEVELOPMENT
IN
NASIRABAD
(PILOT PROJECT)
THE ISLAMIC REPUBLIC OF PAKISTAN

JANUARY 1988

JAPAN INTERNATIONAL COOPERATION AGENCY

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国際協力事業団		
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P R E F A C E

In response to the request of the Government of the Islamic Republic of Pakistan, the Government of Japan has decided to conduct a basic design study on the Project for Agricultural Development in Nasirabad, Baluchistan and entrusted the study to the Japan International Cooperation Agency (JICA). The JICA sent to Pakistan a study team headed by Mr. Nobuyoshi Sakino, Deputy Director, Construction Department, KINKI Regional Agricultural Office, Ministry of Agriculture, Forestry and Fisheries, from September 7 to October 6, 1987.

The team had discussions on the Project with the officials concerned of the Government of Pakistan and conducted a field survey in Nasirabad area. After the team returned to Japan, further studies were made, a draft report was prepared and a mission to explain and discuss it was dispatched to Pakistan. As a result, the present report has been prepared.

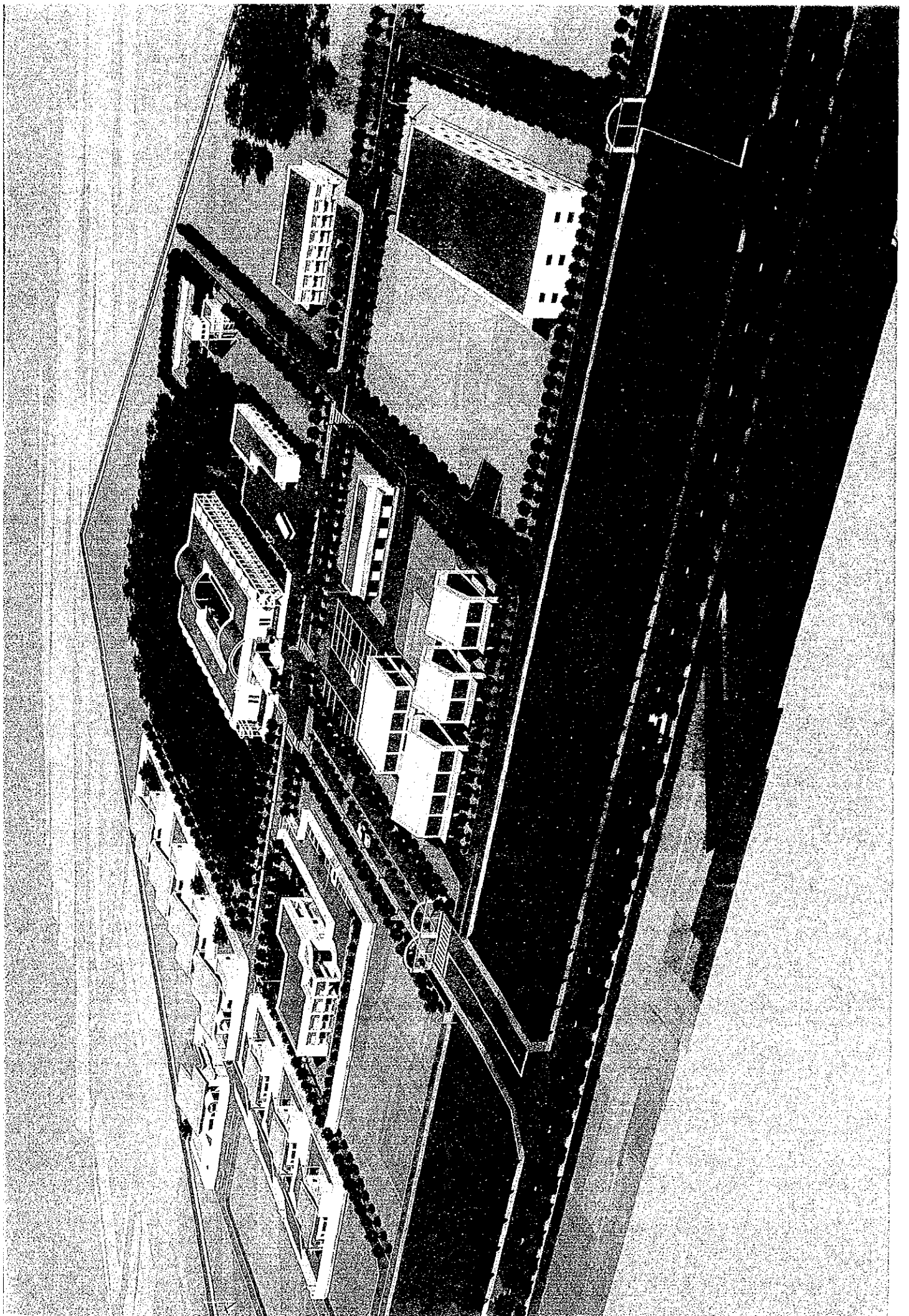
I hope that this report will serve for the development of the project and contribute to the promotion of friendly relations between our two countries.

I wish to express my deep appreciation to the officials concerned of the Government of the Islamic Republic of Pakistan for their close cooperation extended to the team.

January, 1988

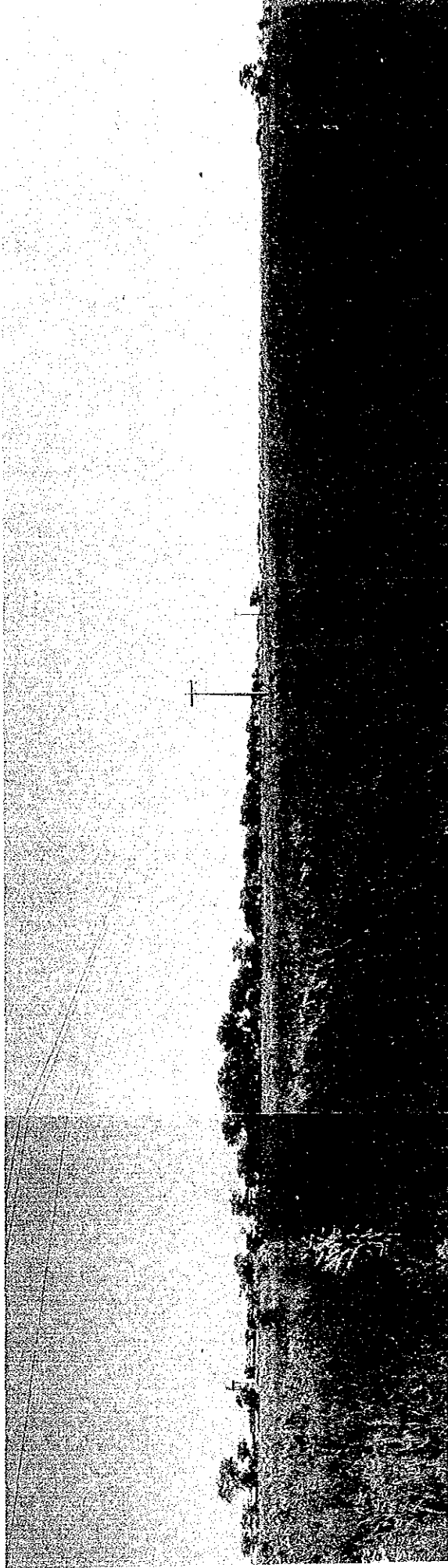


KENSUKE YANAGIYA
President
Japan International Cooperation Agency



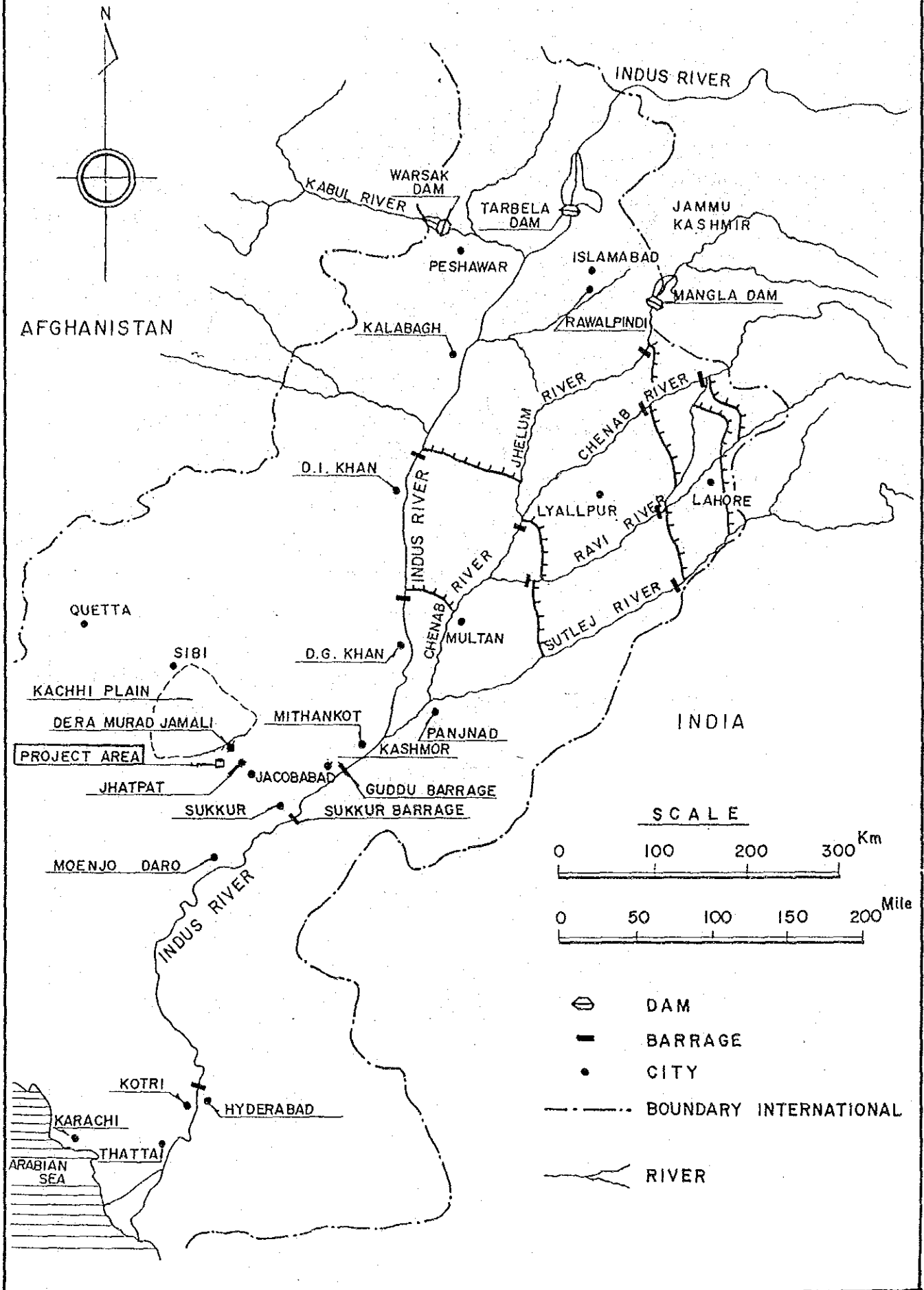


PRESENT CONDITION OF PROPOSED FARM SITE



PRESENT CONDITION OF PROPOSED BUILDING SITE

LOCATION MAP



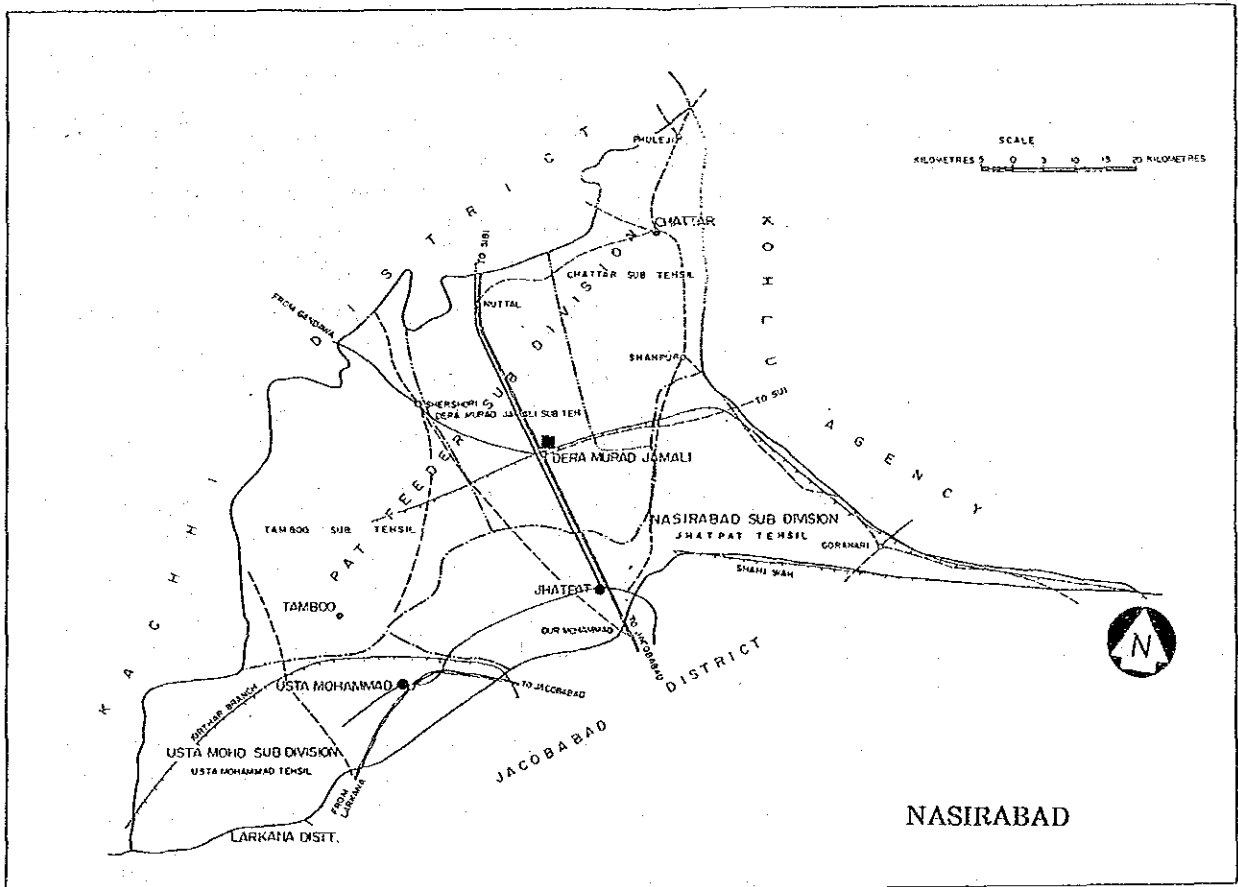
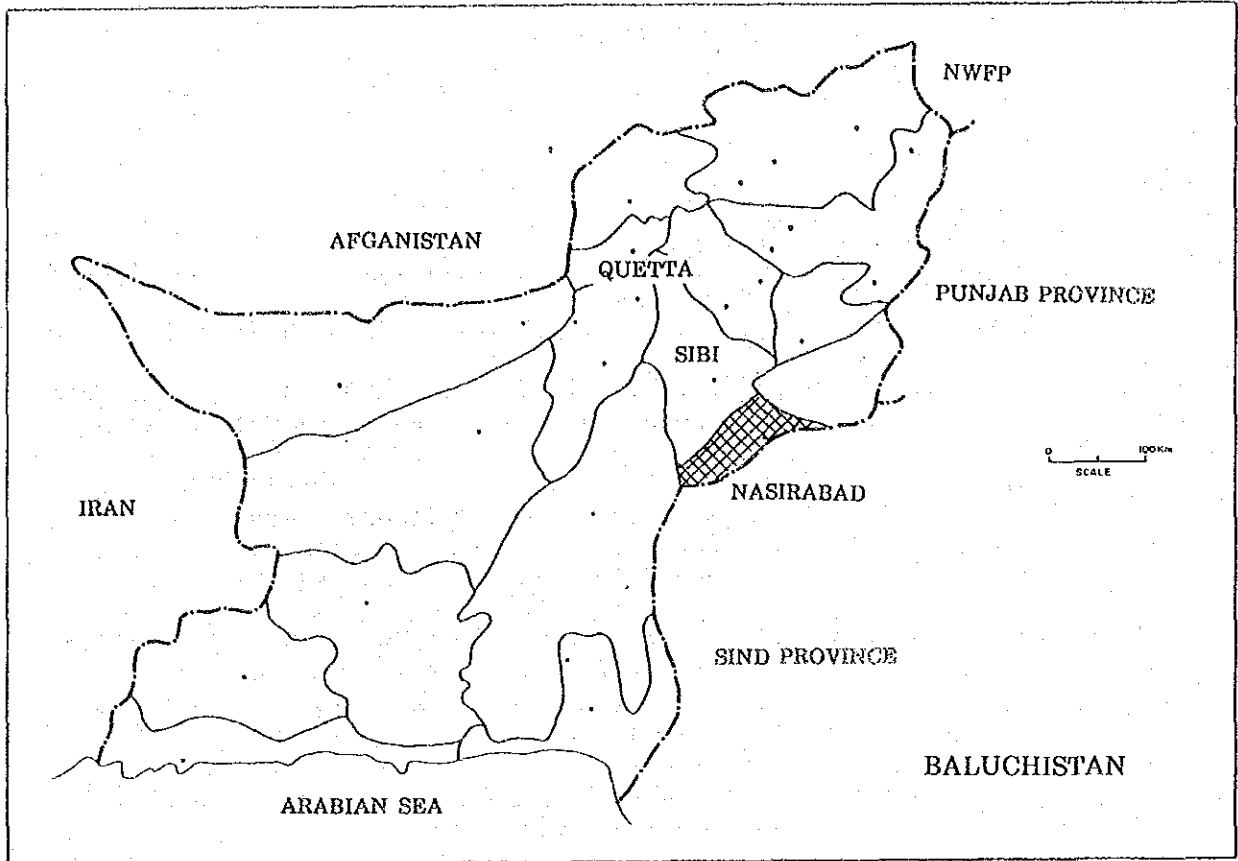


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S U M M A R Y

Since its independence in 1947, the Government of Islamic Republic of Pakistan has made efforts to promote the agricultural development through a series of national development plans. The agricultural products such as rice, cotton and cotton yarn are earning a major portion in the exports of the country. Owing to the development of agriculture sector, the net area sown has increased from 14.69 million hectares in 1947 to 20.61 million hectares at present. The self-sufficiency ratio of wheat and rice has increased and rice have become one of the major exporting products. However, the self-sufficiency ratios of edible oils, tea and sugar are still low.

The Fifth National Development Plan has set an accelerated development of Baluchistan as its objective. Special budget allocation for the implementation was provided to the Province each year. As a result, the provincial development programme is projected to increase the budget at an annual rate of 16 percent, whereas the national average is 12.6 percent. In addition, the programme is provided to meet some more essential requirements in the fields of irrigation, energy, industries and transport.

Baluchistan Province, having 43.6 percent of the total national land area, occupies 3.6 percent of the net area sown to the national total. Nasirabad District is an important agricultural area in Baluchistan Province, particularly in south of the Pat Feeder Canal which occupies 44.9% of the net area sown in the Province.

	Land Area		Net Area Sown	
	sq.km	%	sq.km	%
National Total	796,095	100	156,100	100
Baluchistan	347,196	43.6	5,630	3.6
Nasirabad	5,830	0.7	2,530	1.6

The irrigated agriculture is practised in the southern part of the Nasirabad District by obtaining water from the Pat Feeder Canal and Kirthar Canal. The amount of irrigation water in the Pat Feeder Canal is not sufficient as compared with the cultivable commanded area in the Canal; hence, an effective irrigated agriculture could not be practised. Therefore, the Pat Feeder Rehabilitation and Improvement Project has been set up to develop an economical irrigated agriculture and to increase the agricultural production.

The Feasibility Study for Pat Feeder Canal Widening Project was carried out by the Japan International Cooperation Agency (JICA) in response to the request by the Government of Pakistan. Subsequently, the Project was carried out by the Asian Development Bank under technical assistance.

The Pat Feeder Canal is planned to be widened and improved under the co-finance by the Asian Development Bank and Overseas Economic Cooperation Fund, Japan. It is scheduled to be completed in 1993. Upon completion of the improvement works, the Pat Feeder Canal will increase its discharge capacity to 6,700 cfs (189.61 cu.m/s).

The Government of Pakistan requested the Government of Japan for grant-aid cooperation to construct a Pilot Farm for agricultural development in the Area. In response to the request, JICA dispatched a preliminary survey team of the Pilot Farm to Pakistan to confirm the request and survey the project from February 14 to February 28, 1987. As a result, the Basic Design Study Team was dispatched to the field from September 7, 1987 to October 6, 1987. The study team was engaged in the works to confirm the details of the request and the background of the Project, justify the grant-aid cooperation, investigate the proposed site, study the Pakistan Government's organization for Project execution as well as for Operation and Maintenance of the Project after completion, and to look into the condition of the local construction industry. The study team was again dispatched to Pakistan to explain the Draft Final Report which has been prepared at home office (Japan) and agreed upon by the Government of Pakistan.

After the home office works, based on the field works, the following basic plans for the Pilot Farm were determined:

- 1) Adoptability tests for those crop varieties to be introduced.
- 2) Demonstration of modern farming method including mechanized irrigation system.
- 3) Trial of effective water management system.
- 4) Training of government officials, extension workers and local farmers; and,
- 5) Seeds production.

The following facilities will be constructed in the land which the Department of Livestock has given to the Department of Agriculture in Baluchistan. The land consists of 1,152 acres (466.56 ha) for the on-farm facilities and 33 acres (13.36 ha) for the building facilities.

On-Farm Facilities:

Trial Farm	120 ac (48.60 ha)
Training Farm	80 ac (32.40 ha)
Demonstration Farm:	
Gravity Irrigation Farm	63 ac (25.52 ha)
Mechanized Irrigation Farm.....	57 ac (23.08 ha)
Seed Production Farm	600 ac (243.0 ha)
Canals, roads, etc.	232 ac (93.96 ha)
<u> Total</u>	<u>1,152 ac (466.56 ha)</u>

- Notes: 1) 368 ac (149.04 ha) or 40% of the total farm area 920 ac (372.6 ha) will be remained fallow lands.
- 2) The equipment and devices to be installed in the mechanized irrigation farms are pumps, filters, pipelines, semi-fix type sprinklers, portable sprinklers, including trickle irrigation system and rainguns system, etc.

Building Facilities:

- Main Office Building: Project Directors room, Office room, Laboratory, Lecture rooms, etc.
- Guesthouse for Lecturers: Bedrooms and other lodging facilities for guest lecturers.
- Dormitory for Trainees: Bedrooms and other lodging facilities for trainees.
- Garage: Storage of vehicles.
- Storage for Agri-chemicals and Fertilizers: Storage capacity of 160 tons of fertilizers and 320 cu.m of agri-chemicals.
- Garage/Shelters and Workshop: Garage/Shelter for farming machineries to be used on the farm plots, and workshop for repairing of the machineries as well as for training of Operation and Maintenance of machineries.
- Seeds Processing Plant: Drying and sorting plant for seeds of rice, sunflower and pulses produced.
- Staffhouses: Houses for the Executive staff of Pilot Farm.
- Water Supply Facility: Facility to supply drinking water for office, guesthouse, dormitory, houses, etc.
- Fuel Supply Station: Facilities with pumps to store and supply fuel for farming machineries and other vehicles.
- Other Facilities: Roads, parking areas, etc.

The establishment of the Nasirabad Pilot Farm has been approved as one of the Special Development Programs (SDP) by the Executive Committee of the National Economic Council of the Pakistani Federal Government. And the Governmental organizations and agencies concerned with the proposed Pilot Farm are as follows:

- Sponsoring Agency: Department of Planning and Development,
Baluchistan Province
- Executing Agency : Department of Agriculture, Baluchistan Province
Operation & Main-
- tenance Agency: Department of Agriculture, Baluchistan Province

The Director General of the Department of Agriculture, Baluchistan Province, has set up the Project Office for the Nasirabad Pilot Farm and assigned a qualified personnel as a Director of the Project. The Pilot Farm Project Office will be fully responsible in carrying out the various missions for project execution and operation as well as the maintenance of the Project.

The detailed design and construction supervision will be carried out by a qualified Japanese consultants based on the contract with the Department of Agriculture. The construction works shall be performed by a registered contractor in Japan.

The Department of Agriculture, Baluchistan Province, shall be fully responsible for carrying out the operation and management of the Project after completion, and a functional organization is considered as follows:

It is expected that the SDPs will be given preference with the Operation and Maintenance costs by both the Federal and the Provincial Governments after completion of the Project. The Nasirabad Pilot Farm Project, which is designated as one of the SDPs, will also be preferentially given the O & M costs by both governments.

The Pilot Farm Project does not generate benefits by itself. Unless there is no support by Pilot Farm Project, the agricultural development in Nasirabad District by rehabilitation and improvement of the Pat Feeder Canal will be decreased in its benefits or delay in generation of its benefits. Taking these facts into consideration, Pilot Farm Project will rather be highly evaluated. Therefore, it is deemed quite justifiable and appropriate that the Government of Japan should extend grant-aid cooperation to the Nasirabad Agricultural Development by implementing the Pilot Farm Project.

Furthermore, higher effects of the Project will essentially be required, in order to secure adequate operation and management of the Pilot Farm, well-qualified experts, and education/training of the necessary personnel.

CHAPTER I INTRODUCTION

CHAPTER I. INTRODUCTION

The Government of the Islamic Republic of Pakistan has launched a plan to rehabilitate and improve the Pat Feeder Canal and Kirthar Canal in Nasirabad District where irrigated agriculture has been well diffused in Baluchistan Province. The Pat Feeder Canal Rehabilitation and Implementation Project was co-financed by the Asian Development Bank (ADB) and the Overseas Economic Cooperation Fund (OECF), Japan. The overall improvement of the main and distributary canals is scheduled to be completed in 1993.

The Pat Feeder Canal Rehabilitation and Implementation Project, if completed, will bring a remarkable improvement in the irrigation water distribution in Nasirabad District. Successful irrigated agriculture, however, essentially requires not only the increase in amount of water but also the improvement of farm management, selection of suitable crop varieties, establishment of effective on-farm water management system, etc. Under the circumstances, the Government of Pakistan plans to establish a pilot farm in Nasirabad District and to this end, the Government of Pakistan made a request to the Government of Japan for grant-aid cooperation of the pilot project.

In response to the request, Japan International Cooperation Agency (JICA) dispatched a preliminary survey team to Pakistan from February 14 to February 28, 1987 to confirm the request and technical survey on the proposed pilot farm. According to the results of the preliminary survey, JICA sent a Basic Design Study Team to the field from September 7 to October 6, 1987, to confirm the details of the request and the background of the Project, justify the grant-aid cooperation, investigate the proposed site to study the Pakistan Government's organization for project execution as well as for Operation and Maintenance of the Project after completion, and to look into the condition of the local construction industry and to discuss the scope of the works under the Japanese grant-aid with the officials concerned of the Government of Pakistan.

This Report covers the results of the studies made on the data available through field investigations, and appends the lists of the study teams, important personnel contacted and the copies of the minutes of discussions signed in Pakistan.

CHAPTER II BACKGROUND

CHAPTER II. BACKGROUND

2.1. General Conditions of Pakistan

2.1.1. Land Area and Population

(1) Land Area

The land area of Pakistan extends from Lat. 23°30'N to Lat. 36°45'N and from Long. 65°E to Long. 75°31'E, with distance of about 1,600 km for north-south and about 885 km for east-west. The national land area is administratively divided into four provinces: Baluchistan, Punjab, Sind and North West Frontier Province. The total land area is about 796,095 sq.km. and agricultural land is 317,100 sq.km equivalent to 39.8 percent. The cultivated land (net area sown) is 15.61 million hectare equivalent to 49.2 percent of agricultural land.

Baluchistan Province occupied 43.6 percent of the total land of Pakistan. Cultivated area in Baluchistan is 563,000 ha, of which 44.9 percent (253,000 ha) belonged to Nasirabad District. Toward this end, Nasirabad District is considered an important agricultural zone in Baluchistan Province.

Table 2-1. Agricultural Land in Baluchistan

Division	Total Land Area	Agricultural Area	Cultivable Waste Land	(Unit: '000 ha)		
				Current Fallow	Net Area Sown	Ratio
Whole Pakistan	79,610	31,710	11,100	5,000	15,610	-
Quetta	11,051	940	580	256	104	18.5%
Shibi	4,400	1,068	376	365	327	58.1
Nasirabad District	(583)	(330)	(13)	(64)	(253)	(44.9)
Karat	13,803	4,014	3,665	235	114	20.2
Mekaran	5,465	247	180	49	18	3.2
Total of Baluchistan	34,719	6,269	4,801	905	563	100.0

Source: Economic Survey, 1986-87 and Agricultural Statistics Baluchistan, 1985-86

(2) Population

The population of Pakistan based on the 1981 census was 84.25 million. According to the population censuses of 1972 and 1981, the population of the country in early 1987 was assumed to be about 100 million. The population of each province and Nasirabad District were tabulated in Table 2-2 below.

Table 2-2. Population of Provinces

<u>Province/Districts</u>	<u>Population</u> ('000 persons)
Punjab Province	47,632
Sind Province	19,029
Baluchistan Province	4,332
North West Frontier Province	13,260
National Total	<u>84,253</u>
Nasirabad District	<u>394</u>

Source: Population Census, 1981.

- Note: 1) North West Frontier Province includes the data of FATA.
2) The population census include the number of persons who are working abroad.

The labor population of Nasirabad was 124,082, of which 90 percent is engaged in agricultural sector according to the population census of 1981. Nasirabad is considered an agri-industrial zone. The age distribution of labor population and agricultural labor are as shown as follows:

Table 2-3. Labor Population and Agricultural Labor

<u>Age</u>	<u>Total</u> <u>Population</u>	<u>Labor</u> <u>Population</u> (A)	<u>Agricultural</u> <u>Labor</u> (B)	<u>B/A</u>
0-10	129,672	-	-	-
10-24	106,931	47,946	43,912	91.6%
25-59	131,948	63,453	55,186	87.0%
60 or over	25,903	12,683	11,767	92.8%
Total	<u>394,454</u>	<u>124,082</u>	<u>110,865</u>	<u>89.3%</u>

Source: Population Census, Nasirabad, 1981.

2.1.2. National Economy

The Gross National Products (GNP) of Pakistan for the fiscal 1986/87 is about Rp. 573,100 million and the GNP per capita is about Rp. 5,692 or US\$325.76. Production of the major industries and their shares in the GNP are shown in the following table, which clarifies that the agricultural sector gains a large share and is an important industry of the country.

Table 2-4. Sector-wise Production

(Unit: Million Rupees)

<u>Industries</u>	<u>Production</u>	<u>Share in GDP</u>	<u>Share in GNP</u>
Agriculture	83,767	15.6%	14.6%
Livestock Breeding	39,574	7.4	6.9
Fisheries	3,732	0.7	0.7
Forestry	400	0.1	0.1
Mining	12,616	2.3	2.2
Manufacturing	95,079	17.7	16.6
Commerce	89,420	16.6	15.6
Others	212,687	39.6	37.0
(GDP)	537,275	100.0	(93.7)
Net Income from Abroad	35,871	6.7	6.3
Total GNP	<u>573,146</u>	<u>106.7</u>	<u>100.0</u>

Source: Economic Survey, 1986-87.

The major export-oriented products of Pakistan are cotton, cotton yarn, cotton cloth, etc., whose shares in the total export value are more than 40 percent.

On the other hand, major import items are machineries, crude petroleum and petroleum products, transportation facilities, followed by edible oil, wheat and pulses. Table 2-5 shows the international trade balance from fiscal 1975/76.

Table 2-5 Major Import and Export

(Unit : Million Rs)

Year	Export					Import										Total	Balance
	Rice	Raw Cotton	Cotton Yarn	Cotton Cloth	Textiles	Others	Total	Petroleum & Products	Machines	Transport Equipment	Chemicals	Edible Oil	Grain & Pulses	Others			
1975-76	2,479	981	1,422	1,359	34	4,978	11,253	3,744	2,797	1,353	483	1,047	1,792	9,249	20,465	-9,212	
1976-77	2,478	292	1,172	1,603	36	5,713	11,294	4,083	3,312	2,016	550	1,478	665	10,908	23,012	-11,718	
1977-78	2,409	1,102	1,060	1,741	154	6,514	12,980	4,918	4,147	1,635	648	1,553	1,339	13,575	27,815	-14,835	
1978-79	3,380	655	1,956	2,135	65	8,734	16,925	5,247	4,251	2,474	815	2,953	3,507	17,141	36,388	-19,463	
1979-80	4,179	3,321	2,038	2,416	54	11,402	23,410	10,685	5,590	4,903	895	2,295	1,050	21,511	46,929	-23,519	
1980-81	5,602	5,203	2,050	2,390	1,272	12,763	29,250	15,199	5,684	4,686	2,413	2,625	637	22,300	53,544	-24,264	
1981-82	4,123	2,938	2,075	2,949	245	13,932	26,270	18,046	6,845	5,170	2,699	3,450	806	22,466	59,482	-33,212	
1982-83	3,683	3,897	3,146	3,579	2,798	17,339	34,442	20,529	9,312	5,424	3,423	3,670	880	24,913	68,151	-33,709	
1983-84	5,688	1,772	2,931	4,856	1,452	20,690	37,359	19,161	10,828	6,307	4,587	6,518	866	28,440	76,707	-39,368	
1984-85	3,340	4,368	3,974	4,633	636	21,023	37,979	21,763	13,437	7,816	5,604	6,954	2,910	31,294	89,778	-51,799	
1985-86	5,527	8,291	4,511	5,083	802	25,378	49,592	16,775	14,955	9,178	6,610	6,128	5,067	32,233	90,946	-41,354	
Jul-Mar																	
1985-86	3,974	5,907	3,215	3,781	408	17,996	35,281	14,302	10,784	5,901	4,411	5,070	3,652	22,556	66,676	-31,392	
1986-87	3,691	5,166	5,803	4,123	1,704	23,858	44,345	9,982	11,079	6,366	5,906	3,167	1,489	28,050	66,039	-21,694	

(Source : Economic Survey 1986-87)

Table 2-6 Gross National Product

(Unit : Million Rs)

Year	Agriculture	Livestock	Fishing	Forest	Mining	Manu- facturing	Whole Sale & Retail Trade	Others	GDP	Netfactor Income from Abroad	GNP	Population	GNP Per Capita
1975/76	26,602	11,130	447	159	968	17,812	18,865	43,753	119,736	2,992	122,728	72.12	1,702
1976/77	29,645	13,356	675	292	1,281	20,389	21,051	49,293	135,982	5,480	141,462	74.33	1,903
1977/78	34,920	14,272	964	411	1,317	24,023	24,983	59,035	159,925	12,139	172,064	76.60	2,246
1978/79	37,815	14,822	1,065	445	1,464	27,484	28,381	66,562	178,038	14,533	192,571	78.94	2,439
1979/80	43,993	16,668	1,017	486	2,239	33,553	33,759	78,887	210,602	18,284	228,886	81.36	2,813
1980/81	51,557	18,090	1,523	529	3,149	40,969	40,592	91,187	247,596	22,692	270,288	83.84	3,224
1981/82	60,230	20,761	2,044	391	3,578	48,419	49,738	104,673	289,834	25,349	315,183	86.44	3,646
1982/83	64,024	23,846	2,493	352	4,199	55,201	55,031	121,044	326,190	39,395	365,585	89.12	4,102
1983/84	61,693	27,450	2,681	341	5,086	67,475	61,559	146,463	372,748	39,595	412,343	91.88	4,488
1984/85	72,817	32,134	3,544	378	7,153	75,030	72,173	167,660	430,889	38,311	469,200	94.73	4,953
1985/86	78,901	35,709	3,669	391	11,448	83,670	81,045	190,377	485,210	41,359	526,569	97.67	5,391
1986/87	83,767	39,574	3,732	400	12,616	95,079	89,420	212,687	537,275	35,871	573,146	100.70	5,692

(Source : Economic Survey 1986-87)

2.2. Outline of Agricultural Development

2.2.1. Agriculture in Pakistan

The 1981 population census in Pakistan showed that the rural population of the country was about 60.41 million, which accounted for about 71.7 percent of the national total. The cultivable land was about 20.61 million hectares, equivalent to about 25.9 percent of the total land area of the country.

The agricultural sector excluding livestock breeding and fisheries occupies about 15.6 percent of the Gross Domestic Products (GDP) and plays a vitally important role in the national industries.

Table 2-7. Cropping Acreage of Major Crops

<u>Crops</u>	<u>Cropping Acreage</u> (<u>'000 ha</u>)	<u>Production</u> (<u>'000 ton</u>)
Wheat	7,403	13,923
Rice	1,863	2,919
Maize	804	1,009
Barley	189	134
Mungbeans	1,033	586
Beans	419	211
Sugarcane	780	27,856
Oil Seed Crops	351	250
Sesame	37	15
Cotton	2,364	1,208
Tobacco	46	78

Source: Economic Survey, 1986-87.

The Pakistani agriculture has placed emphasis mainly on production increase of the existing export crops and those crops of wheat, vegetable oil seeds for reducing the amount of imports, and the target growth rate of the GDP of the agriculture sector in the Five-Year Plan is estimated at 4.4 percent.

2.2.2. Agriculture in Baluchistan Province and Nasirabad District

The cultivated land in Baluchistan Province shares 3.6 percent of Pakistan's cultivated land. The cultivated land in Nasirabad District is 253,000 ha and occupied 44.9 percent of Baluchistan's and 1.6 percent of Pakistan's. Nasirabad District is a very important agricultural zone for the Baluchistan Province, wherein irrigation is provided by Pat Feeder Canal and Kirthar Canal.

Major crops cultivated in Nasirabad are wheat, rice, beans, and oil seed crop. These crops share 40 to 50 percent of cultivated area in Baluchistan except rice (96 percent) and beans (100 percent). Yield of crops in Nasirabad is quite low as compared with average yield in Baluchistan (refer to Table 2-8). Thus, the Pat Feeder Canal Rehabilitation and Improvement Project was commenced to increase the sowing area and yield of crops by increase of irrigation water.

However, there is no organization managing the improvement of cultivation practice, establishment of soil improvement, crop selection for Nasirabad and their seed production in the Nasirabad District. Field assistants, who extend to the farmer the practice established by the organization, account only 51 persons, and their duties are not only extension services to the farmers but also selling fertilizer, administrative works, etc. Because of shortage of field assistants and working hours for the extension, field assistance was not carried out effectively.

Table 2-8. Major Crop and Net Area Sown

<u>Crop</u>	<u>Baluchistan</u>		<u>Nasrabad</u>	
	<u>Net Area Sown</u> (<u>'000 ha</u>)	<u>Production</u> (<u>'000ton</u>)	<u>Net Area Sown</u> (<u>'000 ha</u>)	<u>Production</u> (<u>'0000ton</u>)
Wheat	247.6	412.7	106.4	232.2
Rice	94.1	255.2	90.8	250.0
Maize	4.9	3.7	0	0
Barley	13.3	10.8	2.0	1.9
Mungbeans	-	-	-	-
Beans	27.2	19.1	27.2	19.1
Sugarcane	0.4	14.9	0.2	8.1
Oil Seed Crops	36.4	25.0	16.2	9.6
Sesame	2.3	1.1	1.8	0.9
Cotton	0.6	0.2	0	0
Tobacco	1.4	3.0	-	-
Fodder Crop	10.7	318.9	1.7	49.0
Vegetable	8.7	115.1	0.1	1.5
Orchard	38.5	328.8	0.2	0.9

Source: Agricultural Statistics, Baluchistan, 1985-86.

2.3. Outline of the Related Projects

2.3.1. National Development Projects

The Islamic Republic of Pakistan, since its independence in 1947, has made six (6) national development plans and steadily implemented. The target growth of the GDP in each development plan and the achievement are tabulated as follows:

Table 2-9. National Development Plans

<u>Development Plan</u>	<u>Period</u>	<u>GDP</u>		<u>Remarks</u>
		<u>Target</u>	<u>Achievement</u>	
Pre-development period:	1949/50-54/55	-	3.1	
1st National Dev. Plan	1955/56-59/60	2.8	3.1	
2nd National Dev. Plan	1960/61-64/55	4.7	6.8	Food production increase by 27% and manufacturing by 61%
3rd National Dev. Plan	1965/66-69/70	6.5	6.7	Trouble between India/Pakistan and bad weather
4th National Dev. Plan	1970/71-76/77	-	3.9	GNP growth rate was started by 6.5% per annum, but given up by independence of Bangladesh in April 1971.
5th National Dev. Plan	1978/79-82/83	7.0	6.6	The achievement was fairly made in spite of the 2nd energy crisis.
6th National Dev. Plan	1978/79-87/88	6.5	6.9*	Stress was placed on utilization of private vitality and social development.

Source: Economic Survey, 1986-87.

The fiscal 1987 is the last year of the Sixth Five-Year Development Plan. The budget of the agricultural sector is about 3.7 percent of the total, which covers approximately 37.8 percent of the whole production sector.

Since its independence, six developments had been launched and the cultivable land had been increased from 1,466,000 ha to 2,061,000 ha as at present. As a result, self-sufficiency ratio of wheat and rice has increased and rice has become one of the major exporting products. However, the self-sufficiency ratios of edible oil, tea, and sugar are still low.

2.3.2. Special Development Program

In Pakistan, development projects are generally planned and implemented in following the procedures that an executing body shall prepare a plan, which shall be submitted through the Provincial Government to the Executive Committee of National Economic Council (ECNEC) presided by Minister of Finance of the Federal Government for obtaining the approval as a Special Development Program (SDP).

The Project (so-called Pat Feeder Pilot Project in Pakistan), has become a SDP by the approval of ECNEC. The Pat Feeder Canal Rehabilitation and Improvement Project is also SDP.

2.3.3. The Pat Feeder Canal Rehabilitation and Improvement Project

In response to the request of the Government of Pakistan, JICA carried out the feasibility study of the Pat Feeder Canal Widening Project in 1982, while ADB gave its technical assistance to Pakistan for the said project in 1985 after the Japanese feasibility study prepared by JICA.

As a result, the cropping intensity was projected, as shown in Table 2-10 and the incremental benefits were estimated, as shown in Table 2-11. The project implementation is co-financed by ADB for the costs of consulting services and civil works, and OECF, for the costs of mapping works and procurement of equipment and machineries for the operation and maintenance of the facilities.

According to the PC-1 prepared by Water and Power Development Authority in February 1986, the civil works for the main and distributary canals will be completed by the end of 1991, while the drainage canals, by the end of 1992. The Pat Feeder Rehabilitation and Improvement Project will be completed by the end of 1993 because of the delay of the loan agreement with the OECF by about one year.

Table 2-10. Present and Planned Crop Intensity

	<u>Crop</u>	<u>Present</u>	<u>Planned</u>
<u>KHARIF</u>	Rice	21.2%	7.8%
	Sorghum	9.2	8.4
	Oilseeds	0.8	11.6
	Fodder	-	5.0
	Cotton	-	25.3
	Sub-Total	31.2	58.1
<u>RABI</u>	Wheat	30.9	20.0
	Oilseeds	2.7	3.0
	Fodder	4.0	4.0
	Dubari Gram	3.0	6.9
	Others	5.0	-
	Sub-Total	45.6	33.9
TOTAL	76.8	92.0	

(Source: PC-1 Pat Feeder Canal Project)

Table 2-11. Planned Incremental Benefit

(Unit : Million Rs)

Years	<u>With Project</u>			<u>Without Project</u>			Incremen- tal Benefits
	GVP	Production Cost	NVP	GVP	Production Cost	NVP	
1986-87	469.2	352.4	116.8	496.2	352.4	116.8	-
1987-88	489.4	357.7	131.7	489.4	357.7	131.7	-
1988-89	499.9	361.7	138.2	499.9	361.7	138.2	-
1989-90	517.3	366.0	151.3	517.3	366.0	151.3	-
1990-91	559.9	361.6	198.3	522.7	384.8	137.9	60.4
1991-92	618.0	367.1	250.9	518.7	395.8	122.9	128.0
1992-93	682.1	390.8	291.3	514.4	404.8	109.6	181.7
1995-96	897.1	438.9	458.2	510.4	437.8	72.6	385.6
2000-01	1149.4	499.4	650.0	502.3	477.2	25.1	624.9
2005-06	1149.4	499.4	650.0	496.4	466.2	19.4	630.6

(Source: PC-1 Pat Feeder Canal Project)

2.4. International Cooperation for Agricultural Development in Pakistan

The foreign aids to Pakistan have been continuously extended since 1951, and the total foreign aids accounted to approximately 30.5 billion in US dollars on commitment basis. The amounts of foreign aids by each type are shown in Table 2-12, and the B/P financing support occupies 5.3 percent only, while the remaining has been used for the specific projects and/or procurement of equipment/machineries or other commodities for specific purpose.

Table 2-12. Foreign Aids including Loan or Grant

<u>Items</u>	<u>Commitment</u>		<u>Disbursement</u>	
	<u>Amount</u>	<u>Amount</u>	<u>Amount</u>	<u>Amount</u>
	<u>(\$)</u>	<u>(%)</u>	<u>(\$)</u>	<u>(%)</u>
Project Aids	193.7	63.5	129.8	55.7
Non-Project Aids	111.4	36.5	103.2	44.3
(1) Other than foods	(50.7)	(16.6)	(43.1)	(18.5)
(2) Foods	(31.8)	(10.4)	(31.2)	(13.4)
(3) B/P Support	(16.2)	(5.3)	(16.2)	(7.0)
(4) Afghanistan	(12.7)	(4.2)	(12.7)	(5.4)
Refugees Aids				

Source: Economic Survey, 1986-87.

Among the present foreign aid assistance to the Baluchistan, the project related to the Pilot Project is Pat Feeder Canal Rehabilitation and Improvement Project. The OECF extended the loan to the said project amounting to 1,551 million Japanese Yen. The consultant's services commenced in 1987 and the Project is expected to be completed by the end of 1993.

2.5. Background and Details of Request

2.5.1. Background

The cultivated area of Nasirabad District covers almost 50 percent of Baluchistan cultivated land. The feasibility study of the Pat Feeder Canal Widening Project was conducted by JICA in response to the request by the Government of Pakistan. After the study, the Government requested ADB for a technical assistance of the Project.

Both reports of the feasibility study by JICA and the technical assistance by ADB have recommended that a pilot farm should be constructed in the Project Area with increase of cultivable land and irrigation water by the Pat Feeder Canal Rehabilitation and Improvement Project so as to firmly establish the selection of suitable crops to the areas, profitable farm management and its extension system, seed production of the suitable crops and so on.

On the other hand, it was decided that the Pat Feeder Canal Rehabilitation and Improvement Project should be implemented under the co-finance of ADB for the costs of consulting services and civil works and OECF for the costs of mapping works and procurement of operation and the maintenance equipment. And the loan agreements of the both financings have already been concluded. However, on July 16, 1986, the Government of Pakistan requested the Government of Japan to provide the Pilot Farm by Japanese grant-aid, in due consideration that the Pilot Farm should cover not only the cultivable commanded area of the Pat Feeder canal but also the Kirthar Canal.

2.5.2. Details of the Request

The following are the details of the request for the Pilot Farm, which were confirmed in the field by the basic design study team.

(1) Executing Body of the Project

- ° Project Sponsor Department of Planning and Development, Baluchistan Government
- ° Executing Body Department of Agriculture, Baluchistan Government
- ° Operation & Maintenance Organization of the Project Department of Agriculture, Baluchistan Government

(2) Skeleton Plan of the Project

The purposes and details of the Pilot Farm Project are shown as follows:

Purposes:

- i) Demonstration of modern farm management
- ii) Establishment of water management system
- iii) Adoptability tests of crops
- iv) Training of field assistants and farmers
- v) Seed production of suitable crops

Details of the Project:

- i) Establishment of the cropping method suited to the local soil conditions and/or establishment of soil improvement method.

- ii) Establishment of selection method of suitable crops and the most suitable farming method (including control techniques of fertilizers, water farming machines, and agri-chemicals for pests).
- iii) Establishment and guidance of the best suited on-farm irrigation system and the most suitable farming method.
- iv) Test and demonstration of farm plots arranged for mechanized farming.
- v) Seed production of suitable crops.
- vi) Training of government officials including field staffs and the local farmers including best and most diligent farmers.

The proposed Pilot Farm Project Area consists of 1,152 acres (about 466.56 ha) of farm land and 33 acres (about 13.365 ha) of building/facility lots. The farm land shall provide with demonstration farm, trial farm, training farm, seed production farm, etc. The irrigation water in these farms shall be supplied from the Bari canal, distributary of the Pat Feeder Canal, at the rate of 5.0 cfs (0.142 cu.m/sec) and the Kirthar Canal at the rate of 5 cfs (0.142 cu.m/sec).

The Pilot Farm Project shall include the construction of the following structures:

- i) Diversion Facilities (canals, road crossings, roads, etc.)
- ii) Irrigation & Drainage Canal Networks (canals, diversions, farm ponds, pumping facilities, etc.)
- iii) Mechanized Irrigation Facilities (sprinklers, trickles, rain-guns, etc.)
- iv) Other Related Facilities (land consolidated farms, roads, etc.)

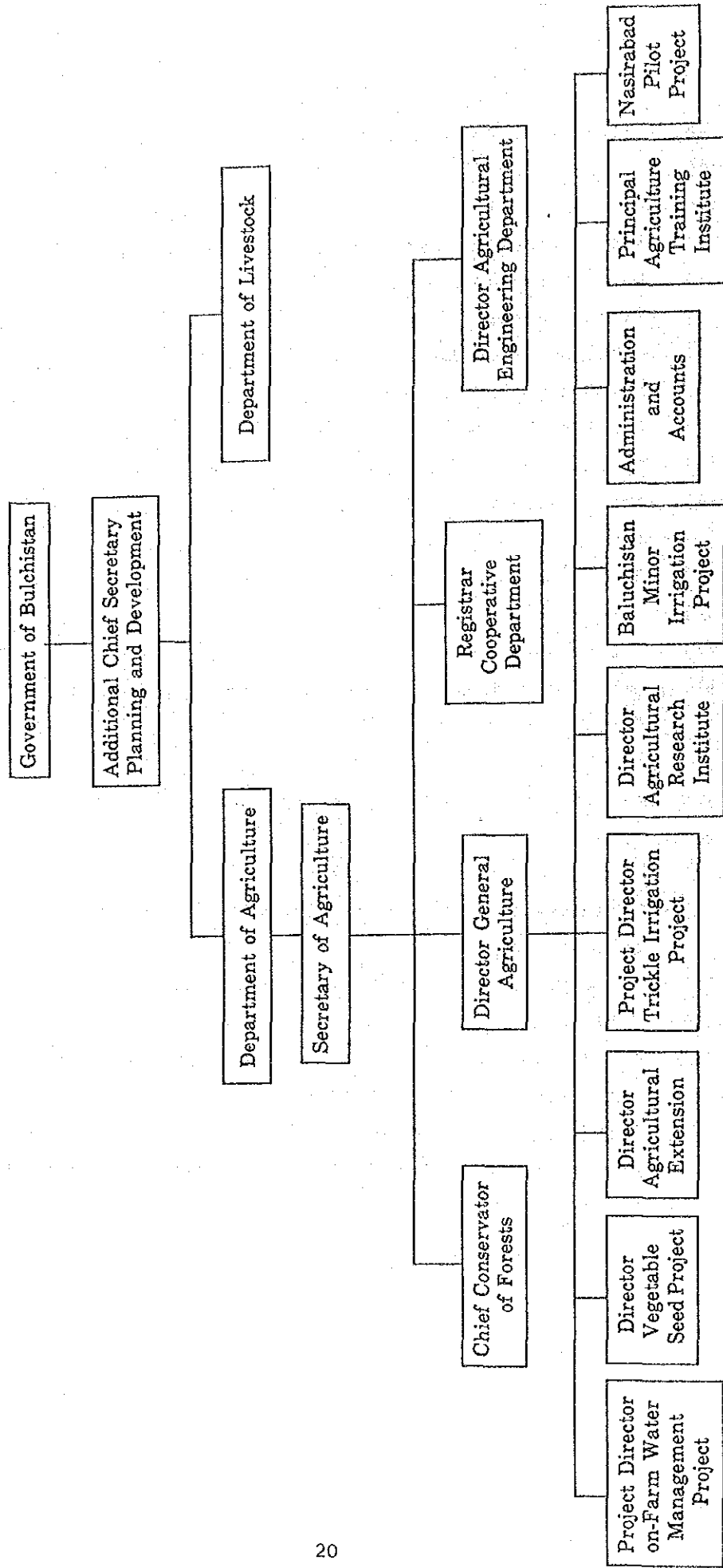
The following buildings shall be constructed in the Pilot Farm Project:

- i) Administration office
- ii) Laboratory for tests & researchers
- iii) Training rooms
- iv) Guesthouse for lecturers
- v) Dormitory for trainees
- vi) Garages/shelters
- vii) Warehouses for fertilizers/agri-chemicals
- viii) Warehouses of farming machineries and workshop for equipment/tools
- ix) Seed processing plant
- x) Seed warehouses
- xi) Staffhouses for the staffs
- xii) Other related facilities (fuel supply station, water supply facilities, etc.)

The following equipment/instruments shall be provided for the Pilot Farm:

- i) Equipment/instruments for testing and researching (provided at Laboratory)
- ii) Audio-visual equipment (provided in the training rooms)
- iii) Vehicles
- iv) Farming machineries/equipment (parked/stored in the warehouses for farming equipment)
- v) Repairing equipment/tools (provided in the workshop)
- vi) Equipment for seed processing (provided in the seed processing plant)

Fig. 2-1 Organization of Baluchistan Province



CHAPTER III THE PROJECT AREA

CHAPTER III. THE PROJECT AREA

3.1. The Project Area

The Nasirabad Agriculture Development Project (Pilot Farm Project) is established in Nasirabad District at the eastern edge of the central part of Baluchistan Province to support the modernized farming practice. (Refer to the Location Map.) The Nasirabad Pilot Farm Project covers mainly the cultivable commanded areas of Pat Feeder Canal and the Kirthar Canal in Nasirabad District.

The proposed Pilot Farm will be in the existing cattle farm at Usta Muhammed Tesil, Nasirabad District.

The proposed farm lot are extends about 50 km west of Jatpat which is along the asphalt-paved national highway running between Quetta and Karachi.

The proposed farm lot area is now cultivable land except some paddy fields, which will be used for the pilot farm lots. The cattle farm is the present owner and cultivates rice in the said paddy field. The proposed pilot farm site, however, will be transferred to the Department of Agriculture after harvesting rice.

The Pilot Farm is planned to be established at the land ceded from Cattle Farm 1,185 acres (479.925 ha) of the total land area, including 1,152 acres (466.52 ha) for farm lots and 33 acres (13.365 ha) for building lots. All construction works of the Project will be carried out by Department of Agriculture. The aforesaid land is located in Usta Muhammad Tesil, Nasirabad District, Baluchistan Province, and transfer landownership from Department of Livestock to Department of Agriculture has been agreed between the two departments. The location of the Pilot Farm is illustrated in the succeeding page.

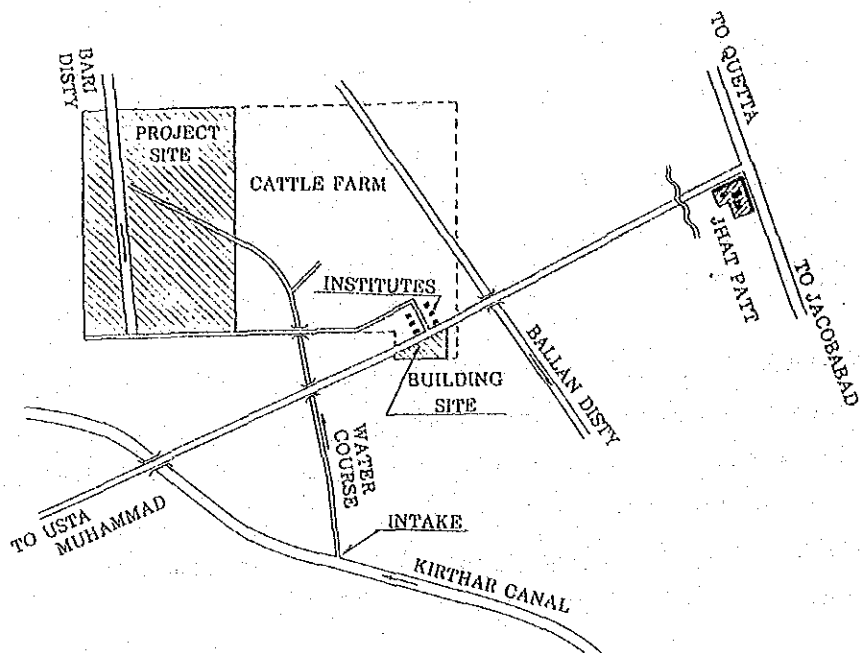


Fig. 3-1 LOCATION MAP AROUND PROJECT SITE

3.2. Natural Conditions

3.2.1. Topography

Baluchistan Province is topographically classified into two: highland and plain. The highland is further classified into two: the highest land called Khorasan with elevation of about 12,000 ft (about 3,658 m) and those mountain ranges of the Mekran, Kharan and Chaghai running east of the Area and the Sulalma, Pab and Kirthar running west of the Area.

The Plain is subdivided into three: the Kachin Plain, Dasht River Plain, and Las Bela Plain. Topographically, the Nasirabad District dips from north to south at the slope ranging from 1/2,000 to 1/3,000. The elevation of the northern land ranges from 230 ft. to 200 ft. in the area along the Pat Feeder Canal, and southern land ranges from 185 to 160 feet.

3.2.2. Meteorology

According to the classification by the World Meteorological Organization, the Project Area belongs to the arid areas, which have summer and winter seasons in a year. The summer season is from April to October and the winter season is from November to March.

General meteorology of Nasirabad district can be summarized as follows:

- | | | |
|------------------------------|-------------------------------|----------------------|
| 1) Temperature | Absolute maximum ----- | 49°C |
| | Absolute minimum ----- | 0°C |
| | Monthly mean maximum ----- | 45.9°C |
| | Monthly mean minimum ----- | 5.4°C |
| | Months of the monthly mean | --- May to |
| | maximum temperature over 40°C | July |
| 2) Rainfall - annual mean | ----- | 3.4 in. (86.4 mm) |
| 3) Evaporation - annual mean | ----- | 111 in. (2,819.4 mm) |

3.2.3. Water Quality

The water quality tests for the Kirthar Canal which is the source of irrigation water of the Pilot Farm were carried out for eight days from September 15 to September 22, 1987 by sampling at two points around the intake site to the Pilot Farm and the cross-regulator in the downstream of the canal.

The 8-day tests showed the results that the electric conductivity was 1.0 ms/cm (25°C) on an average and pH was 8.4. As a result, Kirthar Canal water is utilizable as irrigation water, although slightly high in electric conductivity and a little alkaline. The data on each sampling point are shown in the Appendix.

3.2.4. Soils

The soil tests were conducted by direct observation of soil profile provided by about 1.2 meters manual digging at five sites in the proposed pilot farm fields. The tests showed the features that most of all soils in the proposed fields were silty soils with little gravels and organic materials. The surface soils are badly dry, while the sub-surface soils are brownish orange with moisture contained to some extent. And the soils of the proposed fields are found favourable for

farming in both values of electric conductivity and pH. The details are referred to in the Appendix.

3.2.5. Soil Hardness

The soil hardness was measured by soil hardness tester by the side of the test pits dug for soil tests. This was conducted for testing soil hardness against farming machineries.

The results of measurement illustrate that the soil resistivity, although high in dry condition, will not be so high as expected taking into consideration the existing paddy fields in wet condition. Consequently, the farming machineries will have to be provided with such devices that the contact pressure can be possibly minimized.

3.3. Present Research and Training in Agricultural Development

3.3.1. Agricultural Research

At present, there is a comprehensive Agricultural Research Institute established in Quetta, which has been majoring farming, researches for wheat (wheat both for irrigated farming and rainfed farming), oil seeds crops, vegetables, potato, etc., and furthermore, a variety of tests and experiments for soils, pest control, etc. have been carried out. Since Quetta, however, is located at high elevation land, there have been no researches nor experiments conducted for farming and pest control of arid zone crops and coastal area crops.

3.3.2. Agricultural Training

The Agricultural Training Institute has teaching staffs of four (4) Assistant Professors, eight (8) Lecturers and four (4) demonstrators. It has the following facilities: three laboratories, training room, library, dormitory for trainee with capacity of 80 to 100 persons. The Training Institute provides two courses: 2-year course to field assistant candidates and 3-month training course for field assistants

who have been awarded. The subjects of each course were tabulated as follows:

<u>2-Year Course</u>	<u>3-Month Course</u>
Soil and Fertilizer	Basic Botany
Crop Production	Soil and Fertilizer
Horticulture	Crop and Vegetable Production
Plant Protection	Fruit Production
Irrigation & Water Management	Plant Production
Farm Equipment and Machinery	On-Farm Water Management
Livestock	Farm Mechanization
Farm Management and Mathematics	Farm Management
Agricultural Extension	Extension and Rural Sociology
Miscellaneous	Agricultural Problems
	Livestock
	Miscellaneous

The 2-year course which gives training aims at bringing up the field assistants in many places in the whole Baluchistan area, including farming practices in the arid zone and coastal areas. There are no training facilities in the arid zone nor in the coastal areas.

3.4. Present Conditions of Social Infrastructure

In Pakistan, power supply for domestic lighting and industries has been uniformly made by Water and Power Development Authority (WAPDA) which is responsible from generation to distribution to the consumers. Power generated by hydropower stations at Tarbella dam, Mangra dam, and by thermal power stations at various places in the country is transmitted to almost all of the beneficiaries in the country through the national high voltage transmission line networks. Most of the transmission lines run along the national highways. Also, there is an 11 KV transmission line running along the national highway in the center of the Nasirabad District. The said line is branched off at Jatpat and led to Usta Muhammed.

Telecommunication is available throughout the country by either microwave networks or satellite system. Actually, however, such modernized communication system is available only between the large cities and major municipalities, but unavailable between rural areas or between rural areas and large cities. And the governmental organizations even in the rural areas use telephones to communicate with their headquarter.

A domestic telex system is available besides the telephone networks, however, this system is mainly used only between cities.

There are existing domestic water supply and sewerage systems in large cities such as Karachi, Islamabad, Lahore and Quetta. The Government has established many office facilities with living quarters for local administration in the whole country, and such facilities provide the water supply system under the control of the local administration.

In the large cities, people use natural gas as fuel in their daily life, while in the rural areas, most of people use firewoods but some are using kerosene.

In Pakistan, domestic transportation facilities are railways, roads and airways. The major cities and municipalities are linked by railways, airways and national roads. Only some municipalities in the western part of Baluchistan uses airplanes as their primary means of transportation, although the major municipalities in the eastern part of Baluchistan, Punjab Province, Sind Province are linked by railways, roads and airways. The national highways links to all of the major municipalities of the country.

In Nasirabad District, railways and national highways are available, and Jacobabad in the southern part of the District is linked by regular flights with Quetta, Hyderabad and Karachi.

3.5. General Conditions for Construction Works

Generally, construction in Pakistan is brisk and construction activities of Pakistan are consolidated. Productions of construction materials are high and capabilities of construction labours are also high. However, the availabilities of construction materials and labours are concentrated in the cities. In the Project site, it is slightly difficult to find the construction materials and construction labours. Under the circumstance, the following shall be taken into consideration for the basic design.

(1) Construction Materials

Most of the basic construction materials have been produced in Pakistan, such as in Karachi and/or Islamabad. Construction materials produced in Pakistan can be used, however, attention for qualities, quantities, price of domestic products shall be given.

(2) Construction Techniques

There are big construction companies which have enough number of construction equipments in Pakistan. From the construction management point of view, schedule control, labour control and quality control are not effective, therefore, a strong coordination between the Pakistani and Japanese contractors is indispensable.

CHAPTER IV DETAILS OF THE PROJECT

CHAPTER IV. DETAILS OF THE PROJECT

4.1. Purposes of the Project

The Project aims to construct and operate the Pilot Farm for the following purposes in Usta Muhammed Tesil, Nasirabad District, Baluchistan Province, so as to support the agricultural development in Nasirabad District, which will be realized through the rehabilitation and improvement of the Pat Feeder Canal and the Kirthar Canal.

- i) To demonstrate the modernized farm management.
- ii) To establish an effective water management system.
- iii) To test crop suitability to local conditions.
- iv) To train field assistants and farmers, and,
- v) To produce the suitable crops seeds and to diffuse the aforesaid seeds to the local farmers.

The Project will provide 1,152 acres (446.56 ha) for field plots and 33 acres for building lots to construct the administration office building including training rooms and laboratory, guesthouses, warehouses, etc., all of which shall be provided under the grant-aid cooperation by the Government of Japan.

4.2. Study of the Request

The irrigation water supply to the cultivable land of Nasirabad District by the Pat Feeder Canal of which rehabilitation and implementation works will be completed by the end of 1993 is expected to increase remarkably. Agricultural development under the Pat Feeder Canal Project can not be achieved without introducing new applicable crop varieties, seed production, establishment of agricultural practices including on-farm water management method, training of field assistants to supply the seed and introduce new technology to farmer. As support to the agricultural development, establishment of Pilot Farm is necessary; hence, the request of the Government Pakistan to establish the Pilot Farm is justifiable.

4.3. Details of the Project

4.3.1. Executing Body

The Project was planned by the Department of Agriculture, the Baluchistan Government, and was applied to the Federal Government of Pakistan as a Special Development Program (SDP) through the Department of Planning and Development of the Provincial Government; and the Project was accepted and approved by ECNEC in due course. Consequently, the Department of Agriculture will be the executing body and fully responsible for the implementation and management of the Project.

Practically, however, the Director General Agricultural assigns officials as project offices, who shall perform the necessary project works in common ways as illustrated in Figure 4-1. And the Director of the Pilot Farm has been already appointed for the Project.

4.3.2. Project Plan

The purposes of the Pilot Farm are considered as (1) adoptability test of crops, (2) demonstration of modern farming management, (3) establishment of effective water management system, (4) training, and (5) seed production of suitable crops. And, the following crops are expected to be cultivated in Nasirabad District in future.

Fig. 4-1 Organization of the Pilot Farm

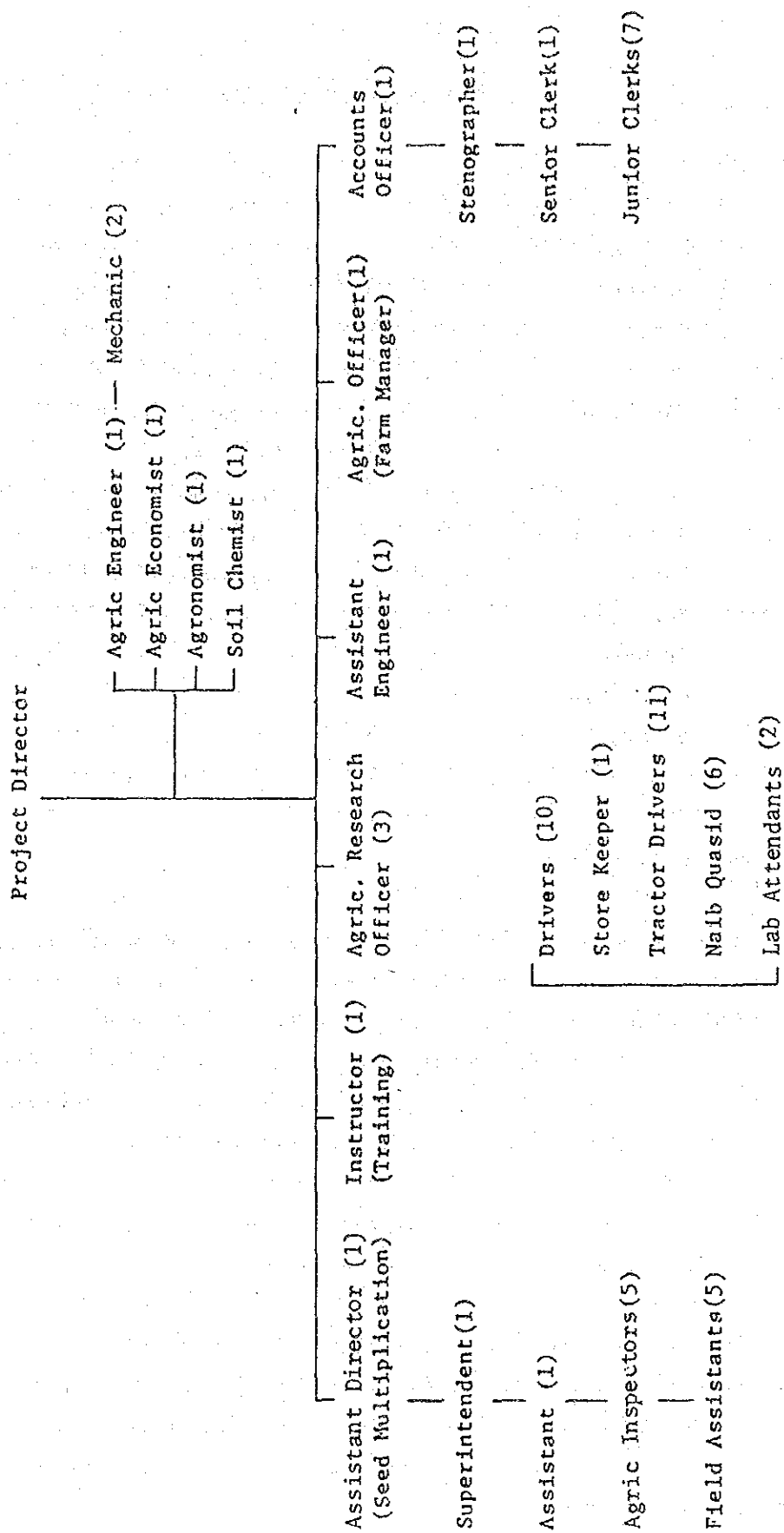


Table 4-1. Testing Crop in the Pilot Farm

<u>Kharif</u>	<u>Rabi</u>
Sorghum	Wheat
Millet	Gram
Rice	Lentils
Maize	Rapeseed
Mungbeans	Mustard
Soybean	Safflower
Sesame	Berseem
Sunflower	Orchard
Cotton	Vegetable
Sugarcane	Others
Orchard	
Vegetable	
Others	

(1) Adoptability Tests

Those crops which are selected as suitable ones to the Nasirabad Area by Agricultural Research Institute, Quetta, or the stations in other provinces shall be introduced to the Pilot Farm practising various tests for suitability to local conditions taking into consideration the irrigation methods, water management systems, soil improvements, fertilization, pest control, mechanized farming works, etc.

For the adoptability tests, the farming plots of 120 acres (48.6 ha), and the laboratory, etc. are required.

Since the fundamental tests are carried out in the Quetta Agricultural Research Institute, it is enough to carry out the adoptability test of soil, planting, and plant protection at this laboratory. In addition, the testing equipment for seed production control are required.

(2) Demonstration of Modern Farm Management

When the aforesaid tests find certain crops/crop varieties to be suitable for the local conditions and introduced into the Area, these crops/crop varieties shall be grown in the similar scale of farming to that of farmers' practical cultivation so as to demonstrate to the field assistants and farmers. For the purpose of giving better effect of extension, the demonstration plots shall be divided into two: one for gravity irrigation and the other for mechanized irrigation. The gravity irrigation plots show the farming method which can be easily applied to the farmers' practices, while the mechanized irrigation plots show the method which will give an effect only by introducing modern equipment and devices such as sprinklers, etc. In the mechanized irrigation plots, not only demonstration but also study of a more effective water management systems will be carried out.

The demonstration farm covers 120 acres in total, which shall be divided into two as mentioned above: one for gravity irrigation plots of 63 acres (25.5 ha) and the other for mechanized irrigation plots of 57 acres (23.1 ha).

(3) Establishment of Effective Water Management System

In Pakistan, the government is responsible for administering the irrigation by dividing the system into two: the Department of Irrigation shall cover the main and distributary canals, and the Department of Agriculture shall cover the terminals. Under the circumstances, establishment of the water management system in the Pilot Farm means to establish the system for water course.

In this connection, there are two approaches of establishment of the terminal canal networks and of water distribution in those terminal facilities. And for the proposed Pilot Farm, the water distribution system in the terminal networks shall be taken up, including rotational water distribution.

Experiments shall be carried out in all the plots of the pilot farm except for the seeds production farm; hence, the adoptability test plots, demonstration plots, and training plots shall be used for the purpose.

(4) Training

Necessary lectures and field training shall be given to the government officials, field assistants and farmers on the subjects of the irrigation method, soil improvement, fertilization amount/method, pest control method, farm management including introduction of farming machineries, etc. for those crops selected by adoptability tests. The trainees will mainly be the government officials, field assistants and farmers, and the expected training period and number of trainees participating for one training session are shown as follows:

Total Training Period : 14 weeks (about 3 months)
 Net Training Hours : 405 hours
 Number of Trainees per one Session: 20 persons

There will be three training terms in a year and about 60 persons can be trained annually. The training subjects and the number of hours are given below.

Orientation	5	hours
Course Closing Ceremony.....	5	"
Course Assessment.....	10	"
Study Trip	90	"
Basic Botany	11	"
Soils & Fertilizers	24	"
Crop & Vegetable Production.....	64	"
Fruits Production.....	33	"
Plant Protection.....	45	"
On-farm Water Management.....	17	"
Farming Mechanization	26	"
Farm Management	10	"
Extension & Rural Community.....	40	"
Agricultural Problem.....	10	"
Livestock Husbandry	15	"
Total	405	hours

(5) Seeds Production

Successful agricultural development inevitably requires sufficient supply of high quality seeds of crops. Presently, there are some kinds of seeds of crops which are unsuited to the local cropping condition of Nasirabad District due to the fact that all the seeds used in the District are domestically imported from other provinces. Therefore, the seeds of crops which are suitable to the local conditions through adaptability tests shall be produced in the Pilot Farm for diffusion.

Since the production of seeds can be entrusted to farmer, seeds of crops are enough to be produced by one-fourth of total requirement in the Pilot Farm; consequently, 600 Ac (243.0 ha) is necessary for the seed production farms.

Seed supply to the farmers shall be carried out by the field assistants.

(6) Testing Crop and Cropping Area

Land prepared by the Department of Agriculture consisting of 1,151 Ac (466.56 ha) is divided into two; namely, farming land of 920 Ac (372.6 ha) and land for irrigation and drainage canals and roads of 232 Ac (93.96 ha). Cropping pattern in the Pilot Farm can be varied by the plan of agriculture extension, progress of cultivation tests, cropping plan of farmers. As a result of discussion with the Department of Agriculture, the cropping pattern as given in Table 4-2 is determined for the design of the Pilot Farm.

Table 4-2 Cropping Area

(Unit: Ac)

Crop	Training Demonstration			Seed Production	Total
	Trial Farm	Farm	Farm	Farm	
a) KHARIF					
Sorghum	10	4	6	40	60
Millet	2	2	4	12	20
Rice	10	4	10	96	120
Maize	4	4	4	28	40
Mungbean	2	4	4	10	20
Soybean	4	4	6	26	40
Sesamun	2	4	4	10	20
Sunflower	10	4	10	16	40
Cotton	4	4	4	68	80
Sugarcane	8	4	6	22	40
Orchard	4	4	4	8	20
Vegetable	8	4	6	22	40
Others	4	2	4	2	12
Fallows	48	32	48	240	368
Total	120	80	120	600	920
b) RABI					
Wheat	10	4	20	116	150
Barly	4	4	4	28	40
Gram	6	4	4	26	40
Lentils	6	4	4	26	40
Rapeseed	6	4	4	26	40
Mustard	6	4	4	26	40
Safflower	6	4	4	26	40
Sugarcane	8	4	6	22	40
Berseem	6	4	4	26	40
Orchard	4	4	4	8	20
Vegetable	6	4	8	22	40
Others	4	4	6	8	22
Fallows	48	32	48	240	368
Total	120	80	120	600	920

(7) Land Consolidation

The farm plots shall be arranged and consolidated for various test crops as above. The unit acreage of one farm plot shall be 1.0 acre (about 0.405 ha). One standard irrigation block shall have the acreage of 16 acres (about 6.48 ha) to make rotation irrigation completed in the block.

The farm plots shall be divided into those for adoptability tests, demonstration, training and seeds production. The same level land consolidation criteria shall be applied to each farm plot except for the mechanized farming plots. Every unit farm plot (1.0 acre) shall be provided with irrigation/drainage ditches and farm road at the same level, and shall have the levelling works in the same standard, and every irrigation/drainage ditches shall have the sufficient capacity to allow rice cultivation available. The stop-logs shall be used for regulating water to be diverted and taken into respective fields.

The farm roads are categorized into two; the main roads and branch roads, and the total width of the former is 30 feet (about 9.15 m) and the latter 20 ft (about 6.11 m). The paving width shall be 12 feet (3.66 m) for the both. This is because farming machineries/vehicles can cross each other at medium speed in the trunk roads, while at low speed in the working roads.

(8) Intake Canal Plan

Water right of the Pilot Farm is five (5) cfs from Kirthar Canal and five (5) cfs from Bari Canal of Pat Feeder Canal. Intake canal plan from these canals is discussed below.

1) Intake Canal from Kirthar Canal

Existing canal takes irrigation water from Kirthar Canal to the Cattle Farm for 3 cfs of water right. Intake canal to the Pilot Farm

cannot be constructed separately due to difficulty of acquiring the land, therefore, the existing canal will be used to convey water to both Pilot Farm and Cattle Farm, and then after separation of irrigation water to Pilot Farm and Cattle Farm, intake canal only for Pilot Farm will be constructed.

2) Intake Canal from Bari Canal

Cattle farm has water right taking the irrigation water of 20 cfs from Bari Canal. Intake point will be constructed on the existing canal to cattle farm. After completion of Bari Canal rehabilitation, new intake will be constructed.

(9) Building Plan

For the purpose of the Pilot Farm, the following buildings will be constructed:

- i) Main office --- director office, expert offices, meeting room, laboratory, library, exhibition room, etc.
- ii) Guesthouse for lecturers --- bedrooms, dining room, kitchen.
- iii) Dormitory for trainees --- five rooms for 20 persons in total, dining room, kitchen.
- iv) Garage --- micro-bus, truck, 4WD station wagon.
- v) Warehouse for fertilizer/agri-chemicals.
- vi) Warehouse for farming machineries and workshop.
- vii) Seed Processing Plant(1) with house --- processing plant of rice and wheat.
- viii) Seed Processing Plant(2) with house --- processing plant of sunflower.
- ix) Seed Processing Plant(3) with house --- processing plant of beans.
- x) Seed storage.
- xi) Staffhouses --- houses for key staff.

(10) Staffhouses

It is difficult to increase the number of staffs of the Pilot Farm due to no staffhouses available at the site. For effective operation and early commencement of pilot farm, it is necessary to secure the qualified personnel.

Eight staff quarters of 13 staff quarters required for key staffs will be constructed under the Japanese Grant-Aid assistance.

4.3.3. General Description of Proposed Facilities and Necessary Equipment/Materials

For the successful operation of the proposed Pilot Farm, the following facilities and equipment/materials will be required:

(1) On-farm facilities

- i) Irrigation canals including water intake canals
- ii) Drainage canals
- iii) Farm plots consolidation
- iv) Farm roads
- v) Equipment for mechanized irrigation

(2) Buildings and other facilities

- i) Main office: Room for Project Director, Office Rooms, Meeting Rooms, Laboratory, Lecture Rooms, Library, Praying Room, and Show Rooms
- ii) Guesthouse for lecturers: Five (5) bedrooms, kitchen with necessary instruments/foodstuffs.

- iii) Dormitory for trainees: Five (5) bedrooms for 20 trainees (4 trainees/room), kitchen with necessary instruments/foodstuffs.
- iv) Garages
- v) Warehouses for agri-chemicals/fertilizers
- vi) Repairshop for farming machineries/equipment
- vii) Seeds processing plant --- for rice and wheat
- viii) Seeds processing plant --- for sunflower
- ix) Seeds processing plant --- for beans
- x) Seeds storage
- xi) Staffhouses
- xii) Fuel station
- xiii) Water supply facilities

(3) Equipment and Materials

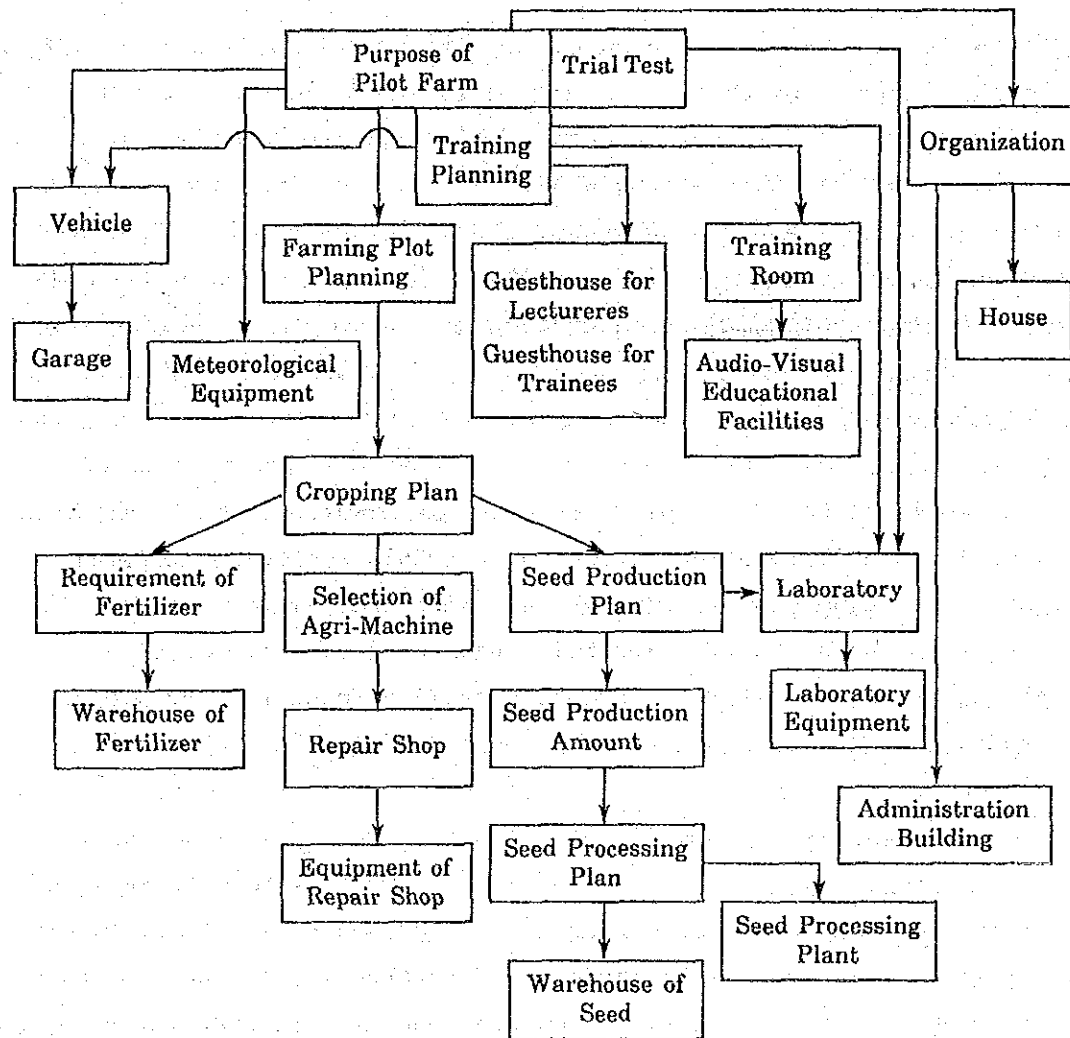
- i) For tests and experiments: Soil test equipment,
(Laboratory) Crop husbandry equipment,
Plant pathological tests equipment
and
Seeds inspection equipment
- ii) Audio-visual education equipment: Video camera, video recorder, video player, TV sets, OHP, screens and projector
- iii) Vehicles: trucks, micro-buses, 4 WD station wagon.
- iv) Repair shop for farming machineries/equipment: to follow the standards (Grant A Level) of Ministry of Agriculture, Forestry and Fisheries, Japan
- v) Farming machineries
- vi) Seeds processing plants

CHAPTER V BASIC DESIGN

5.1. Basic Concept of Design

The Project aims at designing to construct the Pilot Farm, the facilities scale of which will be decided by purposes and method of utilization of the Farm fields. The basic plan of the design works, therefore, shall be prepared according to the Flow Chart illustrated in Fig. 5-1.

Fig. 5-1 Flow Chart of Basic Design Works



The following items shall be included in the basic concept of the basic design works.

(1) The proposed facilities shall be designed to meet various local conditions such as meteorology, etc.

1) Temperature and humidity

Generally, Nasirabad District has high temperature and low humidity; particularly, from May to September, there are consecutive hot days with daily maximum temperature exceeding 40°C and very strong sunshine. Under such high temperature, the proposed buildings in the Project should have higher ceilings than the buildings in the country.

2) Storm

Storms hit the District in summer and winter seasons; and in many cases the storms hit with strong wind. The strong wind cover over the District with sand, and consequently, the buildings shall be designed with air tight structure by windows with sash to prevent sand blown by strong wind from intruding into rooms.

3) Salt Damages

The soils of Nasirabad District are weak alkaline. The salt in the soils spoil durability of construction materials resulting in fatal damages to buildings and facilities in making their life shorten. In learning from the existing major buildings and facilities in the peripheral areas, therefore, the design shall be made to give longer life to them with anti-sulphate concrete and admixtures.

4) Earthquakes

The Nasirabad zone has no records on earthquakes in the past; however, there are records on large scale earthquakes in the mountain area linking with the northern Baluchistan and also records found on the

earthquakes to have hit Quetta with damages. Therefore, the facilities of the Project shall be designed with consideration on horizontal resistivity of 0.10 by tremor.

- (2) The proposed facilities and buildings would fully support the Nasirabad agricultural development

The Project is provided to support the agricultural development works in Nasirabad by rehabilitation and improvement of the Pat Feeder Canal and the Kirthar Canal. The scale, quality grade and utilization method of facilities and buildings shall be decided according to the purposes. The construction schedule shall be prepared in correlation with the schedule of the Pat Feeder widening works.

- (3) The facilities plan shall be prepared to follow changes and increase in requirements in future so as to keep the facilities in more effective use

The facilities plan shall be made to meet the future changes and increase in requirements of the services of the Pilot Farm. In other words, the plan for layout, structure of facilities and arrangement of equipment/materials shall be made with flexibility in response to the changing and increasing requirements of facilities and services, so that the facilities and equipment/materials can be utilized more effectively and efficiently in future as well.

- (4) The Operation and Maintenance (O & M) costs shall be possibly decreased

The on-farm plan, particularly for irrigation/drainage plan, shall be made so that the water from the Pat Feeder Canal and the Kirthar Canal can be evenly distributed to the fields by gravity irrigation. The architectural plan shall be made taking into consideration the natural ventilation and lighting method to reduce the energy costs as much as possible, and furthermore, the local materials and construction

method shall be adopted as much as possible so as to keep the O & M works effective and easy. The construction materials shall be selected considering their durability as standards.

- (5) Facilities shall be provided to meet the conditions in the peripheral areas

The on-farm plan shall be prepared taking into account the suitable facilities in the on-farm development plan worked out in the Pat Feeder Canal Rehabilitation and Improvement Project and the encouragement for diffusion of infrastructural arrangement.

5.2. Basic Design

5.2.1. Layout

(1) Project Site

The proposed Pilot Farm Area can be divided into two as shown in Fig. 3-1, one for farm plots and the other for building lots. The Project Area is ceded from the present cattle farm under the control of the Department of the Livestock, Baluchistan Province. The acreages of the respective land areas are as follows:

Farm Plot Area -----	1,152 acres (466.56 ha)
Building Lots -----	33 acres (13.365 ha)
<u>Total</u>	<u>1,185 acres (479,925 ha)</u>

And as illustrated in Fig. 3-1, the Project site extends along the national highway between Jatpat and Usta Muhammed.

At the center of the proposed farm plot site, the Bari Canal (branch of the Pat Feeder Canal) runs through. This land belongs to the Department of Agriculture.

(2) Layout

1) Farm plots

Plotting of the farm field and layout of roads, irrigation/drainage canals shall be made considering the topography of the Project Area and surrounding areas, conditions of water utilization, and roads, for easy water control and easy access to the farm plots.

The plane planning of the farm fields shall be made according to the following priorities:

- a) A rotation area shall be provided with acreage of 80 acres (32.4 ha) as standard net cultivated area in the farm field of the Project.
- b) The rotation area shall be divided into five standard rotation blocks with acreage of 16 acres (6.48 ha).
- c) The irrigation canals and ditches shall be constructed so densely as to distribute the water taken in the outside source of the Project Area into the terminal field plots completely.
- d) The drainage canals and ditches shall be provided so densely as to collect the drainage water smoothly and to drain to the outside of the Area.
- e) The on-farm roads shall be constructed so densely as to raise the farming efficiency.

2) Layout of Buildings

a) Land use plan of total building lots

The proposed building lots are as large as by 33 acres and there will be no restriction imposed on the respective building plans.

Basically, the total plan shall be made on the grid for the proposed area with a length of 90 m and width of 80 m. The total area shall be divided into three zones according to its functions and characteristics, as shown below.

Table 5-1. Buildings by Functions

Administration Center Zone	Administration Office
Working Zone	Seeds Treatment Plant and Storage
	Workshop and Warehouse for Farming Machineries
	Storage of Fertilizers/Chemicals
	Senior Staff Residences
Living Quarter Zone	Junior Staffs "
	Lodging Facilities for Guests
	" " for Trainees

- i) The buildings shall be constructed in the respective lots in 20 m setback from boundaries or roads for protection of facilities and easy maintenance, since each lot can hold sufficient spaces for building. And for boundaries with neighboring lots, setback shall be about 10 m from the lines.
- ii) Each lot is determined to accommodate the respective buildings with the same functions in one zone considering their characteristic features.
- iii) The access roads shall run in the middle of the administration center zone and a crossing shall be located in front of this zone so that all persons and vehicles could pass therethrough.

a) Layout of Buildings

- i) The functions and characteristics of the buildings shall be classified as shown in Table 5-1, and the administration center zone shall be placed with the center of the Project as symbol of the Pilot Farm.

Other two zones shall be located to be utilized effectively in terms of functions and customs.

- ii) In view of the total control of the working zone, the entrances of the administration office shall be laid out with its entrance as base point for visual supervision, since constant supervision of the progress of work is necessary at central office.

- iii) The living quarter zones shall be placed at both (eastern and western) sides of the Area to avoid intrication of move lines of living members through their decentralization in living places.

Based on the aforesaid general concept, the total layout of the buildings and facilities shall be made so as to recognize easily their characteristics and specific features. Available spaces surrounding the administration/training facilities shall be reserved as wide as possible to be ready for future expansion of these facilities. Greening works shall be accelerated when all proposed facilities and buildings are completely constructed.

5.2.2. Farm Land Arrangement and Consolidation

(1) Plotting Plan

1) Establishment of Rotation Area

Plotting of the farming land shall be so designed as to keep a rotation area with 80 acres (32.4 ha) on an average. The total rotation area is illustrated in Fig. 5-2, having a total acreage of 920 acres (373 ha).

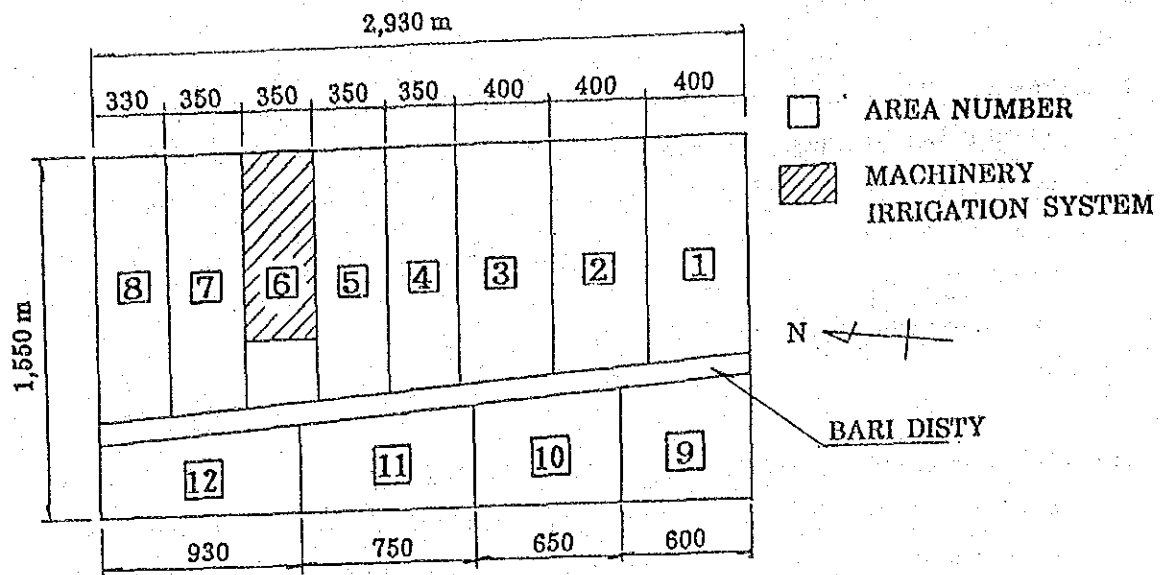


Fig. 5-2 THE LAYOUT OF ROTATION AREA SETTING

2) Provision of Rotation Blocks

One rotation area shall be divided into five rotation blocks, one of which covers 16 acres (6.48 ha) as standard block. A rotation block shall be further divided into 16 farming plots, two plots of which consist of one unit for practising 8-day intervals rotation irrigation.

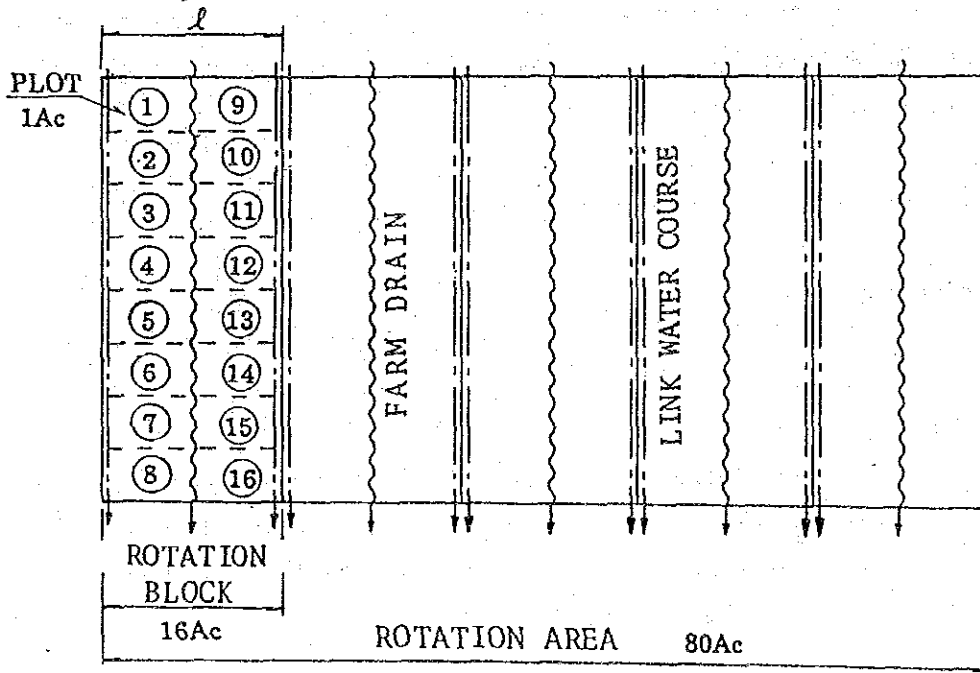


Fig. 5-3 STANDARD OF ROTATION AREA

In the farm land located east of the Bari Canal, the rotation block shall be made up with the long side of 200 m, while, that located west of the Bari Canal, the rotation blocks shall be formed with the long side in a range from 120 m to 186 m corresponding to the long side of the rotation area in a range from 600 m to 930 m.

(2) Agricultural Plan

1) Cropping Plan

The Project aims at constructing a pilot farm, the cropping plan for which has a different purpose from made by farmers for profitable farm management. In other words, the pilot farm shall carry out trial farming of those crops which will be adopted by farmers for practical farming, test farming for crop adoptability, training farming, demonstration farming, and farming for seed production. The cropping plan for the pilot farm will be changed so often as to meet a variety of requirements within availability of irrigation water. The cropping plan for the Project, however, shall be prepared taking into consideration the cropping pattern prevailing in the Nasirabad District.

As previously mentioned, the agricultural land available in the Pilot Farm covers 920 acres (372.6 ha) and the respective farm plots shall have different acreages by purposes. (Refer to Table 5-2 below.)

Table 5-2. Plot Acreages by Purposes

<u>Purposes</u>	<u>Gross Area</u>	<u>Fallow Area</u>	<u>Net Cultiva- tion Area</u>
Adoptability Test	120 acres (48.6 ha)	48 Ac (19.44 ha)	71 Ac (29.16 ha)
Training	80 acres (32.4 ha)	32 Ac (12.96 ha)	48 Ac (19.44 ha)
Demonstration			
Gravity Irrigation Plots	63 acres (25.51 ha)		
Mechanized Irriga- tion Plots	57 acres (23.09 ha)	48 Ac (19.44 ha)	72 Ac (29.16 ha)
Seed Production	600 acres (243.0 ha)	240 Ac (97.2 ha)	360 Ac (145.80 ha)
Total	920 acres (372.6 ha)	368 Ac (149.04 ha)	552 Ac (223.56 ha)

2) Agricultural Inputs

a) Fertilizers

The amount of fertilizers required for cultivation in the Pilot Farm, although different by purposes of tests and researches, is estimated at 72,650 kg in total, based on the amount commonly used in Nasirabad District, which is broken down as follows:

Nitrogen	37,860 kg
Phosphate	29,990 kg
Kali	4,800 kg

The amount to be applied by crops can be referred to in Table 5-3.

b) Agri-chemicals

Agri-chemicals have three types: liquid, solvent and granule. These agri-chemicals are applied for seed treatment, pest control, and weed control. The optimum amount of chemicals to be applied varies according to the magnitude of insect occurrence and thickness of weed growth.

c) Farming machineries

Farming machineries are considered in the premise to be introduced to save manpower and animal power for farming works such as deep plowing, seeding, weeding, harvesting, etc. Table 5-4 shows the farming works that mechanical farming can be applied for crops.

Table 5-3 Required Fertilizer by Crop

THE NAME OF CROPS	N		P ₂ O ₅		K ₂ O		Cropping Area (Ac)
	kg/Ac	kg	kg/Ac	kg	kg/Ac	kg	
<u>KHARIF</u>							
Sorghum	20	1,200	12	720	-	0	60
Millets	20	400	12	240	-	0	20
Rice	40	4,800	24	2,880	-	0	120
Maize	40	1,600	30	1,200	-	0	40
Mongbeans	8	160	24	480	-	0	20
Soybean	8	320	24	960	16	640	40
Sesamum	30	600	20	400	8	160	20
Sunflower	40	1,600	24	960	-	0	40
Cotton	65	5,200	45	3,600	-	0	80
Sugarcane	70	2,800	40	1,600	20	800	40
Orchards	20	400	12	240	-	-	20
Vegetables	40	1,600	24	960	8	320	40
Total		20,680		14,240		1,920	
<u>RABI</u>							
Wheat	50	7,500	37	5,550	-	0	150
Barley	50	2,000	37	1,480	-	0	40
Gram	12	480	24	960	-	0	40
Lentil	12	480	24	960	-	0	40
Oil Seed	25	1,000	24	960	12	480	40
Mustard	25	1,000	24	960	12	480	40
Safflower	70	2,800	40	2,000	40	1,600	40
Sugarcane			included in Kharif				40
Berseem	8	320	48	1,920	-	0	40
Orchards			included in Kharif				20
Vegetables	40	1,600	24	960	8	320	40
Total		17,180		15,750		2,880	
Gross Total		37,860		29,990		4,800	

Table 5-4 Main Farming Pattern Make Use of Agricultural Machinery

		Contents of Farming and Kind of Machinery				
Name of Crop	Cropping Period	Area				
R	Wheat	64 ha	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Grain Drill)	Weeding → (Cultivator) → Pest Controlling → (Knapsack Applicator) → Harvesting (Axial Flow Combine)
	Barley	16 ha	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Grain Drill)	Weeding → (Cultivator) → Pest Controlling → (Knapsack Applicator) → Harvesting (Axial Flow Combine)
	Mustard	16 ha	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Broadcaster)	Pest Controlling → (Knapsack Applicator) → Harvesting (Habitual Method)
A	Oil Seed	16 ha	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Broadcaster)	Pest Controlling → (Knapsack Applicator) → Harvesting (Habitual Method)
B	Sunflower	16 ha	Removal of Residue → (Tooth Harrow)	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Vacuum Seeder) → Pest Controlling → (Knapsack Applicator) → Harvesting (Habitual Method)
I	Berseem	16 ha	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Broadcaster)	Harvesting (Habitual Method)
	Gram	16 ha	Removal of Residue → (Tooth Harrow)	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Vacuum Seeder) → Pest Controlling → (Knapsack Applicator) → Harvesting (Habitual Method)
	Lentils	16 ha	Removal of Residue → (Tooth Harrow)	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Seeding → (Vacuum Seeder) → Pest Controlling → (Knapsack Applicator) → Harvesting (Habitual Method)
	Orchard	8 ha	Tilling → (Disk Plow)	Pulverizing → (Disk Harrow)	Transplanting → (Tine Cultivator)	Field Control → Pest Controlling → Harvesting (Habitual Method)

Chesel Plow

3) Agricultural Products

The agricultural products seed to be expected from the Project are those from the farm plots of adoptability test, training, demonstration, and seeds production. For the adoptability test farm, however, only half the cropping (testing) acreages will be productive, while the training farm will be sufficiently productive.

The volume of seeds to be produced in the Pilot Farm is as shown in Table 5-5.

Table 5-5. Volume of Seeds Produced

Crops	Cropping Acreages				Seed Volume Produced	
	Adopt. Test	Demons- tration	Seeds Produce	Total (Ac)	Yield Per Acre (ton/Ac)	Total Yield (ton)
<u>Kharif</u>						
Sorghum	5	6	40	51	0.48	24.5
Millet	1	4	12	17	0.40	6.8
Rice	5	10	96	111	1.60	177.6
Maize	2	4	28	34	1.42	48.3
Mung Bean	1	4	10	15	0.40	6.0
Soybean	2	6	26	34	0.56	19.0
Sesamum	1	4	10	15	0.72	10.8
Sunflower	5	10	16	31	0.52	16.1
Cotton	2	4	68	74	0.60	44.4
Vegetables	4	6	22	32	0.20	6.4
<u>Rabi</u>						
Wheat	5	20	116	138	1.33	183.5
Barley	2	4	28	34	1.13	38.4
Gram	2	4	26	34	0.48	15.8
Lens Beans	2	4	26	34	0.40	13.2
Corza (Rape)	2	4	26	34	0.56	18.5
Pepper Corza	3	4	26	34	0.56	18.5
Sunflower	3	4	26	34	0.40	13.2
Egyptian clo- ver	3	4	26	34	2.66	87.8
Vegetables	3	8	22	33	0.20	6.6

(3) Irrigation Plan

1) Water Sources and Intake Amount

The potential water sources in the Project Area and the amount of water available are tabulated as follows:

Table 5-6. Irrigation Water Available for Pilot Farm

<u>Water Sources</u>	<u>Available Amount</u>	<u>Remarks</u>
Kirthar Canal	5 cfs (0.142 m ³ /s)	Canal length, 3.4 km
Bari Canal	5 cfs (0.142 m ³ /s)	

2) Irrigation Method

Water shall be conducted from water sources located outside the Area to Pilot Farm by gravity through canals. Gravity irrigation such as basin or fallow irrigation shall be carried out for on-farm irrigation, whereas mechanized irrigation with sprinklers, trickles, raingun, etc. shall be applied for the demonstration farms.

3) Irrigation Canal System and Routing

The irrigation canals in the Project Area can be divided into two systems: Khirthar canal system and the Bari canal system.

Routing of main, link and on-farm canals or ditches are described as follows:

a) Kirthar Canal System

The Kirthar Canal shall be so laid out to conduct water from the Kirthar Canal to the Pilot Farm for distributing to the rotation areas of (1) through (6) (mechanized irrigation areas) as shown in Fig. 5-2. The lateral canals which are branched off from the main canal and distribute the necessary amount of water to the rotation areas shall be constructed at the location with higher elevation than the field elevation. The on-farm irrigation ditches which are branched off from the lateral canals and command the rotation blocks, shall run along the road for easy maintenance work.

b) Bali Canal System

The Main Canal No.3 shall take its route along the left bank of the Bali Canal so that the water conducted from the Bari Canal to the Pilot Farm can be easily conveyed to the rotation areas (6)-(8) (gravity irrigation area) as shown in Fig. 5-2. Furthermore, the Main Canal No.5 shall be proposed to irrigate the rotation areas (9) and (10) with water to be transported to the right bank of the Bari Canal in crossing the said canal by syphon.

The lateral canals which are branched off from the main canal and supply the necessary amount of water for the related rotation areas shall be provided at the location with higher elevation than the rotation areas. The on-farm irrigation ditches which are branched off from the lateral canals and command the rotation blocks shall run along the road, each rotation block.

4) Designed Water Level

According to the topographical map obtained from Department of Agriculture, the elevation of Southeastern boundary of the Pilot Farm is +100.0 m; therefore, the designed water level follows the temporary bench as the standard point.

The canal conducting water diverted from the Kirthar Canal and Bari Canal shall have designed water level of 100.2 m and 101.0 m at its terminal, respectively.

On the basis of the above designed water levels and the field elevation of the Pilot Farm, the designed water levels and slopes of the main and lateral canals shall be determined so that the lateral canals can have sufficiently higher designed water levels than the field elevations to facilitate water distribution to on-farm ditches.

Effective water management shall be practised by installing regulators as water level control devices at diversion points from main to lateral and from lateral to on-farm ditches, respectively.

5) Estimation of Designed Water Requirements

Design of each canal/ditch was considered to as follows. The respective canal networks and their designed capacities are illustrated in Fig. 5-3.

a) On-Farm Water Requirement

The designed water requirement of the irrigation ditches are calculated in case rice is cultivated.

The maximum consumption occurs in mid-July and the consumption is 4.31 inch/10 days (10.9 mm/day).

Table 5-7. Design Criteria

<u>Item</u>	<u>Dimension</u>
Consumption of rice (q)	4.31 inch/10 days
Rice cropping area (A)	8 Ac
Farm loss (Eo)	25%

The designed water requirement (Q) is calculated by the following formula:

$$Q = q.A.1/1-E_o = 4.31 \times 8 \times 1/1 - 0.25 = 45.97 \text{ inch.Ac/10 days}$$

$$= 0.19 \text{ cfs (0.0054 cu.m/s)}$$

$$Q = 0.19 \text{ cfs (0.0054 cu.m/s)}$$

b) Lateral Canals

i) Lateral Nos. 1, 2, 3, 4, 7 and 8

The lateral canals supply water necessary for rotation areas shall have the capacity to convey water to meet requirements of ten on-farm irrigation ditches (covering five rotation blocks).

The designed water requirements for the lateral canals, therefore, can be estimated as follows:

$$Q = 0.19 \text{ cfs} \times 10 = 1.90 \text{ cfs} \quad 0.054 \text{ cu.m/s}$$

ii) Lateral Canal No.5

The Lateral Canal No.5 shall have a capacity of 2.65 cfs (0.075 m³/s) because this canal supply water will be required for the rotation area (6) of the mechanized irrigation area.

iii) Lateral Canal No.6

The Lateral Canal No.6 shall have the capacity to convey water required for gravity irrigation portion (24 acres) and a part of Area (7) (4 acres), and therefore, the designed water requirement (Q) was estimated at 0.67 cfs (0.019 m³/s).

iv) Lateral Canal Nos. 9, 10, 11 and 12

In the premise that the cropping pattern shall be so prepared that rice cultivation can be practised in two areas among areas (9) through (11), the lateral canals shall have the capacity to secure the amount of water by 3.80 cfs (Q = 2 x 1.90 cfs).

b) Main Canals

i) Main Canal No.1

In the premise that cropping pattern shall be so prepared that rice cultivation can be practised in two areas out of (1) and (2) areas, the designed water requirements for this main canal shall be 3.80 cfs.

ii) Main Canal No.2

In the premise and consideration that cropping pattern shall be so prepared that rice cultivation can be practised in two areas out of (3), (4), and (5) areas and the water for the area (6) of the mechanized irrigation shall be also covered, the designed water requirements are determined.

iii) Main Canal No.3

The main canal No.3 shall serve to take the designed amount of water by 5 cfs from the Bari Canal to convey to the Project Area; consequently, the designed water requirements of the canal will be 5 cfs ($0.142 \text{ m}^3/\text{s}$).

iv) Main Canal No.4

The subject canal No.4 shall serve to convey the total designed water amount to the lateral canal Nos. 6, and 7, and 6 Ac of Area 8; therefore, the main canal No.4 shall have a capacity of 2.71 cfs ($0.077 \text{ m}^3/\text{s}$).

v) Main Canal No.5

The main canal No.5 shall serve to convey the designed water amount of 4.23 cfs to the lateral canal No.12, and therefore, the designed water requirements for this canal shall have a capacity of 5.00 cfs ($0.142 \text{ m}^3/\text{s}$).

6) Mechanized Irrigation Plan

Mechanized irrigation farming shall be carried out in a certain limited area of the Project for demonstration purpose, although the gravity irrigation farming is the main line of the proposed Pilot Farm.

The mechanized irrigation farm plots shall be located at a site where gravity irrigation by Kirthar Canal cannot be carried out due to high elevation, and the proposed acreages for mechanized irrigation farm plots of 57 acres.

Table 5-8. Proposed Dimensions of Facilities for Mechanized Irrigation Farm

<u>Item</u>	<u>Dimensions</u>
Irrig. Acreages	57 Acre (23.09 ha)
Water Consumption Per Day	6.5 mm/day
Actual Irrigation Hours Per Day	12 hrs.
Crops to be Irrigated	Sorghum, Millet, Cotton, Sesame, Maize, Soybean, Sugarcane, Vegetables, Green Pea, Sunflower, Fruit Crops
Irrig. Machines and Equipment	Sprinkler, Raingun, Drip
Irrig. Efficiency	75% - 90%
Meteorological Conditions	Monthly Mean Wind Velocity, 0.24 - 1.14 m/s

a) Proposed Cropping Pattern and Layout of Facilities

The following table shows the proposed crops and irrigation machines/equipment to be employed in the demonstration farm plots of the rotation area(6) for mechanized irrigation demonstration.

Farm Ponds	Vegetables, Others A = 8.2 Acres	Maize Sunflower Sugarcane A=16.3 Ac	Sorghum, Millet Soybean, Cotton A = 16.3 Ac	Fruit Crops, Other Crops A = 16.3 Ac
	Fixed Type Sprinkler	Raingun	Portable Sprinkler	

b) Farm Ponds

i) Necessary Storage Amount of Water

The farm ponds shall have the storage capacity to supply irrigation water for one day to the mechanized irrigation area.

Water required for fixed type sprinkler	370 l/min.
-ditto- portable type sprinkler	880 l/min.
-ditto- raingun	800 l/min.
-ditto- drip	492 l/min.
Total	<u>2,542 l/min. (for 12</u>
	<u>12 hrs operation</u>

$2,542 \text{ cu.m/min.} \times 60 \times 12 \text{ hrs} = 1,830 \text{ cu.m (64,664 ft}^3\text{)}.$

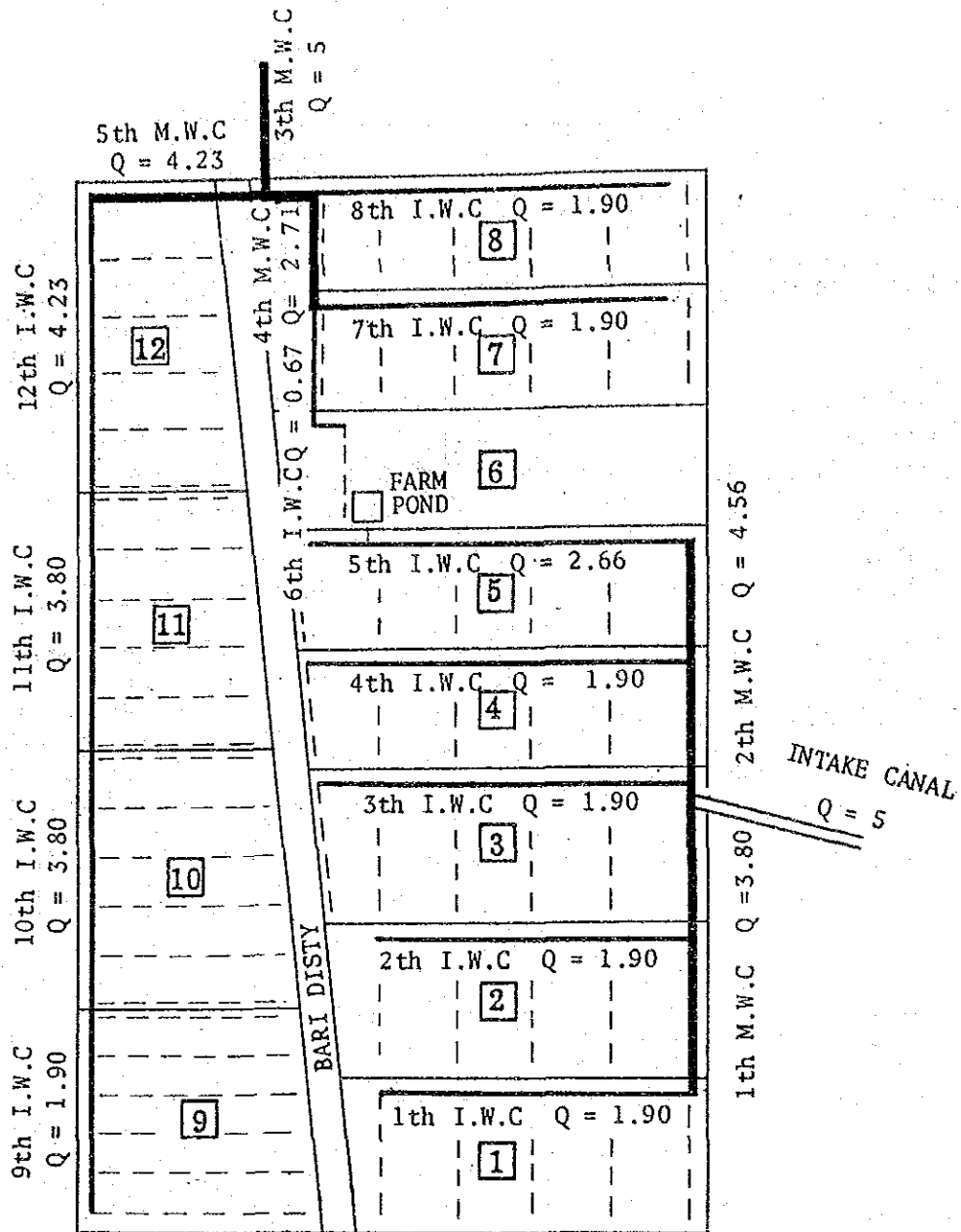
ii) Dimensions of Facilities

Table 5-9. Water Storage of Farm Ponds

<u>Items</u>	<u>Dimensions</u>	<u>Remarks</u>
Effective storage	66,250 cu.ft (1.875 cu.m)	64,664 cu.ft
Effective water depth	5 ft (1.525 m)	
Dead Water	23,336 cu.ft (660 cu.m)	
Total Storage	89,586 cu.ft (2,535 cu.m)	

Table 5.10. Designed Water Requirements (by canals)

<u>Canals</u>	<u>Designed Water Requirements</u>	<u>Remarks</u>
On-Farm Ditches	0.19 cfs (0.0054 m ³ /s)	8 acres for rice and 8 acres for upland crops in a rotation block (16 acres)
<hr/>		
Lateral Irrigation Canals:		Ensure the water to irrigate five rotation blocks.
No.1	.019 cfs (0.054 m ³ /s)	
No.2	"	
No.3	"	
No.4	"	
No.5	2.66 cfs (0.075 m ³ /s)	1.90+0.75=2.65 cfs 1.90 - designed water requirements for Area(5). 0.75 - designed water requirements for Area(6), Mechanized Irrigation plot
No.6	0.67 cfs (0.90 m ³ /s)	0.38 x 28 Ac/16 Ac = 0.67 cfs 28 Ac - Commanding area of lateral canal No.6.
No.7	1.90 cfs (0.054 m ³ /s)	
No.8	"	
No.9	"	
No.10	3.80 cfs (0.108 m ³ /s)	Designed Water Requirements to allow rice cultivation in two areas.
No.11	5.00 cfs (0.120 m ³ /s)	
<hr/>		
Main Irrigation Canals		Lateral irrigation canals (Lateral Irrigation Canal)
No.1	3.80 cfs (0.108 m ³ /s)	Lat. Irrig. Nos.1 & 2
No.2	1.90 cfs (0.054 m ³ /s)	
No.2	4.56 cfs (0.129 m ³ /s)	Lateral irrigation Nos. 3, 4, and 5.
No.3	2.66 cfs (0.075 m ³ /s)	
No.3	5 cfs (0.142 m ³ /s)	Designed water amount taken from Bari Canal.
No.4	2.71 cfs (0.077 m ³ /s)	Lat. Irrig. Nos. 6 & 7
No.5	4.23 cfs (0.120 m ³ /s)	Lat. Irrig. Nos. 12, 11, 10 and 9.



- ; MAIN WATER COURSE (M.W.C)
 - ; INTERNAL WATER COURSE (I.W.C)
 - ; LINK WATER COURSE (Q = 0.19)
 - ; FLOW DIRECT
 - Q** ; IRRIGATION DISCHARGE (cfs)
- 1 cfs = 0.0283 m³/s

Fig. 5-4 IRRIGATION NETWORK AND IRRIGATION DISCHARGE

(4) Drainage Plan

1) Drainage System and Drainage Canal Routing

The drainage water from the farm plots shall be eliminated through the farm drainage ditches provided at the center of rotation block. In the rotation areas(1) through (8), the branch drainage canals shall be constructed along the branch roads to collect drainage water conveyed by farm ditches.

In the rotation areas(9) through (12), the drainage water of the on-farm ditches shall be directly transported to the main drainage canal No.2 to be constructed in the low-lying land extending in the right bank of the Bari Canal.

At the terminal of the main drainage canals, the evaporation ponds shall be constructed so as to evaporate the drainage water flowing down thereto.

The water level in the drainage canals shall be maintained at lower than the field elevation.

2) Estimation of Designed Drainage Water

a) On-farm Ditch

The drainage water from the farm plots shall be estimated by the water flowing through drainage notch on every rice field plot.

The drainage water from the notch can be estimated at 0.055 cfs ($0.0016 \text{ m}^3/\text{s}$) for its peak discharge by applying the equation of discharge for wide crest weir.

Since one on-farm ditch shall collect the drainage water out of 16 notches, the designed drainage water for the on-farm ditches is 0.88 cfs ($0.025 \text{ m}^3/\text{s}$).

b) Lateral Drainage

Also, since one lateral drainage shall collect the drainage water from five on-farm ditches, the designed drainage water is estimated at 4.40 cfs ($0.125 \text{ m}^3/\text{s}$).

c) Main Drainage

In using the proposed rice field of 120 acres, unit drainage discharge (g), and areal ratio, the discharge is determined as follows:

Drainage Canal No.1	:	6.60 cfs ($0.187 \text{ m}^3/\text{s}$)
" No.2	:	4.40 cfs ($0.125 \text{ m}^3/\text{s}$)

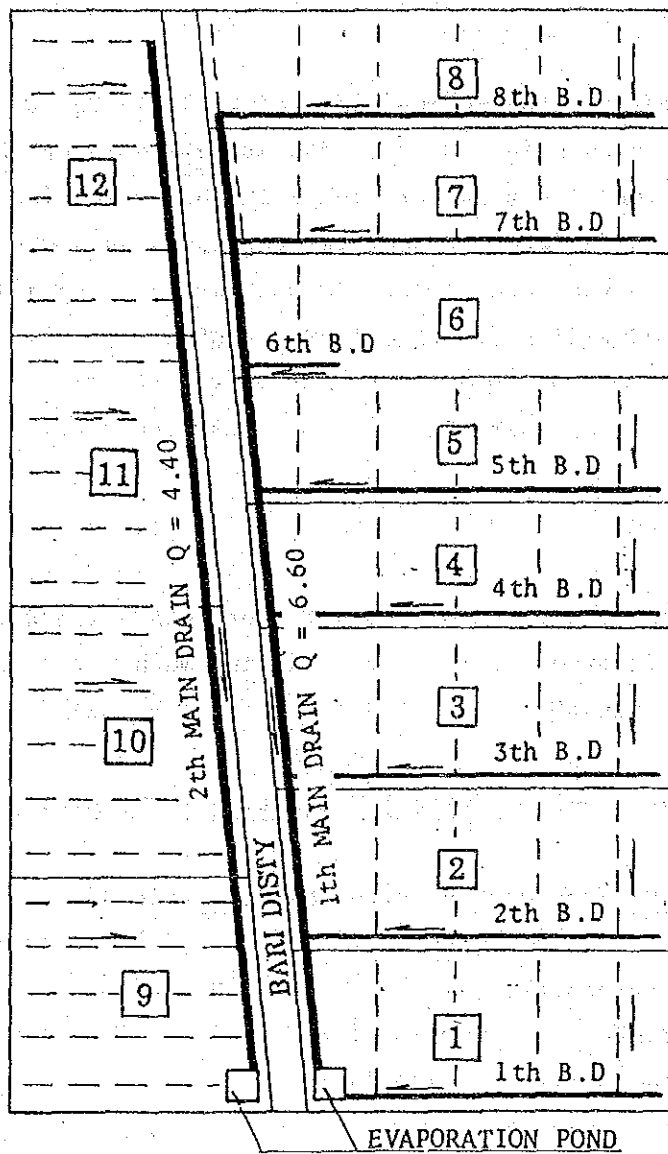
(5) Road Plan

1) Road Networks

The proposed roads for the Project shall be constructed along the Project boundaries and surrounding the respective rotation area as well as rotation blocks so that farming works can be practised more effectively.

a) Trunk Roads

The existing road (unpaved and 4.0 m wide) in the Cattle Farm running east-west shall be utilized after widening and paving as access road to the Project Area. As the in-Project roads are branching off from the above access road, the Main Road No.1 and No.2 shall be provided along the right banks of the Bari Canal, the No.3 along the southern boundary.



- ; MAIN DRAIN (M.D)
 - ; BRANCH DRAIN (B.D. $Q = 4.40$)
 - ; FARM DRAIN (F.D. $Q = 0.88$)
 - ; FLOW DIRECT
 - Q ; DRAIN DISCHARGE (cfs)
- 1 cfs = 0.0283 m³/s.

Fig. 5-5 DRAIN NETWORK AND DRAIN DISCHARGE

b) Secondary Roads

The secondary roads branching off from the main roads shall be constructed surrounding the rotation areas and along the boundaries of the rotation blocks in parallel with the irrigation ditch, so as to raise the efficiency of such farming works as access of farming machineries to the farm plots, transportation of agri-inputs, collection/forwarding of agricultural products.

2) Dimensions of Proposed Roads

a) Effective Width

For the main and secondary roads, the effective width shall be 12 ft (3.66 m) in order that various farming machineries will easily and smoothly pass.

Table 5-11. Overall Width of Farm Machinery

<u>Farm Machineries</u>	<u>Machine Width</u>
Tractors (70 PS)	2.3 m
Trucks	2.5
Seed Drills	3.0
Harvesters	2.4 - 3.1

b) Total Width

The secondary roads shall have a total width of 20 ft (6.10 m) with 8.0 ft shoulders (one shoulder: 4.0 ft) to allow vehicles and farming machineries to park in one side of the roads for loading/unloading of the agri-inputs and products.

The total width of the main roads shall be 30 ft (9.15 m) for vehicles and farming machineries to cross each other smoothly and easily.

c) Road Surface Slope

The slope of two percent (2%) shall be given to the road surface to smoothen drainage from the surface.

d) Pavement

All the roads in the Pilot Farm shall be asphalt-paved (DBST) and comfortable driving, to prevent agri-products from being soiled and to protect crops and farm land from damages by sandy wind etc.

e) Road Height

The road height shall be 1.0 ft (0.305 m) from the field surface.

Table 5-12. Dimensions of Proposed Roads

<u>Dimension</u>	<u>Main Road</u>	<u>Secondary Roads</u>
Total Width	30 ft (9.15 m)	20 ft (6.10 m)
Effective Width	12 ft (3.66 m)	12 ft (3.66 m)
Surface Slope	2%	2%
Pavement	Simple Asphalt Pavement	Simple Asphalt Pavement

5.2.3. Architecture Planning

Based on the layout of the proposed buildings, the functions of the respective buildings shall be clarified to prepare the criteria for the plane planning.

(1) Plane

1) Administration Office

As a result of discussion with the Department of Agriculture, the laboratory and lecture rooms described in the request shall be included

in the building of the administration office. In other words, the administration building shall provide not only a room for Director of Pilot Farm and other office rooms, but also rooms for equipment/devices for research, lecture to trainees and library. The plan of the building, therefore, has been made to minimize the moving lines of the staffs for efficient use of the facilities.

The office building shall be constructed with a yard to accelerate ventilation. The entrance of each room shall be provided in facing the yard. The bath rooms shall be laid out north-south direction and not to face Mecca.

The space of each room was determined as follows:

- i) An area for Director's room was decided to have the similar scale to other public buildings in Baluchistan province such as Agricultural Training Center and Agricultural Research Center in Quetta. As a tradition, the director will have to meet the visitors, therefore, the space of the room was determined by assuming about 10 guests at one time (6.0 sq.m/guest).
- ii) Similar to the director's room, a space for staff's room was determined taking into consideration the local custom and five persons as guests. Both the director's room and staff's room will have a bathroom in each room, which is the same as in other public buildings in Baluchistan.
- iii) A space for assistant staff's room was determined to be able to have meeting with about 3 persons. Following the local custom, the room have 5-6 chairs for the meeting.
- iv) A space for other office rooms was determined based on 5 sq.m per person.

- v) A laboratory space consisting of 4 laboratory tables (for 5 persons) and one table for lecturer. The space of tables measure 120 cm. For reference/purpose, the laboratory of the Agricultural Training Center has a wide space consisting of 8 laboratory tables (for 4 persons). The laboratory equipment will be provided under grant-aid.
- vi) The lecture rooms can be separated by sliding wall. The space for lecture rooms was determined to be wide in order to facilitate as independent room even when separated. The Agricultural Training Center has one hall with the capacity of 70-80 persons, however, the Pilot Farm has no hall. Therefore, the lecture rooms will be used for multi-purpose. Audio-visual teaching equipment will be provided under the grant-aid program in the lecture room.
- vii) The library will have bookshelves, card-case, magazine rack and 2 reading tables (for 6 persons) to be used by 12 persons at a time. The library in Agricultural Training Center has 4 reading tables (for 6 persons) and the library office is adjoining.
- viii) The exhibition room is determined as similar one to that of Agricultural Research Institute. The exhibition room was planned to be surrounded with glass windows for visual-aid purposes. Other rooms were planned to have an allowance in space due to hot humid climatic condition.

2) Guesthouse for Guest Lecturers

Guest lecturers from Agricultural Experimental Station, Training Centers and Colleges/Universities in various places such as in Quetta, Faisalabad, Lahore, Hyderabad, and so forth will be invited from time to time for carrying out efficient tests/experiments for crop suitability and effective training. The proposed lodging/accommodation will be for

invited guest lecturers and shall have such facilities as dining rooms, kitchens, etc. The layout of the facilities, therefore, shall be made so that the moving lines of the guests and cooks, can cross in the dining rooms.

The bedroom will have 15 sq.m space for long stay. The standard bedroom of guesthouses of Provincial offices is about 15 sq.m. Each room will have living and bedroom spaces, which is common in the province. The dining room and lounge will have capacity of 20 persons.

3) Domitory for Trainees

Most trainees will be from Nasirabad District. There are few public transportation facilities available between the Pilot Farm and Usta Muhammed (nearest town to the Farm). The domitory shall be constructed also for the trainees for an efficient training. Under such circumstances, the accommodation shall have a capacity of 20 trainees per class with five bedrooms (four persons per room) together with bathrooms, dining rooms and kitchen.

Each room will have a space of 40 sq.m for 4 trainees to study and lodge. Dining room was designed to accommodate 20 trainees at one time. Attached rooms are similar to those in Japan.

4) Garage

The garage will have roof to protect from hot and strong sunshine. The garage was planned to have a capacity of five 4WD station wagons, 3 trucks and 1 micro-bus. About 1.0 m of space was considered for vehicle inspection and simple repair works.

5) Staff's Housing

The housing plan was determined based on the standard house of government officers of Baluchistan. The floor space was determined uniformly at 256.02 m^2 while that of a standard house at $2,750 \text{ ft}^2$ (255.48 m^2).

The storage space and employee's room in this plan was included while that of standard house was not. The difference in the space is caused by the thickening of wall to 18 inch due to hot area.

6) Storage for Agri-Chemicals and Fertilizers

The N, P, K fertilizer is brought into the farm in 50 kg bag. The requirements of fertilizers are 36.76 tons for summer crop and 35.81 tons for winter crop. Therefore, the requirement for summer crop was taken for designing. The fertilizer requirements for summer crop are 20.60 ton of nitrogen, 14.24 ton of phosphate and 1.92 ton of potassium. They are applied as Urea (46-0-0), superphosphate (0-46-0), K_2SO_4 (0-0-50) and Triple Super Phosphate (T.S.P) (18-46-0). And the total amount of fertilizers are about 160 tons. The necessary storage capacity was calculated at 320 m^3 based on the assumption that the bulk density of fertilizer bag was 0.5 ton/m^3 .

The effective storage space for fertilizers is defined to keep the goods at 80 cm apart from the storage walls and 250 cm from the ceilings. The necessary space is $6.5 \text{ m} \times 16.0 \text{ m} \times 4.5 \text{ m}$.

There are three types of agri-chemicals: liquid, solvent and granule. They are put at their own containers. Since agri-chemicals can be stored closely to the storage walls by their containers, the space was determined at $6.5 \text{ m} \times 11.0 \text{ m} \times 4.5 \text{ m}$.

7) Warehouse for Farming Machineries/Equipment and Repair Shop

One building shall cover the warehouse of the machineries/equipment and workshop for repair with a wall between two portions and the wall shall have a door for traffic between them.

According to the basic plan of Farm Mechanization of MAFF, the space was determined based on the necessary space of respective machinery (882.0 sq.m).

The workshop shall provide the necessary equipment/devices requested in the A-class Standards of provision by Ministry of Agriculture, Forestry and Fisheries (Japan). The A-Class Standards covers a scope of provision of medium/large-size farming machineries as a core and the workshop shall carry out the repair and check of the aforesaid machineries/equipment with dismounting, regularly and when necessarily. The above facilities and works shall be presented for trainees. Furthermore, a spareparts storage and an in-plant office shall be placed for control.

8) Seeds Processing Plants

Among the seeds produced in the Pilot Farm, the seeds of rice, wheat, sunflower are planned to be dried and selected by machine. The seeds treatment plants have tree types, viz., for rice, sunflower and beans depending on the quantity, shape and size of seeds. The seed production is shown in Table 5-5. The net working days is considered at 20 days in a month. The treatment capacity of plant for rice is 177.6 ton ÷ 20 days = 8.9 ton/day. In case the seeds of wheat and barley will be treated by this plant, the necessary capacities are 9.2 tons/day and 1.9 ton/day, respectively. Accordingly, the capacity of seed treatment plant for rice is determined at 10.0 tons/day.

In similar procedure, the necessary capacity of seed treatment plants for sunflower and beans were determined each at 1.0 ton/day.

9) Seed Storage

This is a temporary storage of the seed produced. The seed storage was planned based on the seed production of summer crops (359.9 tons). As the average bulk density of seeds is 0.65 ton/m^3 , necessary storage capacity was estimated at 553.7 m^3 .

The scale of the seed storage is $12.0 \text{ m} \times 20.0 \text{ m} \times 4.5 \text{ m}$. If the 80% of floor area is effective area, $240 \text{ m}^2 \times 0.8 \times 3 \text{ m} = 576 \text{ m}^3$ will be available.

The seeds in storage, which are breathing, shall be packed or sacked in paper or gunny bags with good aeration. These bags shall be stored in pile in keeping sufficient space for breathing well.

10) Building Area

The total floor areas of the building plan are shown below.

Table 5-13. Total Floor Area of Buildings

<u>Buildings</u>	<u>Total Floor Area</u>
Administration office	1,486.5 sq.m
Guest house for lecturers	331.1 "
Dormitory for trainees	398.24 "
Garage	311.75 "
Storage for agri-chemicals and fertilizers	169.0 "
Warehouse for farming machinery and repairshop	1,134.0 "
Seed processive plant for rice	240.0 "
-ditto- for sunflower	120.0 "
-ditto- for beans	120.0 "
Seed storage	240.0 "
Staff housing (per house)	256.02 "

(2) Profile

Nasirabad District has a seasonally large fluctuation in temperature with daily maximum of 50°C in summer, while daily minimum of 0°C in winter, and total annual rainfall of only 3.4 inch (86.4 mm). The annual sunshine is considerably large. In winter, sandstorm sometimes hits the District.

Rain water intrusion into buildings will not be considered due to extremely little annual rainfall.

Contrarily, however, the floor level of the office building, guest houses for lecturers and dormitory for trainees shall be raised by 100 cm from the ground level due to a large amount of annual sunshine, and those of the other buildings shall be raised by 80 cm.

In other respect, the on-farm main roads shall have the height of 150 cm by the surface level from the ground level, but the secondary roads shall have height of 50 cm due to its ecessibility to the buildings and facilities.

The ceiling height for the administration office shall be 5.5 m from the floor in considering the beam height. For other offices, the ceiling height shall be 4.5 m in terms of possible expansion of the room volume against high temperature. The air-conditioners shall be provided with only several limited rooms by individual operation type. For residences and lodging buildidngs, special attention is given to securing the quality living conditions and the ceiling height shall be 4.5 m from floor level as taken in the general offices so as to pursue comfortability.

Since all the buildings and facilities are expected to be exposed in the considerably strong sunshine, all buildings for administration offices and lodgings are designed to provide corridors or outside passages to protect strong sunshine reflection into their rooms. The windows and other openings are designed to have enough sizes only for

lighting and ventilating in order to prevent sandy wind. The opening facing the yards, however, shall have sashes as wide as possible to allow the natural ventilation effective, and air-conditioners will be installed in minimum scale.

5.2.4. Structural Planning

(1) Basic Concept for Structure to be Employed, Proposed Structure and Design Criteria

- 1) Reinforced Concrete and Ramen Structure (RC Standards - 1975)
- 2) Brick Buildings (BS Standards)

(2) Seismic Structure

- 1) Nasirabad District has not recorded earthquakes, but since Quetta, about 300 km apart from the District, has experienced earthquakes, the proposed building shall have the structure to stand for horizontal tremor as large as 0.1 in magnitude.
- 2) The brick walls for both sides of the Ramen structures are considered as non-bearing wall.
- 3) The brick walls shall be so designed as to stand against wind load.

(3) Materials to be Used and Strength Required

- 1) Concrete $F_c = 210 \text{ kg f/cm}^2$
Cement Anti-Sulphate Cement (Type V)
Aggregates River bed sand and gravels
Admixtures AE Dehydro agent
- 2) Iron Bars SD 30
- 3) Steel Traff. SS 41
- 4) Bricks

(4) Design of Foundation

Bearing capacity: 15 ton/sq.m by independent or strip foundation.

(5) Countermeasures for salt damages

- 1) The soils of Nasirabad District contain much salts than the others and the salts (sulphates) will react with C_3A in cement to produce Ettringite and swelled. When the reaction is heavy, concrete may sometimes rise in surface and collapse. Under the conditions, Type V cement with less C_3A content contained shall be used as anti-sulphate cement.
- 2) The water to be used for concrete mixing will also contain salt, which can be estimated in quantity at 70 g per 1.0 m^3 of concrete on the Cl conversion basis (unit water amount used: 180 kg/m^3). Consequently, AE dehydro agent shall be used for decreasing the water for concrete mixing.

(6) Structural Calculation

- 1) The analysis shall be made in the two dimension Ramen structure.
- 2) Long-term stress analysis shall be made by fixed moment method.
- 3) Stress by earthquake shall be analyzed by D-value method regardless of shearing deformation and stiff areas.
- 4) Section study shall be made in accordance with the criteria referred to in Concrete Structure Calculation Standards with Comments by JASS.
- 5) The large beam with 120 m span is deemed considerably large for RC structure and the related specifications shall include the specific instruction to use the quality cement to meet the above requirements.

5.2.5. Planning for Equipment/Devices

1) Electrification

The proposed Project Site for both farm plots and building lots provides the high voltage elevated transmission lines for 11 kV under control of WAPDA. And the Regulations of WAPDA specifies that all works of installation of necessary facilities and their maintenance shall be made by WAPDA upto the immediate outside of the buildings. The installation and maintenance of electric meters shall be practised by WAPDA accordingly.

For every building and house, electric requirements shall be applied with WAPDA to have power supply individually. The individual power requirements can be estimated in the following table:

Table 5-14. Individual Power Requirements

<u>Building/Facilities</u>	<u>Voltage</u>	<u>Phase</u>	<u>Power Requirement</u>
Administration Office	380V/200V	3	90 KW
Guest house for lecturers	"	3	40 KW
Dormitory for Trainees	"	3	12 KW
Garage	200V	single	3 KW
Agri-Chemical/Fertilizer Storage		"	2 KW
Farm Machinery Garage & Workshop	380V/200V	3	25 KW
Seed Processing Plant(1)	"	3	25 KW
" (2)	"	3	15 KW
" (3)	"	3	15 KW
Seed Storage	200V	single	2 KW