

**ANNEX E**

**AGRICULTURE, MARKETING  
AND AGRO-ECONOMY**

## ANNEX - E

### AGRICULTURE, MARKETING AND AGRO-ECONOMY

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## **ANNEX E AGRICULTURE, MARKETING AND AGRO-ECONOMY**

### **E.1 Introduction**

Chashma Right Bank 1st Lift Irrigation Project aims at increasing agricultural productivity and farmers' livelihood through irrigation development, provision of agricultural support services, and organization of farmers' associations etc. This annex focuses on assessment of the present situation of agricultural production, agricultural support services, farming practices, farm economy and marketing, and formulation of agricultural development strategy and plans.

Main items described in this annex are summarized as follows:

- (1) Assessment on the present condition of agricultural activities, crop production, agricultural marketing and farm economy in the Project Area,
- (2) Assessment on the suitable cropping pattern in the Project area and the development potential in agricultural production,
- (3) Estimation of the farm inputs requirement under "With Project" condition, and
- (4) Formulation of the plans for farmers' associations and agricultural supporting services.

Following field surveys were made to assess the present condition of the area and to formulate the development plans:

- (1) Survey on farming practices for each crop, cropping pattern (calendar), crop unit yields and production,
- (2) Marketing survey for farm inputs and products,
- (3) Agro-economic survey in the Project Area, and
- (4) Survey on existing farmers' organizations and agricultural support services including agricultural extension and research, etc., and
- (5) Public consultation survey to assess the farmers' concerns to the Project.

Information and data were collected from the government authorities concerned such as District Agriculture office, District Cooperative Office and others. Farm survey of 210 farm household were made to obtain more practical and reliable information on agricultural activities and farming practices. Public consultation survey covering nine (9) union councilors and 326 villagers in 10 mouzas under the eight (8) unions was implemented in March 1994 and July 1994.



## E.2 Socio-Economic Background

### E.2.1 National Economy

Gross Domestic Product (GDP) at current factor cost in 1992/93 was Rs. 1,200,455 million (US\$ 46.2 billion by the rate of 25.96). Per capita GDP at factor cost was Rs. 9,935 (US\$ 383). Agricultural sector in Pakistan occupied around 25 % of GDP during 1988/89 to 1992/93 and held 48 % of labor force in 1993/94. Shares of GDP in industry and services sectors were 23 % and 52 %, respectively. There was no significant change in the sectoral GDP distribution during the last 5 years. Annual growth rates of GDP and per capita GDP during 1987/88 to 1992/93 could be estimated at 5.0 % and 1.8 %, respectively (Ref. Table E.2.1.1 to E.2.1.5).

GDP growth in 1991/92 - 1992/93 was interrupted and down at around 2.3 %. This accrued mainly from a decline of 5.3 % in agricultural output. This year had excessive rains and devastating floods which affected agricultural production. GDP and growth rate are summarized as follows:

Sector	GVA* in 1992/93 (Rs. Million)	Share (%)	Annual Growth Rate (1987/88 - 1992/93) (% p.a.)
Agriculture	297,816	24	3.69
Industry	264,778	23	5.61
Services	637,861	53	5.32
GDP	1,200,455	100	4.98
(Per Capita GDP)	(Rs.9,935)	-	1.84

Note: \* ; Gross Value Added at current factor cost

The Government of Pakistan has been implemented a macroeconomic and structural adjustment program since 1988/89 to improve financial imbalance and the structural weakness. Despite adjustment efforts, Pakistan's balance of payments remains weak. Exports have been increased and trade balance improved since 1987/88. While this improvement was still insufficient to compensate for the negative balance in the services.

Cotton and cotton manufactures have been the main source of exports. The share of those exports during 1989/90 to 1991/92 was around 58 % to the total merchandise export amount. Rice export accounts for 6 % of the total amount. Non-traditional exports increased rapidly with 20.8 % p.a. during 1987/88 to 1991/92. Major import foods comprise edible oil, wheat and sugar which account for 4.4 %, 3.3 % and 1.1 % of the total import amount respectively. Quantity of wheat import varied year by

year from 601 to 2,171 thousand tons and 1,560 thousand tons on average during 1987/88 to 1991/92. Machinery import occupies a biggest share with around 25 % of the total .

Item	Share/Average (1989/90 - 1991/92) (%)	Growth Rate in Value (1987/88 - 1991/92) (% p.a.)
<b>I. Exports</b>		
Manufactures	58.0	11.8
Rice	5.6	3.5
Other traditional goods	15.5	4.0
Non-traditional goods	20.9	20.8
<b>Total</b>	<b>100.0</b>	<b>11.6</b>
(US\$Million/c.i.f in 1991/92)	(6,904)	
<b>II. Imports</b>		
Foods	10.7	6.2
(Edible oil)	(4.4)	(-0.4)
(Wheat)	(3.3)	(34.2)
(Sugar)	(1.1)	(-9.0)
Crude oil	5.8	1.6
Petroleum/Product	9.9	12.0
Machinery	24.7	14.3
Fertilizers	2.7	9.5
Others	46.2	0.6
<b>Total</b>	<b>100.0</b>	<b>5.7</b>
(US\$Million/c.i.f in 1991/92)	(9,842)	

## E.2.2 Agricultural Development Plans

### (1) Seventh Plan review

Seventh Five Year Plan (SFYP) has been implemented since 1988/89, and 1992/93 was a last year of the Plan. Annual growth targets for SFYP were set at 6.5% in GDP and 3.3 % in per capita GDP during the plan period (Ref. Table E. 2.2.1). Based on the GDP figures during 1987/88 to 1992/93, these growth target could not be achieved i.e. actual growth rates were 4.98 % in GDP and 1.84% in per capita GDP.

The average annual growth rate of the agricultural sector during the Seventh Plan period is estimated at 3.7% against a target of 4.7%. The shortfall is mainly due to the heavy rains and floods in 1992.

Actual crop production was below the Seventh Plan target except tobacco, vegetables, meat and milk production. Self-sufficiency in wheat could not be attained and wheat

had to be imported to meet the domestic requirement. Self-sufficiency of sugar has been attained, however the sugarcane production was below the target mainly due to lack of improved high yielding varieties. The overall growth of livestock has been 5.7% against the target of 5.3% (Ref. Table E. 2.2.2).

It is estimated that Rs. 10.6 billion has been utilized against the Seventh Plan allocation of Rs. 12.3 billion, indicating 86% of achievement. The subsidy on fertilizer is estimated to be Rs. 5.4 billion against the Plan allocation of Rs. 3.3 billion (Ref. Table E. 2.2.3).

(2) Development activities in NWFP

In NWFP, around 1,300 provincial and district projects have been implemented since 1990-91. Provincial development budget accounts for Rs. 2,745 million on average during 1990-91 to 1991-92, of which around 63 % or 1,735 million is allocated to the respective district development budget. D. I. Khan district was allocated Rs. 127.9 million which accounts for 7.4 % of the total district budget. Regarding sectoral allocation, the education budget occupies biggest share of 23 % in the province and 35 % in D. I. Khan district. The second and third shares are spent for water supply and sanitation categorized as physical planning and housing (19% in both) and road development (13 % in the province and 16 % in D. I. Khan). Agriculture budget, and water and power budget including irrigation occupy less than 10 % of the total budget respectively as follows (Ref. Table E.2.2.4 and E.2.2.5):

Sector	Province *1 (NWFP)	D. I. Khan *2 District
<b>I. Share (%)</b>		
Agriculture	5.4	6.2
Water and power	7.3	3.4
Transport & communication	12.5	16.4
Water supply and sanitation	18.7	18.9
Education	22.9	35.1
Health	15.0	11.7
Others	18.2	8.3
<b>Total</b>	<b>100.0</b>	<b>100.0</b>
<b>II. Budget (Rs. Million)</b>		
<b>Total</b>	<b>2,774.7</b>	<b>127.9</b>
(Provincial ; 1,009.8 District ; 1,734.9)		

Note: \*1; Average of 1990/91 and 1991/92. \*2; Average of 1990/91 to 1992/93

The number of on-going development plans and projects in D. I. Khan is 42 schemes comprising the following sectoral distribution (Ref. Table E. 2.2.6):

Sector	Number of Scheme	Project Cost (Rs. Million)
Agriculture	3	115.5
Forestry & fishery	3	31.7
Transport & communication	5	242.2
Water supply and sanitation	16	70.0
Education	10	41.2
Health	4	211.8
Social welfare	1	2.8
Total	42	715.2

### (3) Eighth Plan objectives and strategies

Eighth Five Year Plan (EFYP) covering 1993/94 to 1997/98 was officially published in June 1994. Annual growth targets are set at 7.0% in GDP and 4.1% in per capita GDP. The annual growth rate of agricultural sector is expected to be 4.9% during the EFYP period (Ref. Table E. 2.2.7).

The primary objective of the Eighth Plan in agriculture sector is set at the achievement of a growth rate higher than the population growth, in order to ensure food security, self-sufficiency and exportable surpluses. Integrated development of irrigation, drainage and agriculture with greater responsibility devolving on the Provincial Governments is emphasized.

In order to achieve the objectives, the implementation of policies and programs since the Seventh Plan will be continued. The research and development activities will be focused on productivity evolving high production technology and its quick transfer to the farmers. Closer linkages will be established between the agriculture and irrigation departments. Concerted efforts will be made to improve the operational efficiency of the irrigation infrastructure and promote conjunctive use of water along with other inputs in order to rapidly increase crop production. Major emphasis will be laid on increasing the per acre yield of crops and improving the productivity of livestock, fisheries and forestry sub-sectors.

Special efforts will be made to channel appropriate technologies and resources differentiated by agro-climate and ecological zones (rainfed, dry land, desert and hilly areas) to small and medium-sized farms. The improvement of profitability of agricultural sector will be realized through sustained improvement in agricultural productivity, supply of institutional credit for purpose of inputs, machinery and implements, and provision of remunerative support prices to farmers.

In order to improve the socio-economic conditions of people residing in rural areas, non-farm activities such as livestock, agro-forestry, fisheries, agro-industries will be promoted. The Government has already formulated policies for rapid rural industrialization. For environmental protection to deforestation, overgrazing, and damaging effects of agro-chemicals, a 25-year Forestry Master Plan is prepared and implemented during the Eighth Plan (Ref. Table E. 2.2.8).

Based on the above agricultural development strategy, major crop production targets during the EFYP period are expected as follows (Ref. Table E. 2.2.9):

Crops	(Unit: %/a.n.)	
	7th plan Actual	8th Plan Target
Wheat	5.0	4.0
Rice	-0.8	5.5
Maize	0.9	4.0
Cotton	1.1	5.3
Sugarcane	2.9	5.0
Pulses	-0.5	4.3
Rape and mustard	0.3	3.7
Vegetables	8.7	5.0
Fruits	2.8	5.6

An amount of Rs. 5.214 billion excluding fertilizer subsidy of Rs. 0.5 billion has been allocated for the federal programs of agricultural sector. The subsidy on phosphatic fertilizer is expected to be eliminated during 1992-93, while subsidy on potassic fertilizers is expected to be eliminated by 1995-96 (Ref. Table E. 2.2.10).

### E.2.3 Agriculture in Pakistan

Pakistan is situated in arid and semi-arid climatic zones and is heavily dependent on irrigation. Of the country's total area of 57.8 million ha, 20.7 million ha were cultivated in 1991-92. The irrigated area is about 16.2 million ha of which about 11.7 million ha is under canal irrigation, most of it in Punjab and Sind provinces. It is estimated that about 79 % of cropped area depend on irrigation and that the increase in cultivated land by over a third since 1947 has largely been due to improvements in irrigation. However, there is still believed to be scope for extension of the irrigation system to potentially cultivable areas as well as improvement in the management of the existing system, which is geared to extensive rather than intensive farming. Of equal importance to new irrigation works is reclaiming irrigated land that

has become saline through water logging, especially in Sind. Surface water resources contribute approximately two-thirds of total water availability and ground water resources one-third. The North West Frontier Province (NWFP) covers 8.3 million ha, of which 1.9 million ha or 23 % is cultivated and about 0.8 million ha or 41 % irrigated. The Province is not self-sufficient for staple foods. In terms of cropping area, wheat and maize are of major importance, most of it grown under rainfed conditions. Land utilization and irrigated area of Pakistan and NWFP are given as below ;

Description	Pakistan (‘000 ha)	NWFP (‘000 ha)
Cultivated Area:	<u>20,660</u> (35.7%)	<u>1,909</u> (22.9%)
- Net sown area	14,720	1,554
- Current fallow area	5,940	355
Total Cropped Area:	<u>19,520</u>	<u>2,080</u>
- Area more than ones	4,800	526
Un-cultivated Area:	<u>37,120</u> (64.3%)	<u>6,436</u> (77.1%)
- Cultivable waste	9,260	1,032
- Not available for cultivate	24,400	4,073
- Forest	3,460	1,331
<b>Total Area Reported:</b>	<u>57,780</u> (100%)	<u>8,345</u> (100%)
<b>Total Irrigated Area:</b>	<u>16,220</u> 78.5%	<u>785</u> 41.1%

Source: Agricultural Statistics of Pakistan, 1991-92

Climate condition define two cropping patterns in Pakistan. These are wheat in Rabi season (winter season which extends from October to March) and paddy or cotton in Kharif season (summer season which extends from April to September). The six major food grains grown in Pakistan are wheat (66 %), paddy (rice, 18 %), maize (7 %), millet (4 %), sorghum (3 %) and barley (2 %), which together are grown on 11.7 million ha of 5 years average from 1987/88 to 1991/92. After adding 1.4 million ha of pulses, the total food crop area comes 13.1 million ha. The main cash crops in Pakistan are sugarcane, cotton, oilseeds and tobacco, which together account for 4.3 million ha. In addition, 0.8 million ha are under fruits and vegetables, and 3.1 million ha are planted to other crops. This indicates that the food crops and cash crops account for 55 % and 18 % of cropped area, and summarized as below ;

Crops	Cropped Area	
	('000 ha)	(%)
Food Grain	11,667	54.6
Cash Crops	3,794	17.7
Pulses	1,420	6.6
Oilseeds	523	2.4
Vegetables	381	1.8
Fruits	452	2.1
Others	3,113	14.8
<b>Total</b>	<b>21,350</b>	<b>100.0</b>

Source: Agricultural Statistics of Pakistan, 1991-92

Wheat is the most important crop in terms of cropped area, production value and its role in consumption. Between 1975/76 and 1991/92, cropped area and production increased from 6.1 to 7.7 million ha and from around 8.7 to 14.3 million tons. Thus the larger proportion of the increase in production was due to an increase in unit yields, which doubled over this period. These increases were achieved through intensive use of fertilizer and high-yield varieties as well as irrigation. The weather, however, continue to be crucial factor, particularly in the rainfed area. The cropping area, crop production and yield for major crops during 1987/88 - 1980/91 are estimated as below ;

Item	Pakistan			NWFP		
	Cropped Area ('000 ha)	Production ('000 tons)	Yield (t/ha)	Cropped Area ('000 ha)	Production ('000 tons)	Yield (t/ha)
Wheat	7,734	14,332	1.85	817	1,064	1.30
Paddy (rice)	2,064	3,233	1.57	62	116	1.87
Cotton	2,657	1,634	0.61	1	-	0.25
Gram	965	487	0.50	104	57	0.55
Sugarcane	871	36,070	41.43	102	4,376	43.05
Maize	855	1,180	1.38	500	735	1.47
Millet	424	175	0.41	13	7	0.56
Sorghum	398	231	0.58	22	15	0.70
Oilseeds(rape/mustard)	300	227	0.76	38	17	0.45

Source: Agricultural Statistics of Pakistan, 1991-92

### E.3 Present Condition Of The Study Area

#### E.3.1 General Condition

D. I. Khan district has a total area of 896,000 ha of which only about 288,000 ha (32 %) area is cultivated and about 418,900 ha (47 %) is non-cultivated area as cultivable waste. About 42 % of the total cultivated area is irrigated by gravity canal

and tube well irrigation water, whereas the remaining 58 % is rainfed land. The Study Area is estimated at 141,700 ha by the land use survey using the topography map (1/50,000). Present cultivated land area is estimated about 106,640 ha or 75 % of the Study Area. Only 940 ha (1 %) is irrigated by the tube well irrigation water, and remaining 99 % is rainfed land. Present land utilization is given in Table E.3.1.1 (1) and (2).

The climate in the Study Area is characterized by the distinct summer (Kharif) and winter (Rabi) seasons. The summer season extends from April to September and the winter season during the remaining months. The average annual rainfall in the Study Area is about 270 mm of which some 46 % occurs in the summer months of July and August. Fluctuation of annual rainfall is big at the range from 140 mm to 425 mm on the basis of last 10 years' records. The annual mean temperature is 24.5 °C, ranging from the maximum monthly mean of 34.2 °C in June to the minimum of 12.2 °C in January. Mean sunshine hour is as short as 6.6 hours/day in November, while the other months are long ranging from 7.0 to 9.7 hours/day (Ref. Fig. E.3.1.1).

In relation to the above climate conditions, inadequate and erratic rainfall under irregular distribution throughout the year arises low productivity in rainfed area. Most rainfed area has no inherent soil limitation, but the crop production is moderately to severely constrained by the lack of adequate moisture supply. The shortage of irrigation water not only restricts increase in cropping intensity but also hampers crop productivity. The present marginal crop production keeps farmers' livelihood at subsistence level.

### **E.3.2 Administrative Divisions**

Local government bodies in North West Frontier Province comprise 19 districts and one municipal corporation in Peshawar, 17 municipal committees, 24 town committees and 697 union councils in 1991 which are classified as follows:

- |                           |   |
|---------------------------|---|
| (1) District Council      | Area of revenue district excluding city and populated urban areas       |
| (2) Municipal Corporation | City having population of more than 500,000                             |
| (3) Municipal Committee   | Urban area having population of 20,000 or more                          |
| (4) Town Committee        | An urban area having population of more than 5,000 but less than 20,000 |
| (5) Union Council         | Rural area consisting mouzas which are sub-divided into                 |



villages

For local administration, provincial government has line department offices by a level of district and division. One divisional office covers two to five district offices. Commissioner is appointed by a level of division for coordinating local administration among provincial line departments. Deputy commissioner and assistant commissioner are also appointed by a level of district and tehsil (sub-divisions of district), respectively (Ref. Table E. 3.2.1).

D. I. Khan district comprises one municipal committee in D. I. Khan, two town committees in Paharpur and Kulachi, 34 union councils, and 359 mouzas which are sub-divided by two tehsils of D. I. Khan and Kulachi. The Study Area is located in D. I. Khan district and extends over two tehsils. Administrative Study Area comprises 13 union councils covering 102 mouzas in D. I. Khan tehsil and 1 union council covering 2 mouzas in Kulachi tehsil as of March 1994. Administrative divisions of the Study area are summarized as follows (Ref. Fig. E.3.2.1 and Table E. 3.2.2):

Item	No. of Union Council	No. of Mouza	Area (km <sup>2</sup> )
<u>Administrative Divisions of Study Area</u>	<u>14</u>	<u>104</u>	<u>2,082</u> (28%)
D. I. Khan Tehsil	13	102	2,034
Kulachi Tehsil	1	2	48
<u>D. I. Khan District</u>	<u>34</u>	<u>359</u>	<u>7,325</u> (100%)
<u>NWFP</u>	<u>697</u>	<u>4,733</u>	<u>74,521</u>

### E.3.3 Land and Population

#### (1) Present demography

Population of D. I. Khan district in 1993 is estimated at 725 thousand which accounts for 4.4 % of the NWFP's 16.6 million. District population is sparsely distributed at 99 persons per km<sup>2</sup> compared with NWFP's 222 and Pakistan's 152. Kulachi tehsil is less populated at 50 persons per km<sup>2</sup>. On the other hand, D. I. Khan tehsil is dense at 129 persons per km<sup>2</sup> where covers CRBC Phase I and II irrigation area as well as the urban area in D. I. Khan city and Paharpur town (Ref. Table E. 3.3.1) as follows:

Item	Population ('000)	Area (km <sup>2</sup> )	Population Density*
D. I. Khan District	725	7,325	99
D. I. Khan Tehsil	587	4,557	129
Kulachi Tehsil	138	2,768	50
NWFP	16,555	74,521	222
Pakistan	120,840	796,095	152

Note: \* ; Persons / km<sup>2</sup>

JICA study team carried out Farm Survey at the selected 11 mouzas during July to August 1993. On the basis of the Farm Survey results, the Study area (141,700 ha) locates within the 104 related mouzas having 208,200 ha. The population and household number in the area of 104 mouzas are estimated at around 122,700 (which accounts for 17% of the district population) and 19,600, respectively with an average family size of 6.3 (Ref. Tables E.3.3.2 and E.3.3.3). Population of the 104 mouzas is classified as rural population due to no town committees and will be directly and indirectly benefited by the 1st lift irrigation project. The residential population and household within the Study area are estimated at 83,500 and 13,340, respectively which account for 68% of those of the 104 mouzas. Demographic features of the 104 mouzas covering the Study Area in 1993 are summarized as follows:

Item		Study Area	104 Mouzas	D. I. Khan	NWFP
Area	(km <sup>2</sup> )	1,417	2,082	7,325	74,521
Population	(Person)	83,500	122,700	725,000	16,555,000
Household No.	(No.)	13,340	19,600	119,000	2,435,000
Family Size	(/H.H)	6.3	6.3	6.1	6.8
Population Density	(/km <sup>2</sup> )	59	59	99	222
Population Growth (1981 - 1993)	(%/a.n.)	3.01	3.01	3.25	3.42

Literacy ratio of D. I. Khan district in 1981 was 18.4 which was lower than the national average of 26.2, while comparatively higher than the provincial average of 16.7. The ratios of rural area are commonly lower than those of urban area. In the district, the ratio in rural area remained at 13.7. In addition, education for the female is less promoted and the ratio of female was limited at 8.0 (Ref. Table E. 3.3.4. Based on the farm survey results of 210 farm households , literacy ratios are estimated at around 22 for male, 4 for female and 14 in both. Educational level of male respondents is summarized as follows):

Item	Educational Level (% to 20 years old and over)		
	Primary (5-9)	Secondary (10-14)	College (15-18) University (19-20)
Sampling Results (Male only in 1993)	11.9	5.7	1.4

Agricultural labor force is predominant in the Study Area. In D. I. Khan district, agricultural labor force accounts for 56% of the total labor force in 1989/90 which is a little lower than the provincial average of 62% and higher than the national average of 45% (Ref. Table E.3.3.5).

(2) Future demographic status

The annual population growth in the Study area during 1981 to 1993 is estimated at a little lower growth trend of 3.01% because there are insufficient infrastructure and limited industries, and the area could not maintain livelihood of the people. Through the 1st lift irrigation and other socio-economic infrastructure development, population increase of the area will be accelerated by the in-migration from backward rainfed area. On the other hand, the stage III CRBC gravity irrigation project is being constructed and will be completed before the year of 2000. The population of the study area might be absorbed by the stage III development. The CRBC gravity irrigation development at stage I and II has arisen in-migration from the Study area, while the population growth in the period has a still significant rate of 3.01%. It is assumed that the future population growth of 3.01% per year be maintained at least in the Study area. Based on the farm survey results including the population growth at urbanized mouzas in the Study area, a higher population growth rate at 3.50% would be expected through the commercial and industrial development.

It is considered that the population growth rate of 3.01% per year is a reasonable rate for the future demographic estimation in the Study area. Labor force population is estimated applying the crude active rate (the percentage of persons in labor force to total population) of 31.5 which is based on the population by age and sex in D. I. Khan district and the result of Labor Force Survey 1990-91. The demographic forecast is summarized as follows (Ref. Tables E.3.3.6 and E.3.3.7):

Year	Population	Household Number	Labor Force	Labor Force per ha of CCA
1993	83,500	13,340	26,300	0.23
2000	102,800	16,320	32,400	0.28
2005	119,200	18,920	37,500	0.32
2010	138,200	21,940	43,500	0.38

#### E.3.4 Land Holding and Tenure

The latest land ownership records in 10 mouzas out of the selected 11 mouzas (the record of Chahkan in 1970 was excluded) were collected at the respective revenue offices. Joint family system is common in the Study Area and 2 to 3 owners live together as one household. Registered owners and their agricultural land were consolidated by a unit of household taking their father's names into consideration. The household numbers and their agricultural land distribution by size of land were estimated through the above analyses (Ref. Table E.3.4.1).

According to the information collected from the village chiefs in the selected 11 mouzas. Out of 13,340 households in the Study area, resident agricultural land owner households are estimated at around 10,000 (75%) and the rest of 3,340 (25%) are landless households such as the government officers, merchants, landless tenants, laborers, etc.

Based on the sampling data in the selected 10 mouzas (average size of agricultural land holding and their household distribution), registered agricultural land covering cultivated area and some part of fallow is estimated at around 59,900 ha which accounts for 44% of the total agricultural land of 135,400 ha. Area under resident agricultural land holdings is estimated at 49,600 ha (83%). The rest of the land (10,300 ha / 17%) is assumed to be absentees'. It is obvious that the absentee land holding is prevailing in the Study area.

Average holding size of agricultural land is 5.0 ha in resident owner households, 3.4 ha in absentee owner households, and 4.6 ha in total owner households. Agricultural land is unevenly distributed among land owner households in the Study Area. The number of marginal and small owner households below 3 ha account for 74%, while their share of agricultural land area is limited at 9% of the total land. On the other hand, the number of large land owner households more than 5 ha is limited at 18%, while their share of land area accounts for 84%.

Size of Agricultural Land (ha)		Number of Household		Agricultural Land		Average Size of Agri. Land (ha/H.H)
		No.	%	ha	%	
Less than 1	(Marginal)	7,253	56	1,368	2	0.2
1 - 3	(Small)	2,291	18	4,206	7	1.8
3 - 5	(Medium)	1,097	8	4,267	7	3.9
5 and above	(Large)	2,359	18	50,056	84	21.2
Total/Average		13,000	100	59,897	100	4.6
R.H.H		10,000	77	49,620	83	5.0
A.H.H		3,000	23	10,277	17	3.4

Note: R.H.H ; Resident household, A.H.H ; Absentee household

Overall land holding status in the Study Area of 141,700 ha covering the registered agricultural land of 59,900 ha, fallow, cultivable waste, and non-agricultural area was assessed. The holding balance between all land and registered agricultural land concentrates on the large owner households more than 5 ha. The holding balance in the large owner households is estimated at around 78,500 ha which accounts for 96% of the total balanced area of 81,800 ha.

According to the data collected from the selected 10 mouzas, around 33% of the registered agricultural land is tenanted. Share cropping is predominant in the Study Area. Input cost and produce are usually equally divided by the owners and lessee. Social status of lessees is low and bound to owners because of debts and local convention.

### E.3.5 Present Cropping Pattern and Cropping Intensity

The cropping calendar in the Study Area is characterized by three distinct crop seasons, Kharif (summer), Rabi (winter) and spring. About 46 % of the annual rainfall occurs in the summer season from July to August. In the winter season, about 27 % of rainfall occurs from December to March. Under irregular rainfall pattern in the Study Area, frequent crop failures occur in rainfed lands of Barani and Rod Kohi area because of inadequacy of soil moisture supplies. The present cropping calendar in the Study Area is presented as below:

Crop Season	Sown	Harvested
Kharif Season Crops:	July-August	Oct.-Nov.
Rabi Season Crops:	Oct.-Nov.	March-April
Spring Season Crops:	Feb.-March	June-July

For Kharif season crops, sorghum (jowar, 47 %), millet (bajra, 46 %) and guara

(4 %) are the major crops while wheat (53 %), gram (28 %) and oilseeds (16 %) are the main crops for Rabi season crops.

On the basis of 5 years average, 5,370 ha or 5.0 % of the cultivated areas of 106,640 ha are sown in the summer season. Harvesting, however, is limited only at around 30 % of the total sown area and remaining area is damaged. During winter season, 16,060 ha or 15.2 % of the cultivated area are sown, and 39 % of the total sown area was harvested. The present cropping intensity (percentage of sown area to the cultivated area) is estimated at 20.1 %. In terms of harvested area to the cultivated area, harvesting intensity is limited at 7.4 % comprising 1.5 % of Kharif and 5.9 % of Rabi. The difference between the cropping intensity and harvesting intensity is caused by uncertain and uncontrolled water in the summer season, and acute shortage and untimely availability of water in the remaining months of the year.

The typical cropping pattern and cropping intensity in irrigated, Rod Kohi and Barani cultivated area are shown in Fig. E.3.5.1. The annual cropping area and overall cropping intensity in the Study Area are estimated in Table E.3.5.1, and summarized as below:

Crops	Cropping Area		Cropping Intensity	
	Sown (ha)	Harvested (ha)	Sown (%)	Harvested (%)
<b>Kharif Season Crops:</b>				
Sorghum	2,530	775	2.4	0.7
Millet	2,470	640	2.3	0.6
Maize	10	5	-	-
Sugarcane	30	20	-	-
Cotton	60	25	-	-
Guara	230	105	0.2	0.1
Vegetables, fruits, pulses, fodders others	40	25	0.1	0.1
<b>Sub-total</b>	<b>5,370</b>	<b>1,595</b>	<b>5.0</b>	<b>1.5</b>
<b>Rabi Season Crops:</b>				
Wheat	8,540	3,590	8.0	3.3
Barley	400	145	0.4	0.1
Pulses (gram)	4,420	1,690	4.2	1.6
Oilseeds/lentil	2,580	765	2.4	0.7
Sugarcane	30	20	0.1	0.1
Vegetables, fruits, fodders, others	60	40	0.1	0.1
<b>Sub-total</b>	<b>16,060</b>	<b>6,270</b>	<b>15.2</b>	<b>5.9</b>
<b>Total</b>	<b>21,400</b>	<b>7,845</b>	<b>20.2</b>	<b>7.4</b>
<b>Total Cultivated Area: 106,640 ha</b>				

Note: (-) These figures are under 0.1 %. (Ref. Table E.3.5.1)

### **E.3.6 Present Farming Practices and Farm Inputs**

The present cultivated lands are closely related to topographic and soil conditions and availability of irrigation water. There are two types of farming in the rainfed land, namely, Barani and Rod Kohi. Rod Kohi is torrent watered cultivation which is practised by diverting and spreading the intermittent flow of the torrents in the piedmont plains. In these lands, shortage of soil moisture is the principal constraint for extending cropping area and improving crop yield.

The tractor is now the dominant source of farming power for land preparation work and transportation of agricultural products. In the Rod Kohi land, the tractor mounted blade or bulldozer is used for field bound maintenance and repair of breached bounds. The traditional bullock drawn scraper board is still used. There are three types of land preparation works such as ploughing, harrowing and leveling (planking) as below:

- a. Full mechanization: ploughing with disc plough and harrowing with multi-tined cultivator by tractor power and tractor mounted or towed drill.
- b. Semi-mechanization: ploughing with bullock drawn plough after initial ploughing by tractor.
- c. Traditional method: ploughing and harrowing by hand or with bullocks.

The seed-bed is not prepared properly. The field, when comes in workable condition, is stirred with local plough and planking is done with local implement called Sohaga (clod breaker and leveler). The soil is not pulverized, therefore, fine tilth is not obtained. The seed does not germinate well on unlevelled seed-bed with clods. The shallow ploughing has a depressing effect on root development and growth. The stand of crop in such field remains poor and growth does not occur properly.

The seed used is of poor quality with low germinability and low yielding. Improved seed is not available and seed is purchased from local market. The seed is either drilled with Nali (hollow wood pipe) or is broadcasted and planking is done. The seed does not fall at proper depth and sometimes falls above moisture and sometimes goes much deeper. In case of broadcasting, seed is not spread uniformly. The emergence of crop in such field remains patchy and poor.

Fertilizers application is not prevailing due to the risk of crop harvest and farmers' financial constraints. Fertilizers are not used for soils with low fertility where exhaustive crops like sorghum, millet, wheat, etc. are grown. The low fertility and exhaustive cropping systems reduce crop yields. Weeding is not done at proper time. Weeds are allowed to grow and are harvested as fodder. Weeds compete with crops for moisture, light, nutrients, etc. and reduce crop yields. Present dosage of farm inputs in the Study area are estimated in Table E.3.6.1.

Locally produced seed is not treated with fungicide, hence seed and soil borne diseases affect crops adversely. Beside farmers' financial constraints and cropping risk, spraying to protect insect and pest damages is hampered by uneasy procurement of water in the Study Area.

Harvesting is usually done by hand sickle throughout the day. Harvested crop is tied into the bundles and the bundles are left in the field. Transportation from fields to threshing floors at village is done by bullock cart, donkeys or heads.

Threshing is done with stick or with bullocks. Use of threshers is still limited. Timely threshing and winnowing can reduce losses. Seed for the next cropping is randomly taken from the harvest. There is no practice to keep good grains or harvest as seed.

### **E.3.7 Present Crop Yield and Production**

The unit yields of major crops have not reached sufficient high levels due to poor soil fertility, shortage of rainfall water, low level of farm inputs and traditional farming practices. Average unit yields of major crops are estimated on the basis of the agricultural statistic data of D. I. Khan and Kulachi thesils from 1987/88 to 1992/93. The unit yields of major crops in the Study Area are summarized as below:



Crops	Irrigated (t/ha)	Non-irrigated (t/ha)	Average (t/ha)
<b>Kharif Season Crops:</b>			
Sorghum	0.79	0.70	0.72
Millet	0.78	0.75	0.76
Sugarcane	35.55	-	35.55
Cotton	1.54	1.00	1.46
Guara	1.90	1.50	1.57
Fodders	11.86	-	-
<b>Rabi Season Crops:</b>			
Wheat	2.02	0.95	1.04
Barley	0.90	0.75	0.76
Gram	0.64	0.60	0.60
Oilseed (mustard)	0.54	0.50	0.52
Fodders	13.30	-	-

Note: (-) This data is not available. Ref. Table E.3.7.1

Annual crop productions of major crops are estimated on the basis of 5 years' average data from 1987/88 to 1992/93, and summarized as below:

Crops	Cropping Area (ha)	Unit Yield (t/ha)	Production (tons)
<b>Kharif Season Crops:</b>			
Sorghum	2,530	0.72	1,820
Millet	2,470	0.76	1,870
Maize	10	0.63	6
Pulses (Mung Beans)	5	0.52	3
Sugarcane	30	35.55	1,070
Cotton	60	1.41	85
Guara	230	1.56	360
Fodders	10	11.86	120
Vegetables, others	25	2.88	70
<b>Sub-total</b>	<b>5,370</b>		
<b>Rabi Season Crops:</b>			
Wheat	8,540	1.04	8,850
Barley	400	0.76	300
Pulses (Gram)	4,420	0.60	2,660
Oilseed (Rape/ Mustard)	2,580	0.52	1,330
Fodders	60	13.30	800
Vegetables, others	30	4.20	130
<b>Sub-total</b>	<b>16,030</b>		
<b>Annual Cropping Area</b>	<b>21,400</b>		

Ref.: Table E.3.7.2

### E.3.8 Livestock

D. I. Khan district is not self-sufficient in beef meat, and cattle and buffalo are

imported from the Punjab province. On the other hand, D. I. Khan is self-sufficient in mutton meat, and some sheep and goats are exported to the Punjab province. Majority of the farmers in the rural area is still suffering from malnutrition and is living under the poverty line. The growing population is increasing pressure on the limited available resources in the rural areas. The present livestock population in D. I. Khan district is estimated as follows:

Livestock	Population (Unit: heads)	
	1985/86	1990/91 (Estimate)
Cow	232,150	243,760
Buffaloes	50,040	52,540
Sheep	131,700	138,300
Goats	180,880	189,920
Camels	16,800	16,960
Horses	2,030	2,130
Donkey (Asses)	20,160	21,170
Poultry (Chicken)	478,000	501,900

Most of the farmers in the rainfed area always rely on livestock for majority of their income and family consumption, but own small livestock under subsistence conditions. Cow (Cattle) are kept for draft power, milk and social status, which can easily be turned into cash. Buffalo milk is locally preferred and the demand in the district is increased by population growth. Goats are rapidly increasing than cattle because of the popularity of the meat, the low price of breeding stock, and a wider range of herbage. Camels and donkeys play an important role in transportation.

According to the farm survey of 210 households in the 11 mouzas, average number of livestock holdings and population in the Study Area are estimated based on 13,340 households as follows:

(Unit: heads)		
Livestock	Nos. of Holding per Household	Population (1993)
Cow	5.61	62,000
Bulls/ Steer	2.14	23,700
Buffaloes	1.29	14,250
Sheep	7.10	78,600
Goats	12.08	133,600
Camels	0.36	4,000
Horses	0.07	750
Donkey (Asses)	0.17	1,900
Poultry (Chicken)	10.20	112,800

Ref. Table E.3.8.1

In the rainfed area, the volume of available crop residue and fodder crops is insufficient. Main feed resource for livestock is free grazing in cultivable waste land under thorny bushes, plants and roughages which are consumed readily by the livestock. In the irrigated lands, livestock is fed by fodder crops and crop residues as well as casual free grazing.

### E.3.9 Marketing System

#### (1) General

There are no large markets in the Study Area except a few small village markets and one inter-union market. Therefore, analysis of marketing and prices in this Study is conducted on the district of D. I. Khan as a basic unit. Almost all marketed agricultural crops in the D. I. Khan district are sold through the open market system. Agricultural produce is marketed in the D. I. Khan district market, other district markets in NWFP, and markets in Punjab Province.

#### (2) Present Marketing Flows and Marketing Channels

##### Farm Product

Farm survey indicates that 58% and 64% of wheat produced is sold by farmers in the Study Area and CRBC Area, respectively. As for other products, these marketed ratios are much higher except maize in CRBC Area, as shown in Table E. 3.9.1. Farmers sell their products to Beopari (village merchant), commission agent or village shop. Beopari is a main sale destination for wheat, rice, gram and oil seed in particular. Most of sugarcane is sold to sugar mills directly. (Table E. 3.9.2)

Wheat procured from farmers, village merchants or commission agents by the Food

Department and Pakistan Agricultural Storage and Services Corporation (PASSCO) is stored once, and sold to flour millers in D. I. Khan district and then marketed through dealers and wholesalers to Kohat, Bannu, Swat and Federally Administrative Tribal Area (FATA) as well as D. I. Khan district. Wheat sold in the open market shows almost the same marketing flow. This marketing flow is shown in Fig. E.3.9.1 (a).

Besides the local procurement in the District, the Food Department and PASSCO receive imported wheat and indigenous wheat especially from Punjab. These amounted to 55,000 tons in 1993/94 (July-February), approximately, as shown in Table E. 3.9.3. Some portion of this wheat is directed to Afghan refugees and World Food Program.

Most of paddy sold at the village is taken to rice mills through village merchants. Basmati is marketed in D. I. Khan, and IRRI-6 variety is marketed in Bannu, Swat, Peshawar, Miram Shah (FATA) and Rawalpindi through dealers. Only a small amount of rice is considered to be delivered to Karachi for exports though it could not be clearly traced.

Pulses and gram are marketed in D. I. Khan district and neighboring districts. A portion of mung bean is conveyed to mills in Faisalabad in Punjab, and come back to D. I. Khan market as split and washed bean. Oil seeds (rape and mustard seeds) are sold to dealers and marketed in D. I. Khan. Sunflower, which is one of the non-traditional oilseeds and strongly recommended by the National Oil seeds Development Project, is procured by PASSCO although production is very small in D. I. Khan district. The marketing flow is shown in Fig. E.3.9.1 (b).

Most of sugarcane is transported to sugar mills or their purchasing centers directly by farmers. There are 3 large mills, namely Chashma, Fecto and Bannu sugar mills, within and adjacent to the district of D. I. Khan. Based on the interview with Chashma sugar mill, refined sugar is marketed in D. I. Khan district, Tank, Bannu, Mingora, Mianwali and Rawalpindi through sales agents. Seed cotton is procured by dealers and conveyed to ginning factories in Bhakkar district in Punjab although its production is very small at present in D. I. Khan district.

Some of the fruits such as dates, mango and melon are marketed in Peshawar and Bannu in NWFP and Mianwali, Faisalabad, and Lahore in Punjab through commission agents/wholesalers. Tomato and onion are also delivered to Peshawar, Bannu and Kohat in NWFP and to Multan, Bhakkar and Sargodha in Punjab.

Seasonally, on the other hand, some vegetables are delivered to D. I. Khan market from Peshawar, Bannu and Wana in NWFP and other cities in Punjab. Some fruits such as apple and citrus also come from Punjab.

Details of flow of farm products based on Market Survey by JICA Study Team are shown in Table E.3.9.4 and the market flow paths in and out of the various markets are shown in Fig. E.3.9.2.

### Farm Inputs

Both provincial government and the private sector are engaged in marketing of fertilizer. There are four major dealers in D. I. Khan district. They are Agricultural Development Authority (ADA), National Fertilizer Corporation (NFC), Fauji Fertilizer Corporation (FFC) and Dawood Corporation. Offtake from NFC and ADA in 1993/94 are 5,245 tons and 3,614 tons, respectively, as shown in Table E.3.9.5. They have their own shops and storage facilities in D. I. Khan and other inter-union markets. According to the Farm Survey, as shown below, most of the farmers in the Study Area get farm inputs from these dealer's shops.

Source of Farm Input	% to the respondents
Purchase at shop	83.4
From landlord	5.7
From marketing agency	5.2
Others	5.7
<u>Total</u>	<u>100.0</u>

All of imported fertilizer come from Karachi. Some of indigenous fertilizer such as Urea is delivered from the factory at Multan or other cities in Punjab. As for pesticide, there are about 10 dealers in D. I. Khan. Most of them are retailers and sell directly to farmers. Main storage facilities for some dealers are located in Peshawar.

### (3) Local Markets

There are three types of markets in the D. I. Khan district. They are village markets, inter-union markets and the district markets, respectively. Main role of village market is to supply food grains, fresh fruits and vegetables to adjacent village markets, the inter-union markets and the district market in case when there are surplus to their requirements. Inter-union markets provide some market facilities in order to transact grains, vegetables, fruits and consumer goods for farmers. This market can link the village markets and the district market. Also, in some cases, this market has direct links with the markets located outside the district. Pahapur, Paniala, Yarik, Kulachi,

Daraban and Paroa are main inter-union markets in the district of D. I. Khan. The role of district market remain almost the same as those of village and inter-union markets, but the volume of transaction is much larger and the linkage to the outside from the district is stronger compared to the preceding two types of markets. This market is situated at three locations in D. I. Khan city. These are two food grain wholesale markets and one fruits and vegetables wholesale market. These markets deal in wholesale business, but sometimes functions of the wholesaler and retailer are not clearly separated. Market Regulation under Agricultural Produce Market Act 1939 has not been notified by the provincial government.

### **E.3.10 Marketing Prices**

#### **(1) Price Policy**

The federal government has already created conducive environment for marketing of major crops. Support prices for wheat, rice, sugarcane, cotton, gram, onion, potatoes, and non-traditional oil seeds, namely sunflower, safflower, and soybean are fixed by the government with a view to provide economic incentives to farmers. The support prices are reviewed annually keeping in view factors such as cost of production, domestic demand, import and export parity prices, supply and stock position, comparative advantage of crops and so on, and are generally announced before the sowing time, in order to enable farmers to properly plan allocation of area and input for different crops. Details of support prices are given in Table E. 3.10.1.

According to the Seventh Plan Review for Eighth Plan, the support price program has been working satisfactorily for wheat, rice, cotton and sugarcane but has fallen short of expectation for gram, non-traditional oilseeds, onions and potatoes in the national level.

In D. I. Khan district, wheat, sugarcane and sunflower are outstanding in terms of actual application to the policy. Sunflower, in particular, is the target crop of the National Oil seeds Development Program, and procurement by support prices are conducted although the quantity procured is very small.

Retail prices of major agricultural produce, on the other hand, are also controlled. In D. I. Khan markets, the retail prices are controlled by the Price Review Committee headed by assistant commissioner in daily basis. Powers of this committee derive from the notification of the Food Department in NWFP government in April, 1975. Members of the committee are the District Food Controller (the Food Department),

traders, dealers and consumers. Retail prices are based on the average of the prevailing wholesale prices.

(2) Retail and Wholesale Prices and Marketing Margins

Average wholesale market prices of major crops from April in 1993 through March in 1994 at D. I. Khan market are summarized below. The price fluctuations for wheat, wheat flour, and rice are relatively small throughout the period. Details of wholesale and retail market prices for the period are shown in Table E.3.10.2 and Table E.3.10.3, respectively.

Crop	Rs./40 kg
Wheat, Desi	150 - 173
Wheat Atta (Flour)	170 - 192
Rice, Basmati	535 - 560
Rice, Irri-6	220 - 230
Maize	160 - 240
Millet (Bajra)	175 - 240
Sorghum (Jowar)	120 - 220
Gram Black	300 - 445
Rape and Mustard Seeds	290 - 380
Onions	145 - 320
Mangoes	410 - 600

Commission agents (who sometimes double as wholesalers) charge a fee which is generally 2% of the wholesale prices from growers and 1% from retailers for cereals, 6% from growers and 6% from retailers for vegetables, and 3% from growers and 6% from retailers for fruits.

(3) Farmgate Prices

Farmgate prices have been estimated for crops on the basis of posted wholesale prices, less reductions to meet posted commission agent margins, and farmers' marketing costs (farmgate to market). As a result, farmgate prices of cereals, pulses and oil seeds are in a range between 74% and 93% of the average retail prices, and farmgate prices for vegetables and fruits are in a range between 54% and 82%. Details are given in Table E. 3.10.4. Marketing costs are set at Rs. 0.1 per kg for cereals, pulses and oil seeds, Rs. 0.13 per kg for vegetables, and Rs. 0.29 per kg for fruits based on the market survey, as given in Table E. 3.10.5.

Farm survey by JICA Study Team also gave prices of some crops, which are received by farmers in the Study Area and CRBC gravity irrigation area, as shown

below.

(Unit: Rs./kg)		
Crop	Study Area (1)	CRBC Area (2)
Wheat	3.56	3.48
Paddy	-	2.41
Maize	5.33	5.00
Millet (Bajra)	5.27	5.50
Sorghum (Jowar)	5.62	-
Gram	7.30	9.75
Oil Seeds	6.16	6.25
Sugarcane	-	0.44
Vegetable	-	2.00
Fodder	-	0.25
Guara	4.00	-

Source: Farm Survey by JICA Study Team (The Survey was conducted from July through September, 1993.)

(1) Average price of rainfed and Rod-Kohi areas in some crops.

(2) CRBC gravity irrigation area

#### (4) Price Assessment

Based on the farmgate prices and the results of Farm Survey, the financial prices for cereals, pulses and oil seeds have been taken, on a conservative basis, at 85 % of the D. I. Khan average retail prices from April in 1993 through March in 1994. The financial prices for vegetables and fruits have been taken at 50 % of the D. I. Khan average retail prices in the same period. The financial prices of sunflower, sugarcane, cotton, and fodder have been estimated during the field work in Market Survey. For the purpose of project preparation, all prices are taken at constant prices as of March in 1994. Details are given in Table E.3.10.6. The prices of farm inputs have also estimated during the field work in Market Survey, and given in Table E.3.10.7 and E.3.10.8.

### E.3.11 Processing and Storage Facilities

#### (1) Agricultural Processing Facilities

##### Flour Milling

The production of wheat in D. I. Khan district was 115,264 tons in 1991/92 though its processing capacity is 372,000 tons. Processing costs in large mills are Rs. 400 per ton in harvest season and Rs. 200 per ton in other seasons. 35 small flour mills with single unit mainly for home consumption and 5 large mills are located in D. I. Khan city with the average milling capacity of 36 tons per day and 120 tons



per day, respectively, as shown below.

Items	No	Average capacity (tons/day)	Total capacity (tons/day)	Total capacity (tons/200 days)
Flour Mill (large)	5	120	600	120,000
Flour Mill (small)	35	36	1,260	252,000
Total	40	-	1,860	372,000

Source: Market Survey by JICA Study Team

### Sugarcane

In D. I. Khan district and adjacent districts, three large sugar mills, namely, Chashma (D. I. Khan), Bannu (Serai Naurang), and Fecto (Bhakkar district), are operating. Chashma sugar mill, which is located at about 15 km south of D. I. Khan, started its operation in the 1991/92 season of crushing. Its installed capacity amounts to 3,000 tons per day. It is designed to operate a 150 day campaign (450,000 tons of sugarcane). Fecto sugar mill is located at Darya Khan in Bhakkar district about 40 km from D. I. Khan across the bridge. Before the operation of Chashma sugar mill, more than 30 % of cane had been supplied from D. I. Khan tehsil, but only a small part is supplied at present. Bannu sugar mill is located at Serai Naurang about 150 km from D. I. Khan. This mill has been competing with Chashma sugar mill for cane supply in CRBC irrigated area. Installed capacity, cane crushed, crushing season, and recovery rates of these mills are shown below.

Mills	Installed Capacity (tons cane per day)	Crushing season (days)	Cane crushed (tons)	Recovery (%)
Chashma				
1991/92 *1	3,000	113	174,454	8.65
1992/93	3,000	131	328,422	8.43
1993/94 *2	3,000	-	400,413	8.35
Fecto				
1991/92	3,000	136	378,674	8.50
1992/93	3,000	138	403,842	8.25
1993/94 *2	3,000	-	371,986	8.11
Bannu				
1991/92	2,400	127	240,390	8.69
1992/93	2,400	119	219,262	8.45
1993/94 *2	2,400	-	220,172	8.37

Source: Each sugar mill and Pakistan Sugar Mills Association

Note: \*1 The first year of operation

\*2 For the season 1993/94 up to March 15, 1994

The calculated production cost of sugar of Chashma Sugar Mill amounted to

Rs. 4,127 per ton. Details are given below.

(Unit: Rs./ton of sugar)

1. Cost of sales	
Chemicals and stores consumed	265.9
Salaries, wages and benefits	491.6
Power and fuel	139.2
Repair and maintenance	130.3
Insurance	19.0
Depreciation	1,737.1
Sub-total	<u>2,783.0</u>
2. Administrative and general expenses	274.0
3. Financial charges	1,159.7
4. Other charges	105.4
5. Credit for molasses	(195.6)
Total	<u>4,126.5</u>

Source: Chashma Sugar Mill

Oil from rape and mustard seeds is extracted in small oil mill with single unit of crusher. Small mills produce 23% of oil and 71 % of cake from seeds. At present, large scale oil mills (including ghee mill) and a solvent oil extraction plant (Agro Oil Extraction Industries) in D. I. Khan are closed. Agro oil mill, however, has a plan to operate in the 1994/95 season by procuring sunflower. From sunflower, 34-35% of oil, 40% of meal, 20% of hull can be yielded according to National Oil seeds Development Board in Islamabad. Agro oil mill can yield 12% of refined oil, 42% of meal for poultry, 6% of lint, and 28% of hull from cotton seeds. The installed processing capacity is 70 tons per day. The estimated processing costs by the firm are Rs. 1,230 per ton. Numbers and capacities of oil mills in D. I. Khan city is summarized below.

Item	Capacity per Unit		Total Capacity	
	No	(tons per day)	(tons per day)	(tons/200 days)
Oil Mill/Single Unit	15	0.024	0.36	72
Oil Mill/Large *1	4	12.4	49.7	9,940
Oil Extraction Plant *1	1	70	70	14,000

Note: \*1 Not operated at present Source: Market Survey by JICA Study Team

Cotton seed expellers (oil mills) are found in Bhakkar district of Punjab, which uses cotton seed after ginning. Processing costs are Rs. 250-300 per ton of cotton seed in average. From cotton seed, they yield 9-10 % of oil, 85% of cakes, and 4-5 % of waste. Oil are shipped to Ghee mill, cooking oil factory and soap factory. Cakes are sold to farmers.

### Cotton Ginning

There is no cotton ginning factory in D. I. Khan. Seed cotton in D. I. Khan, even though very little in quantity, is sold to ginnerers in Bhakkar or other districts in Punjab through dealers. Based on the interviews to ginnerers in Bhakkar, average yields of lint and cotton seed are 34% and 62%, respectively. Processing costs are Rs. 1,250 per ton of seed cotton.

### Rice Milling

There are 16 small rice mills in D. I. Khan city. The average milling capacity is 5 tons per day. Rice yields about 60-65 %. Processing costs are Rs. 262 per ton of paddy. About 50 percent of processing costs is labor charge.

## (2) Storage Facilities

Public storage facilities for agricultural inputs and output in the D. I. Khan district are operated by the Food Department, the Agricultural Department, and Agricultural Development Authority (ADA). Food Department can store wheat up to 60,000 tons in 7 godowns and up to 18,000 tons in open silo. The Agriculture Department and ADA can store food grain and fertilizer up to 27,000 m<sup>3</sup>, and seed and fertilizer up to 9,600 m<sup>3</sup>, respectively. In addition, there are 151 private owned storage facilities with a total capacity of 7,300 m<sup>3</sup> in D. I. Khan city. Further, there is one private-owned cold storage for vegetables and fruits.

The result of Farm Survey shows the current conditions of on-farm storage in the Study Area and CRBC Gravity Irrigation Area.(Table E.3.11.1) More than 80 % of farmers in the Study Area and 100 % of them in CRBC Area store some of their produce for home consumption. The average quantity of food stuff per household /year is 2,062 kg in the Study Area and 1,850 kg in CRBC area. Among them, share of wheat is dominant. Storage facilities consist of storage in room, earthen (Kutchra) bin, and other (date palm leave bin). The date palm leave bin has the largest share in both areas. As for storage capacity, the category of "above 1,200 kg " shows the largest share with around 50 % in both areas. The storage capacity in CRBC area is rather larger than that of the Study Area although sample size is small.

## (3) Industrial Development

The provincial government established two industrial estates in D. I. Khan in order to promote industrial development. The first one is the Small Industrial Estate, which was developed by Small Industries Development Board, along the Tank road. This

estate is nearly fully allocated by about 40 industries although a considerable part of them is not operating due to lack of working capital at present. The second one is the estate for medium-scale industries with an average plot size of 1 acre by the Development Authority. Industries located in both estates are given incentives such as tax holidays and exemption of local charges.

### E.3.12 Food Balance

#### (1) Food Balance in the National Level

##### Wheat

As wheat is the staple diet of the majority of population, its availability to consumers at reasonable rates is important socio-economic objective. Although the self-sufficiency of it, therefore, was the major target in the Seventh Five Year Plan, it was not accomplished. In order to supplement domestic reserves and to maintain a regular supply in the open market at stable prices, 2,357 thousand tons of wheat were imported in 1992/93, while the production of wheat is estimated at 16.4 million tons in the same year. Imports of wheat in recent years are shown below.

Year (May - April)	Quantity (000 tons)
1988-89	1,766
1989-90	1,603
1990-91	627
1991-92	1,640
1992-93 (1)	2,357

Source: Agricultural Statistics of Pakistan (1991/92)

(1) Economic Survey (1992/93)

##### Oil seeds

Edible oil is also imported in Pakistan because the demand is much larger than the domestic supply. In recent years the imported quantity of edible oil is increasing, while domestic production is stagnating as shown below. It is generally projected that the increase of income will result in the increase of edible oil consumption. Therefore, the government emphasizes the increase of production of non traditional oil seeds such as sunflower, safflower, and soyabean as well as traditional oil seeds. The production targets of sunflower, soyabean, and safflower in 1992/93 crops are 1.37 thousand tons, 12 thousand tons, and 2.4 thousand tons, respectively.

Year	Domestic Production (000 tons)	Imports (000 tons)	Imports (%)	Imports value (Rs. /million)
1985-86	340	825	72.3	6,128
1990-91	484	940	66.0	7,983
1991-92	564	1,055	65.2	10,023
1992-93	482	1,340	73.5	15,204

Source: Oilseeds Development Board, Ministry of Food and Agriculture

### Rice

Besides being an important food, rice is one of the major exported commodities in Pakistan. The production of rice in 1992/93 is estimated at 3,083 thousand tons in the whole country. Exports of rice are shown below.

Year	Quantity (000 tons)	Value (Rs. /million)
1988-89	854	5,967
1989-90	744	5,144
1990-91	1,205	7,848
1991-92	1,512	10,340
1992-93 *1	808	6,253

Source: Economic Survey (1992/93)

Note: \*1, July - March in 1992/93 (9 months)

### Sugar

Although refined sugar has been one of major imported commodities in Pakistan, the imported quantity is decreasing because the indigenous production of sugar is constantly increased. Imports of sugar in recent years are shown below. According to the Pakistan Sugar Mills Association, sugar production will rise to at least 2.8 million tons from Pakistan's 62 sugar mills in 1993/94, compared with 2.4 million tons in 1992/93, which is almost equivalent to the total demand in the country. Thus, sugar will be exported to Middle east and other regions since refined sugar have a surplus of 0.4 million tons approximately in 1993/94.

Year	Quantity (tons)	Value (Rs./million)
1988-89	43,380	204
1989-90	210,954	1,920
1990-91	433,320	3,596
1991-92	116,892	915
1992-93	75,156	552

Source: Economic Survey (1992/93) and Pakistan Sugar Mills Association

### Pulses

The production of mung bean in 1992/93 fell short by 5.5% to 48.2 million tons compared with 51.0 million tons produced in 1991/92. Imports of pulses are increasing as shown below.

Year	Quantity (000 tons)	Value (Rs. /million)
1989-90	49	447
1990-91	78	652
1991-92	117	1,269

Source: Agricultural Statistics of Pakistan (1991/92)

## (2) Food Balance in NWFP

### Wheat

Wheat is insufficient in NWFP as a whole although the production of wheat in the district of D. I. Khan is surplus compared to its population. In 1991/92, the total production amounted to 1,163 thousand tons in this province, while the demand is estimated at around 2,066 thousand tons. Thus, the deficit comes to 900 thousand tons, approximately. This figure comes from the assumption that per capita consumption of wheat is 129 kg in year, which is based on the data in the Provincial Food Department in NWFP, and population estimated is 16,012 thousand in 1992 based on the past annual trend of population increase at 3.42% since 1981.

### Oil Seeds

In NWFP, production of oil seeds (rape and mustard seeds, cotton seeds, sesame and soyabean) in NWFP was 18,194 tons in 1991/92, of which rape and mustard seeds accounted for 90.1% (16,479 tons). If extraction rate on oil seeds is set at 32 % in average, which is based on the Report of the National Commission on Agriculture (1988), the total supply amounts to 5,822 tons although all of rape and mustard seeds oil are not necessarily for edible oil. As for demand side, per capita requirement of edible oil is assumed to be 11.4 kg per person in a year based on the Seventh Five Year Plan and Perspective Plan, 1988-2003. Then, total requirements amount to 182,537 tons. Demand of edible oil is, therefore, much larger than supply.

### Other crops

Rice and pulses show a deficit in NWFP. Maize itself has a surplus if simply comparing requirement and production, but a large portion of it is utilized as a substitute of wheat and raw materials for concentrated feed at present. Coarse grains have a surplus. As for sugar, it has a deficit when it is assumed that 72% of

sugarcane production is utilized for refined sugar by sugar mills. The rest of sugarcane are processed into gur (unrefined raw sugar) or utilized for other purposes. Estimated food balance of these crops in NWFP is given below.

Crops	Requirement (000 tons)	Production (000 tons)
Rice	341,056	122,950
Sugar (refined)	326,645	273,038 (1)
Pulses	88,066	54,621
Maize	136,102	774,926
Other grains	73,655	85,019 (2)

Note: Per capita requirements of crops are based on Seventh Five Year Plan and Perspective Plan (1988-2003). Rice: 20.4 kg per year, Refined sugar: 20.4 kg, Pulses: 5.5 kg, Maize: 8.5 kg, Other grains: 4.6 kg

- (1) Recovery rate is set at 8.3%. It is assumed that 72% of sugarcane are processed for refined sugar by sugar mills based on the data of Pakistan Sugar Mills Association.
- (2) Millet (6,246 tons), sorghum (15,783 tons) and barley (62,900 tons)

### E.3.13 Present Crop Production Value

Present crop production value in the Study area is estimated based on the farmgate prices as of March in 1994. The total crop production value is Rs. 88.5 million. The details are shown in Table E.3.13.1 and summarized as follows ;

Crops	Cropping Area (ha)	Crop Production (tons)	Unit Price (Rs./kg)	Production Value (Rs. '000)
<b><u>Kharif Season Crops:</u></b>				
Sorghum	2,530	1,820	4.18	7,620
Millet	2,470	1,870	4.86	9,090
Maize	10	6	4.02	25
Pulses (Mung Beans)	5	3	9.45	25
Sugarcane	30	1,070	0.35	370
Cotton	60	85	9.80	830
Guara	230	360	4/00	1,440
Fodders	10	120	0.20	25
Vegetables, others	30	70	3.17	220
<b>Sub-total</b>	<b>5,370</b>			<b>19,645</b>
<b><u>Rabi Season Crops:</u></b>				
Wheat	8,540	8,850	3.50	30,980
Barley	400	300	3.40	1,030
Pulses (Gram)	4,420	2,660	9.92	26,380
Oilseed (Rape/ Mustard)	2,580	1,330	7.60	10,120
Fodders	60	800	0.25	200
Vegetables, others	30	40	3.36	145
<b>Sub-total</b>	<b>16,030</b>			<b>68,855</b>
<b>Total</b>	<b>21,400</b>		<b>88,499.5</b>	<b>88,500</b>

Ref.: Table- E.3.13.1

### E.3.14 Farm Economy

Family income and expenditure by household group are analyzed on the basis of result of farm survey. The share of farm income to the total income is increased with the scale of operating size from 39% in marginal owners (0.74 ha) to 63% in large owners (18.9 ha). Livelihood of marginal and small owners below 3 ha depends on non-farm income accrued mainly casual labor employment. Contribution of farm income to the expenditure is also increased with the scale of operating size from 40% in marginal to 69% in large. The balance between income and expenditure, especially for marginal and small owners, is negligibly small less than Rs. 600. The capital formation of marginal and small owners are primitive at present. In order to introduce irrigation farming system which requires high agricultural costs, financial assistance will be essential in the Study Area (Ref. Table E. 3.14.1):



(Unit: Rs.'000)

Operating Size of Farm (ha)	Marginal (0.7)	Small (2,3)	Medium (4.7)	Large (18.9)	Total (12.9)
1. Income	17.6	22.1	29.4	38.1	33.1
Farm Income (%)	(39)	(49)	(59)	(63)	(61)
Non-Farm Income (%)	(61)	(51)	(41)	(37)	(39)
Share of Farm Income to(2) (%)	(40)	(51)	(61)	(69)	(65)
2. Expenditure	17.4	21.6	28.2	35.3	31.1
3. Balance	0.2	0.5	1.2	2.8	2.0

### E.3.15 Agricultural Support Services

#### (1) Agricultural Research

Agricultural Research Division has been created in the Ministry of Food, Agriculture and Cooperatives to supervise and coordinate the research activities of various agricultural institutes in the country both at the federal and provincial levels. Pakistan Agricultural Research Council (PARC) is the principal organization at national level for promotion and coordination of agricultural research in different fields.

Provincial Agricultural Research System and NWFP Agricultural University Peshawar (AUP) were merged under the Act of 1986. This re-organization was done under USAID supported project, Transformation and Integration of Provincial Agriculture Network (TIPAN). The research and education are under the umbrella of NWFP/AUP. TIPAN aims at farm-oriented research and education and provides degree and non-degree training.

Agricultural Research Institute (ARI), D. I. Khan was established near D. I. Khan city. At the ARI compound, the following organizations have offices and/or experimental fields:

Organization	Area (ha)	Purpose
Extension Department	206.8	Seed production
PARC	71.6	Arid zone research
Animal Husbandry	0.6	Poultry development
Fish Department	0.7	Fish development
Veterinary Research Institute	2.0	Diagnosis of animal diseases
Forest Research Institute, Pakistan	3.6	Conservation of Energy
District Administration	18.1	Sports
Agriculture Research Institute	86.6	Research and seed production
Building and roads	20.0	

The following table indicates staff position of the ARI:

Designation	No.
Director	1
Senior Research Officers	10
Research Officers, Supervisory	11
Research Officers	23
Administration Officer	1
Superintendent	1
Other Personnel	155
<b>Total</b>	<b>202</b>

The goals of the ARI, D. I. Khan are summarized as follows:

- a. Evaluation, selection and development of varieties.
- b. Development of improved production technology for irrigated, Barani, Rod-kohi and sailaba farming.
- c. Achievement of high cropping intensities through improved cropping patterns, crop sequences and growth period/stand establishment.
- d. Development of low cost production technology.
- e. Fertilizer requirements and micro-nutrient studies.
- f. Weeds management studies.
- g. Development of technology for off-season vegetables production.
- h. Feasibility of growing new crops, fruits and vegetables.
- i. Seed production and multiplication of superior varieties.
- j. Studies on the insect, pests and diseases control.
- k. Adaptive research and demonstration on farmer's fields.
- l. Screening of cereals, fruits and vegetables for nutritive values and quality.
- m. Development of techniques for preservation and processing of cereals, fruits and vegetables.

## (2) Agricultural Extension

Director General Agricultural Extension based at Peshawar is responsible for extension services in NWFP. He is supported by officers from the fields of agronomy, economics, marketing, statistics and plant protection.

Two ways of extension services comprising traditional services and training and visiting (T&V) system operate in D. I. Khan district. Traditional services prevails outside the CRBC Project area. Extension in the CRBC Project area is based on T&V system. The contact by the field officers under T&V is more than 5 times that of traditional service area. One T&V field assistant (FA) serves 400-500 farmers

compared to 1,000 farmers under traditional services. The main activities carried out by the office of the Deputy Director Agriculture, D. I. Khan division are summarized as follows:

- a. Agricultural extension services
- b. Seed production services
- c. Plant protection services
- d. Horticultural activities
- e. Barani agricultural development activities
- f. National oil seed development activities
- g. Productivity enhancement program activities

The present staff position of the offices of the Deputy Director of Agriculture (DDA), D. I. Khan division, Extra Assistant Director of Agriculture (EADA) and CRBC project is as follows:

Designation	DDA Office	EADA Office	CRBC Project	Total Area
Deputy Director of Agriculture	1	-	-	1
Extra Assistant Director of Agriculture	-	1	-	1
EADA (Economic & Marketing)	1	-	-	1
Assistant Publicity Officer	1	-	-	1
Junior SMS (Pest Control)	-	-	1	1
Junior SMS (Agronomy)	-	-	1	1
Assistant PPO	-	1	-	1
Agricultural Officer	1	12	7	20
Administrative Officer	1	-	-	1
Superintendent	2	-	-	2
Other Personnel	22	41	64	127
<b>Total</b>	<b>29</b>	<b>55</b>	<b>73</b>	<b>157</b>

Note: SMS ; Subject Matter Specialist, PPO ; Plant Protection Officer

### (3) Government Seed Farm

The Agriculture Extension operates 4 seed farms in D. I. Khan district to multiply seed of approved varieties of wheat, paddy, maize and gram. The locations and area of farms are as follow:

Name of Farm	Location	Area (ha)
Rakh Manghan	Daulapur	356
Ratta Kulachi	Lakhra	200
Rakh Zandani	Kotla Saidan	453
Rakh Bund Kurai	Bund Kurai	400

Each farm is controlled and managed by Agricultural Officer assisted by 3 Field Assistants. The day-to-day operations are carried by the share cropping tenants under their supervision.

Agricultural Research Institute, D. I. Khan produces breeders nucleus seed, pre-basic seed and basic seed. The above government seed farms produce basic seed from pre-asic seed and certified seed from basic seed. Registered growers also produce basic seed and certified seed. Seed is procured by Agricultural Development Authority (ADA) and is sold to farmers. Seed certification is done by the national seed certification agency.

#### (4) Livestock Extension

District Animal Husbandry is headed by Assistant Director Livestock and Dairy Development. He is assisted by sixteen veterinary officers and 75 stock assistants and compounders. There is also one Assistant Director Artificial Insemination for D. I. Khan, Bannu, Lakki Marwat and Tank districts. He is assisted by 3 veterinary officers and 12 inseminators. One Project Director under CRBC stage-II is responsible for the project area. He is assisted by two veterinary officers, 4 stock assistants and 12 supporting personnel. The objectives of the Animal Husbandry Department in brief are summarized as follows:

- a. Develop and strengthen livestock and dairy development capability through the existing staff of Veterinary Institutions
- b. Special focus on (i) nutrition and (ii) parasitic control
- c. Provide information and advice through media material (brochures, videos) on benefits of full and balanced feeding.
- d. Demonstrate feeding material like wheat-straw, molasses urea, quick lime, minerals and concentrate like oils seed cakes, etc.

Special targets of the project are as follows:

- a. Field-days (150 times annually) at Tehsil / village level for livestock extension work. At least 30 farmers are trained in each meeting.

- b. Visits of cinema van to villages (30 visits each year)
- d. Fodder demonstration plots (15 nos.) of one acre with one or more farmers
- e. 10 films to be prepared for project
- f. Treatment of livestock (cattle, 40 % of the buffalo, sheep, goat, etc.)

The constraints for the livestock development in the Study Area are (i) no organized extension service, (ii) poor feeding, (iii) worm infestation, and (iv) diseases (liver fluke, foot and mouth, black quarter, hemorrhage septicemia).

#### (5) Marketing Support

Several marketing and price support agencies are located in the D. I. Khan district. Major agencies are Food Department/District Food Controller, Pakistan Agricultural Storage and Service Corporation (PASSCO), and Agricultural Development Authority (ADA).

Food Department has functions (i) to procure and store wheat, (ii) to sell the procured wheat to flour millers, (iii) to issue the license to food grain dealers and millers and (iv) to check the retail prices of essential commodities. Food Department is a member of the price review committee headed by assistant commissioner.

The role of PASSCO of D. I. Khan district, which was established in May 1993 as a seasonal office, is to procure wheat from farmers and to stabilize the market. It also procures other agricultural products such as sunflower. The office may shift to permanent one. At present, PASSCO of D. I. Khan district has 14 office workers and 20 field officers.

ADA has responsibility on marketing of farm input. It procures quality seeds and sells to farmers. ADA also sells fertilizers to farmers though the share of the handled volume is relatively small in the total circulation of the district. The sales points are located in D. I. Khan city, Paharpur, Kotjoi and other places in the district.

#### (6) Rural Credit

Based on the farm survey, 98 in number or 47% of the total respondents (210) received credits from several sources. Only 27 or 28% of borrower respondents (98) were benefited by institutional credit. Institutional agricultural credit is supplied by Agricultural Development Bank of Pakistan (ADBP), cooperative banks, and commercial banks. Main source of rural credit even in the Study Area is from non-

institutional sources such as friends and neighbors (61% of the borrowers), wholesalers and businessman (6%), and others (5%). Majority of borrowers (93 in number and 95% of borrowers) spent their credit for farm inputs. Annual interest rates from banks were 17 to 18%. However 60% of the total respondents have belief in interest being against religion (Ref. Table E. 3.15.1).

Agricultural Development Bank of Pakistan (ADBP) has three branches in D. I. Khan city, Kulachi and Paharpur towns. There are no ADBP offices in the Study Area. 12 mobile credit officers (MCO) in total are assigned for implementation of supervised agricultural credit and one MCO covers around 30 mouzas on average in D. I. Khan. Credit disbursement concentrates at the CRBC gravity irrigation area and the Kulachi branch has only two MCO covering around 60 mouzas per MCO.

ADBP in D. I. Khan district disbursed 879 loan cases with Rs. 33.2 million on average from 1989-90 to 1992-93. Disbursement was concentrated on development credit under medium term (above 18 months and below 5 years) and long term (more than 5 years) repayment periods which accounts for 91 % of the total amount disbursed for the same period. Medium term loans are utilized mainly for tractors and tube-wells. Long term loans are applied mainly to agro-processing facilities.

Short term production loans (less than 18 months repayment period) mainly used for fertilizer procurement is limited at 9 %. Amount per loan is 5 to 13 thousand for production loan, 25 to 34 thousand for medium term loan, and 186 to 250 thousand for long term loan. Loan recovery rates are 46 % in development loan and 60 % in production loan (Ref. Tables E.3.15.2 and E.3.15.3).

Item	Distribution (%)		Amount per Credit (Rs.'000)
	Number	Amount	
Production Loan	45	9	5 - 13
Development Loan	55	91	55 - 93
Medium term	46	39	25 - 34
Long term	9	52	186 - 250
Total	100	100	26 - 44
Loan cases/year ; 879	Amount/year ; Rs. 33.2 Million		

Note: Figures are indicated as average from 1989-90 to 1992-93.

Regarding size of loan amount, the share of loan cases less than Rs. 10 thousand is 75 % in number and 14 % in amount disbursed in 1992-93. On the other hand, the loan cases more than Rs. 200 thousand are limited at 6 % in number, while occupies

62 % in amount. ADBP loan can be disbursed to landless tenants with two guarantors, while there are no disbursement cases in D. I. Khan. In 1992-93, the loanees holding more than 10 ha account for 61 % in number and 63 % in amount (Ref. Tables E.3.15.4 to E.3.15.6).

Loan disbursement to the cooperative societies by the Provincial Cooperative Bank in NWFP was discontinued since 1990-91 due to shortage of fund and accumulated overdue. There is one branch of cooperative bank in D. I. Khan city. The bank had handled production finance for farm inputs (short term repayment less than 18 months) and development finance for procurement of tractor and machinery (medium and long term repayment less than 8 years). Based on the disbursement record for four years from 1986-87 to 89-90, the bank annually disbursed the loans of 292 in number and Rs. 22.3 million in amount on average. The share of production finance to the total is predominant with 99 % in number and 95 % in amount for four years. Especially, sugarcane loan occupied 68 % in number and 78 % in amount. Land holding size of member loanees is less than 5 ha (small farmers classified by the cooperative bank) in production finance except 1988-98 and between 7 to 11 ha (economic farmers) in development finance. According to the information from the cooperative bank, loan recovery rate is 77 % by 1993 (Ref. Tables E.3.15.7 to E.3.15.10).

Item	Distribution (%)		Amount per Loanee (Rs.'000)
	Number	Amount	
Production Finance	99	95	5 - 38
Wheat	30	17	6 - 9
Sugarcane	68	78	5 - 38
Development Finance	1	5	34 - 50
Total	100	100	5 - 50
Loan cases/year ; 292		Amount/year ; Rs. 22.3 Million	

Note: Figures are indicated as average from 1986-87 to 1989-90.

There are five commercial banks in D. I. Khan District, i.e. Allied Bank of Pakistan (ABL), Habib Bank Ltd., (HBL), National Bank of Pakistan (NBP), United Bank Ltd., (UBL), and Muslim Commercial Bank (MCB). There are no agricultural loan disbursement from MCB during 1989-90 to 1992-93. Other four commercial banks are handling agricultural loans, while JICA study team could get information only from ABL and UBL. Agricultural loans from ABL and UBL are limited to production loan under short term repayment less than 8 months and no disbursement for medium and long term loans. Annually loan disbursement are 46 in number and

Rs. 615 thousand in amount for ABL, and 18 and Rs. 164 thousand for UBL on average for four years from 1989-90 to 92-93. Production loans from both banks are mainly used for fertilizer procurement in wheat and rice production. The loaning conditions by credit institute are summarized as follows:

Item	Eligibility	Mark Up Rate (%/year)	Repayment Period
<b>I. Production Finance</b>			
ADBP	Land owner/Landless	15.5	18 months
Coop. Bank	Land owner	9.5 - 14.0	8 months
	(less than 20.3 ha)	Sugarcane; 10.0	18 months
ABL	Land owner/Landless	7.0	8 months
UBL	Land owner/Landless	8.0	8 months
<b>II. Development Finance</b>			
ADBP	Land owner	15.5	7 - 8 years
Coop. Bank	Land owner	Imported ; 15.0	5 - 8 years
	(less than 20.3 ha)	Local ; 10.0	
ABL / UBL			

### E.3.16 Farmer Organizations

#### (1) Cooperative Society

The cooperative structure in Pakistan follows a pyramidal pattern. The primary cooperative societies composed of individual members are federated at the secondary level usually covering a district or a division. The secondary cooperative societies are organized at the tertiary level as the apex body covering a provincial or a nation.

The primary credit societies have the provincial cooperative banks in all the four provinces as their provincial federations. In NWFP, a provincial cooperative union is organized to promote farm input supply and marketing of products by the primary agricultural societies.

According to the Statistics collected from the Department of Cooperative, NWFP and D. I. Khan district office, 7,166 cooperative societies in NWFP, 497 in D. I. Khan district are registered. In 104 related mouzas covering Study Area, there are 26 societies having 1,024 households of which participation rate is low less than 5% to the total number of households of 19,600 (Ref. Table E. 3.16.1).



Item	No. of Society	Total Members	Members per Society	Share Capital per Society (Rs.'000)	Working Capital per Society (Rs.'000)
<u>D. I. Khan:</u>					
S. L. S.	4	175	44	11	132
P. A. S	456	35,793	78	7	49
Non-A. S.	7	938	134	13	146
I. S.	12	208	17	1	11
<u>Study Area:</u>					
P. A. S.	26	1,024	39	8	101

Note: S.L.S. ; Secondary Level Societies P.A.S. ; Primary Agricultural Societies  
Non-A. S. ; Non Agricultural Societies, I.S. ; Industrial Societies

## (2) Results of Farm Survey on Farmer Organization and Farmers' Concerns

Based on the results of farm survey, there were no cooperative members in the 210 respondents. Cooperative societies in the Study Area are inactive and dormant. There are social and cultural difficulties to organize farmers as a democratic body. Most of cooperative societies organized in the Study Area were family member groups. To organize horizontally different families at the village level as a cooperative society, strong education and extension activities as well as financial and technical support services will be indispensable.

Out of 210 samples, only two were members of "Society of Rod Kohi Cultivators" to solve the problems in Rod Kohi among villagers. This organization have a meeting once a month and more frequently during irrigation season.

Most of farmers are affected by drought and irrigation water supply is most required in agricultural development of the Study Area. Based on the results of farm survey, around 81% of 210 sampled respondents in total have drought damages followed by shortage of fertilizer (22%) and high yielding variety seed (17%) (Ref. Table E. 3.16.2).

Around 83% of the respondents knew about the 1st Lift Irrigation Project and their majority (207 in number) expressed positive participation to the Project. Types of participation are to supply labor (42%), do any works (43%), give land for the Project (5%), and pray early completion of the Project (11%). Respondents expected the Project benefits such as increase in production and yield (24%), more land cultivation (24%), solution of problems and finance (25%), and increase in employment (6%).

Two hundred five (98%) respondents out of 210 were willing to pay water charge, while 186 (89%) did not know about water charges clearly. 67% of respondents expected the same rates of water charge in the gravity scheme area as follows (Ref. Table E 3.16.3):

Item	Number	%
Same as the rate of gravity system	140	66.7
Plus 10%	28	13.3
Plus 20%	16	7.6
Plus 30%	15	7.1
Plus 40%	1	0.5
Plus 50%	9	4.3
Over 100%	1	0.5
<b>Total</b>	<b>210</b>	<b>100.0</b>

Source: JICA Farm Survey

Suggestions to the Project from the respondents (Ref. Table E. 3.16.4) are summarized as follows:

Item	Number	%
Good and beneficial project	51	24.3
Construction/canal, water course	49	23.3
Quick completion of the project	25	11.9
Maximum command area	20	9.5
Others	15	7.2
No answers	50	23.8
<b>Total</b>	<b>210</b>	<b>100.0</b>

Source: JICA Farm Survey

### E.3.17 Public Consultation Survey

#### (1) Background

The farmers' organization set-up is the most crucial issue for the effective utilization of demand based irrigation water as well as practical O&M of irrigation facilities. Union councilors elected by the villagers are supposed to serve as a link between the people and the provincial government. The existing local councils might be utilized to formulate farmers' organization for the Project Implementation. On the other hand, there are several village organizations such as society of rod kohi cultivators and cooperative societies as production based organization, and Islahi Committee (village welfare committee) and Zakat and Ushr Committee (religious tax committee), Jirga (consulting elder members for solution of village dispute), Vingar (free supply of labor and animal power to improve village infrastructure) as village community based

organization. Cooperative societies in the Study area are inactive and dormant in general. While the other community based and non-political village organizations are well established and active.

In order to formulate an appropriate farmers' organization plan, clarification of the present status of union councils, and the villagers' needs and suggestions to the Project would be indispensable. The Study team carried out the village surveys both to union councilors and villagers during two field survey periods. The first village survey in March 1994 covered the interview survey to union councilors and villagers at one mouza each in two unions. Based on the results of the first village survey, the questionnaires were revised and the second village survey carried out in July 1994 was limited to the villagers of 10 mouzas in the eight (8) unions.

The Study team got much coordination and assistance from the deputy commissioner and the Local Government and Rural Development Department for the survey, but the sampling number of councilors and villagers was limited mainly due to the shortage of manpower and transportation means. Moreover five (5) unions could not be visited due to inaccessible roads damaged by the unusual floods. The followings are assessment results on the interview survey to union councilors and villagers:

(2) Sampling area and survey method

a) First village survey to villagers and union councilors (March 1994)

During the first village survey, union councils of Chakhan from D. I. Khan tehsil and Ghara Isa Khan from Kulachi tehsil in the Study area were selected as representative unions. Area of the selected two unions will be under the Project area. Chakhan mouza in Chakhan union and Gandi Umar Khan mouza in Ghara Isa Khan were selected for the farm survey done in July 1993 and classified as medium density mouzas in terms of population density to cultivated area with 73 to 145 persons per km<sup>2</sup>. Ghara Isa Khan union has recently (in 1994) been transferred from Kulachi tehsil to D. I. Khan tehsil. Chakhan and Ghara Isa Khan unions comprise 14 and 9 mouzas, respectively. Seven union councilors are elected in each union.

Questionnaires to union councilors and villagers were separately prepared. Questionnaires to union councilors were translated in Urdu (Pakistan national language) and pre-tested applying self-writing by councilors themselves. The results of self-writing were unsatisfactory because some of the councilors were illiterate. Study team changed the survey method for union councilors from self-writing to

interview by employed enumerators.

The Study team visited Chakhan and Gandhi Umar Khan mouzas where union councilors and villagers gathered and attended the meeting. During the meeting, explanation of the project and question-answer were made. Implementation organization plan, farmers' association set-up and villagers' participation in the project were explained referring the related items on the questionnaires. After the meeting, the interview survey was done by the enumerators. The sampling number of two unions is 9 union councilors and 53 villagers.

b) Second village survey to villagers (July 1994)

Based on the result of the first village survey, the questionnaire was revised and additional items such as agricultural and residential land prices and condition of rural infrastructure (rural road, drainage, electricity, telecommunication, water supply, school and dispensary) were included. Major items interviewed are as follows:

- i. Socio-economic status of villagers
- ii. Constraints and activities of villagers
- iii. Community organization and changes in the villages
- iv. Concerns on farmers association and activities for C.R.B. lift irrigation project
- v. Condition of rural infrastructure

One representative mouza in each of 14 unions under the study area was tentatively selected, while five unions could not be accessed due to damaged road by the unusual flood. Finally, 10 mouzas in 9 unions covering 273 villagers were surveyed as shown in Table E. 3.17.1. Method of the second village survey was basically same as the first survey. While drawing pictures and figure on lift-up canal system, colonization development using regulating reservoir at each head of distributary, and farmers' organization chart were prepared and used for the meetings in order to get an easy understandings of the Project by the villagers.

(3) Survey results (9 councilors and 326 villagers)

a) Socio-economic status of the respondents

A large number of councilors (8 persons) falls in the age range of 36 to 55 years old. Age of villager respondents shows a general population distribution by age and about half of the villagers (171 persons) are 18 to 35 years old (Ref. Table E. 3.17.2).

Four (4) councilors and 202 villagers (62% of the villagers) are illiterate. Primary (1-5 class), middle (6-8 class) and matric (9-10 class) level respondents are 108 villagers and 4 councilors (33% of the total respondents). The respondents more than 11th class educational level are limited at 17 persons (5% of the total) (Ref. Table E. 3.17.3).

Two hundred and twenty two (223) villagers (68% of the villagers) and all councilors are engaged only in agriculture. The villager respondents include agriculture cum other jobs (22%) and non-agriculture (8%). Around 91% of the total respondents are agricultural households (Ref. Table E. 3.17.4).

One hundred and thirty nine (139) villagers (43% of the villagers) are owner-cultivators. Owner cum tenants are 1 councilor and 94 villagers (28% of the total). There are 55 villager and 8 councilor landlords (19% of the total), and 8 full tenants in the villagers. As regards the size of agricultural land holdings, 8 councilors and 102 villagers (33% of the total) hold more than 22 ha, while the majority of land is not cultivated due to shortage of rainfall and no irrigation water. Sixty eight (68) villagers (21% of the villagers) hold less than 6 ha. Majority of the respondents i.e. all councilors and 254 villagers had inherited land from father or grandfather. Purchased land holders are limited at 32 villagers (10% of the total) (Ref. Tables E.3.17.5 to E.3.17.7).

Twenty-five villagers and five (5) councilors (9% of the total) have more than Rs. 75,000 annual income. One union councilor and 175 villagers (53% of the total) have less than Rs. 15,000 (Ref. Table E. 3.17.8).

b) Activities of union councilors and villagers

Out of 9 councilors, family members of 8 councilors were members of the union councils. Six councilors have previous experience as councilor. Union councilors were asked a question on factors for contesting the union councils elections. Seven councilors wished to serve the people, one to do social work, and one did not respond. Regarding the procedure in decision-making in the union council, all councilors state that decisions are made by the chairman in consultation with other members. Six councilors receive cooperation from family group members in the implementation of development projects. The rests are from common villagers, members of party, and local government officials, respectively (Ref. Tables E.3.17.9 to E.3.17.13).

The respondents were asked to state major problems of the villages. Majority of the respondents complain of no irrigation water supply which include 4 councilors and 258 villagers (78% to the total). The next problems in priority are no dispensary (48%), no drinking water supply (28%), bad road condition (26%), and shortage of educational facilities (16%)

(Ref. Table E. 3.17.14 ).

Six (6) councilors and 215 villagers (66% of the total) approached concerned department to solve the problems and three (3) councilors and 36 villagers approached union chairman. The rest of villagers (23% of the villagers) had no actions (Ref. Table E. 3.17.15 ).

Around 66% and 68% of the villagers are satisfied with the councilors' and provincial government works, respectively. Two hundred and ninety one (291) villagers (89%) feel decrease of disputes due to the efforts of union council (41% of the villagers) and villager themselves (48%). The villagers were asked the nature and way of participation in development projects. One hundred and nineteen (119) villagers (37% of the villagers) provided free labor, while 74 villagers (23%) limited to cooperation, and 97 villagers (30%) answer was no participation. (Ref. Tables E.3.17.16 and E.3.17.17).

c) Changes in the villages and community organization

Regarding socio-cultural changes in the villages, the respondents feel that village people have become aware of their responsibilities (76% of the total), and they develop a sense of collective working (71%) and participate in the decisions of development projects (54%). Necessity of female education is expressed by 87% of the respondents.

As far as economic changes are concerned, only 41% of the respondents feel increase in income during the last 5 years. Nutritional improvement is expressed by 53% only. Seventy four (74%) of the respondents mention that people start giving education to their children. Decrease in domination of landlord and rich families over the people is expressed by 78% of the respondents. Answers to self-transport of products to market and purchasing property are limited at 46% and 49% of the respondents, respectively (Ref. Table E. 3.17.18).

Zakat and Ushr Committees (religious tax committee) are operating in every village and respondents are aware of them. Eighteen villagers answer Jirga (consulting elder

members) as village community based organization. The villagers are getting benefits from these organizations which are closely related to villager's needs. There was no conflict during the time of election based on the answers of villagers. (Ref. Tables E.3.17.19 and E.3.17.20).

d) Concerns on farmers association and activities for CRBC lift irrigation project

All respondents know the Chashma 1st lift irrigation project and express positive answers on the establishment of farmers association (FA) by a unit of distributary. Participation of farmers association in design and construction stages is considered necessary only by 47% of the respondents. Regarding FA's activities, the respondents answer that O&M under distributary (69%), collection of water rate (71%), and financial management (91%) could be done by FA. (Ref. Table E. 3.17.21).

Regarding procedures for farmers' association (FA) set-up, 56% of the villagers express the negative answers to union councilors' participation. Eighty seven (87) % of the villagers prefer that the chairman of FA should not be from union councilors. The villagers need financial assistance (65%), training and technical assistance (72%), and government coordination (47%). Ninety one (91) % of farmers require the government assistance for FA set-up. All of the respondents agree to a higher water rate payment. (Ref. Table E. 3.17.22).

(4) Basic concept for farmers' organization development

Through the explanation meetings with farmers and union councilors at 10 mouzas and the analysis of the interview survey, the following issues were observed:

- a) Half of the villagers are under a significantly low income level with less than Rs. 15,000 per annum and they don't feel any increase in income during the last 5 years.
- b) Contrary to 66 to 68% of the villagers' satisfaction with the councilors' and provincial department works, many complaints about the wastage and pilferage of funds by councilors and non-consultation about the development activities by the departments were heard in the meetings.
- c) Villagers agreed to the formation of farmers association (FA) at distributary level (100%), operation and maintenance of distributary (69%), and collection of water charges (71%) and financial management (91%) by FA with the support of the government i.e. training and technical assistance (72%), assistance for FA set-up

(91%), and financial assistance (65%).

- d) All of respondents agree to a higher water rate payment for the lift irrigation project.
- e) The farmers and even union councilors (87%) were strongly of the view that the farmers associations should be non political and be independent of the union councils.

Based on the above observations, basic concept for farmers' organization development may be prepared as follows:

- a) Formation of the farmers associations should focus more on owner and tenant cultivators as well as consensus of big owners including absentees.
- b) Farmers at each minor canal or appropriate number of water courses should be organized as a Unit Farmers Association (UFA).
- c) UFAs will be federated by each distributary as a Distributary Farmers Association (DFA). Twenty five (25) DFAs will be organized in the lift irrigation area. UFAs will send their representative to the respective DFA.
- d) Federation of 25 DFAs will be formed and its representative will have a seat in the Project Implementing Organization as an advisor.

#### **E.4 Basic Concept For The Project Development**

##### **E.4.1 Development Potential**

To formulate the development plan, it is required to study the constraints and confirm the potentials for development. Development potentials existing in the Project Area are expressed in terms of availability for major project components.

###### **(1) Water availability**

The source of irrigation water for this Project is the surface water of Indus River and the amount of available water is subject to the Water Accord concluded in March 1991. Both sides of the Study team and Pakistan counterpart personnel have been recognized that there is a discrepancy between the water requirement as indicated in PC-I 1973 of CRBC Project and the 10 daily breakdown of the Water Accord. It was concluded that the season wise figures and not the 10 daily figures of the PC-I 1973 should be used for the Study. Water for this Project is free to be made changes as to be considered fit as long as the total Kharif availability remains less than 0.639 MAF (787.9 million cu.m.) and Rabi availability as 0.547 (674.5 million cu.m.) .



(2) Land availability

The total acreage of the Project Area is 134,600 ha. Based on the land classification, about 4,500 ha (3 % of the total area) is classified into un-cultivated land, besides 4,400 ha (1 %) for residential area in the irrigable land. About 10,100 ha (7 %) is classified into marginal land for cultivation mainly because of irrigation/ drainage canals, farm roads and field borders. It is estimated that the cultivable command area (CCA) is 115,600 ha or 86 % of the total area. The marginal land is included in the CCA promising to take certain countermeasures in irrigation.

(3) Labor force availability

The Project Area is sparsely populated at present due to less availability of water for irrigation and for domestic use. Labor shortage seems to be one of the constraints to the implementation of the Project at present. However, considering the high unemployment rate in and around the Project Area, the labor force is not substantial constraint from the view point of long-run Project development. It is expected that in-immigration to the Project Area, especially from the backward mountainous area and outside of the District, will increased according to the progress of construction and expansion of irrigated farm area. Some measures to encourage the mobilization of labor will be however necessary in order to attain the full development within the earliest stage of the Project.

#### **E.4.2 Agricultural Constraints**

(1) General

Major economic activity in and around the Project Area is agriculture. Agriculture in the Project Area is sluggish at low productivity and performed in limited area due to compound bottlenecks of limited water resources, severe natural condition, immature farmer's organization and low income caused by small employment opportunity. These are noticeable constraints for development of the Project Area while these are targets to be overcome. Constraints in each field clarified in previous chapters are summarized as follows:

(2) Socio-Economy

Low Population Density and Labor Shortage Prospect

Population density in the Project Area is estimated at 56 person per km<sup>2</sup> and 0.56 person per ha. A half of population at most will contribute as labor force at present. Labor force will be increased as irrigated agriculture develops. However, for the

initial stage of irrigation development, supplemental supply of laborer and/or extension of farm mechanization will be indispensable.

#### Disparity of Land Holding

Agricultural land is unevenly distributed among land owner households in the Project Area. The number of marginal and small land owner households below 3 ha accounts for around 74 % of total land owner households, while their share of registered agricultural land area is limited at 9 % of total area. On the other hand, the number of large land owner households more than 5 ha is limited at 18 %, while their share of land area accounts for 84 %.

#### Prevailing Absentee Land Holding and Tenant

The absentee land holding is prevailing in the Project Area at the share of around 17 % of the registered agricultural land. Around 33 % of the registered agricultural land are tenanted. Social status of lessees are low and bound to owners mainly because of debts and social convention.

#### Limited Financial Capacity of Resident Households for the Development

Income and expenditure balance, especially for marginal and small owners, is negligibly small less than Rs. 600 per year. Capital formation of these farmers are primitive at present and financial assistance will be essential for the irrigation development in the Study Area.

### (3) Agriculture

#### Shortage of Water Resources for Introduction of Modern/Intensive Farming

Annual average rainfall in the Study Area is less than 279 mm which is inadequate to supply soil moisture even for one crop in Rabi / winter season. In addition, inadequate and erratic rainfalls and their irregular distribution throughout the year have forced the agricultural production activities to be primitive and extensive. Supply of water is essential to introduce modern farming and increase crop productivity.

#### Lack of Farmers' Knowledge and Experience on Modern/Intensive Farming

Use of improved varieties, fertilizers, agro-chemicals, etc. for intensive farming is not prevailing in the Project Area mainly due to risk of crop production and farmers' financial constraints. Resident farmers have insufficient knowledge and experience on intensive farming except the limited tube-well irrigated area of 940 ha. Main farm income accrues from livestock production at present. Livestock grazing in cultivable

waste land and feeding fodder crops are important production activities both for home consumption and cash income. Cattle and camels also play an important role in draft power and transportation.

#### Lack of Farmers' Knowledge and Experience on Irrigation Farming

Torrent watered cultivation (Rod Kohi) using flood has long been practiced in the Project Area. On the other hand, canal irrigated cultivation has different characters from Rod Kohi cultivation and requires regular farming practices according to water distribution schedule and cropping pattern. Farmers in the Project Area have no experience on the canal irrigated farming.

#### (4) Marketing

##### Unregulated Markets

As of March in 1994, the district wholesale market in D. I. Khan is not declared as a regulated market under a provincial government notification. Thus, the market committee is not functioning. The middlemen and merchants, therefore, are not controlled and the market margin seems to be higher than that of the regulated markets. In general, the market committees acquire sites for market, provide infrastructure like shelters, sheds, parking places, road lights and drinking water. Also, the committee undertake collection and dissemination of market information and regulation of sale and purchase of agricultural produce.

##### Inadequate marketing facilities and distribution system

Farmers at villages do not have appropriate storage facilities with adequate capacity. The loss between farmers and markets, and between markets and consumers is not small. There is only one cold storage for fruits and vegetables in D. I. Khan district. Transportation facilities such as parking lots at the market are not developed. Processing facilities of the perishables do not exist in the district. There is no efficient system on grading and standardization of agricultural produce, either. Sometimes defective containers and packing materials are used.

##### Weak marketing road network

The linkage of farm-to-market and market-to-market (village market to inter-union market or inter-union market to inter-union market in particular) is weak due to poor road network.

As for transportation of agricultural produce, the result of Farm Survey supported the above mentioned constraints. The survey showed that 29 % of the farmers in the

Study Area and 45 % in CRBC Gravity Irrigation Area feel difficulties on transportation, respectively. Major difficulty being reported is the lack of access roads in both areas. Also, in the Study Area, 30 percent of respondents complained about the lack of transport facilities. (Table E. 4.2.1)

(5) Support System

Lack of Farmer's Organization Activities

Except tube-well irrigation area of 940 ha, there are no farmer's organizations for operation and maintenance (O & M) of irrigation facilities, water distribution, and collection of water rates. Cooperative participation rate is very low at less than 5 % to the total households. Existing 26 cooperative societies in 104 related mouzas covering the Study Area are inactive and dormant. There are social and cultural difficulties to organize farmers as a democratic body. Most of the cooperative societies were family member groups.

Shortage of Agricultural Support Services

Even in the existing CRBC gravity irrigation area, support services for on-farm development, such as management of irrigation water distribution, extension of agricultural technology, farmer's organization set-up, distribution of institutional credit are insufficient to accrue the prospective irrigation development benefits. There are no support service organizations and activities for promotion of irrigation development in the Project Area.

Disorganized Activities for Operation and Maintenance (O & M) of Irrigation System

Several independent institutions are concerned with the operation and maintenance of CRBC irrigation system. Their functions are set up by the level of irrigation facilities from Chashma barrage to the tail water courses. Major institutions and their functions are summarized as follows:

WAPDA

- Construction of main canal, distributaries and their related structures,
- O & M of main canal, distributaries and their related structure,
- Intake irrigation water from the Chashma barrage and
- Water distribution from main canal to distributaries.

Irrigation Department

- Construction of minor/sub-minor canals and their related structures,
- O & M of distributaries, minor/sub-minor canals, and their related structures,

- Water distribution from distributaries to minor/sub-minor canals and water courses,
- Coordination and consultation for rotation of water by command area of water course, and
- Monitoring of crop production to assess water rate.

**On Farm Water Management (Agriculture Department)**

- Promotion of water users association set-up,
- Improvement and construction of water courses, and
- Demonstration of precision land leveling.

There are several constraints encountered for O & M of the CRBC gravity system. These are low density of minor/sub-minor canals and water courses, disorganized water distribution, disordered cropping to the original plan, improper and wasting water use at farm lot, low participation of farmers to water user's association, etc. Coordination committees for the CRBC gravity project are organized by the level of administration from the province down to the district, while the constraints at field level could not be properly recognized. The existing institutional arrangement and their functional set up by the level of irrigation facilities seem to be unsuitable and ineffective to solve the constraints. Institutional re-arrangement may be one of countermeasures for effective implementation of the Project, proper O & M activities and early realization of development benefit.(Fig. E.4.2.1)

**(6) Other constraints**

Other constraints should be pointed in the light of issues for implementing project. One is the stiff operation of irrigation system due to fixing their capacities assuming the supply based irrigation. Although the irrigation system is designed on the basis of design criteria for the supply based irrigation, the system can be operated to meet with application of realistic crop based irrigation. Discrepancies between demand and supply will create other constraints.

**E.4.3 Agricultural Development Concept**

Present agricultural production activities in the Project Area has primitive and extensive characters using local varieties without farm inputs under the irregular and insufficient rainfed conditions. The resident farmers are not familiar with modern and intensive farming using irrigation water. Livestock grazing and feeding are important production activities and main farm income accrues from livestock production.

Farmers' livelihood, especially for marginal and small scale farmers less than 3 ha, is at subsistence level and their major income accrues from non-farm employment. In addition, income disparity among farmers arises from uneven distribution of land holding with prevailing absentee land holding and tenant. Society of the Project Area has conservative and family-oriented characters with low literacy ratio less than 20 %. There are social constraints to organize resident farmers as a democratic body for introduction of intensive irrigation farming and improvement of marketing.

There are abundant land resources in the Project Area, while present cropping intensity and agricultural productivity are limited mainly due to insufficient water resources. From the view point of natural constraints, irrigation water supply through water resource development is indispensable agricultural development in the Project Area. Without irrigation water supply, cultivation of waste land, increase of cropping intensity and productivity could not be realized. While solely irrigation water supply could not improve the present farming condition and farmers' livelihood in the Project Area. Other developments than irrigation such as technical dissemination on intensive irrigation farming, supply of institutional credit, post-harvest arrangement, necessary farmers' organization set-up will be also essential.

Based on the present social and natural conditions of the Project Area, agricultural development objectives in the Project Area should have integrated approach taking farmers' participation into consideration. The integrated and participatory approaches are indispensable for the early realization of Project benefit. The agricultural development objectives for the Project could be set as follows:

- a) Utilization of waste cultivable land and increase cropping intensity and crop productivity through proper irrigation water supply,
- b) Introduction of intensive irrigation farming through technical dissemination to farmer beneficiaries,
- c) Increase of agricultural productivity using improved varieties and necessary farm inputs under the proper farm mechanization,
- d) Improvement of marketing situation in the Study Area through construction of necessary post-harvest facilities and rural road and

- e) Creation of integrated support service system for the Project covering training and extension, institutional credit, necessary farmers' organization set-up.

## E.5 Agricultural Development Plan

### E.5.1 The Project Area

The total acreage of the Project Area is 134,600 ha of which 101,740 ha is cultivable. The future cultivated land in the area is composed of 1,000 ha of irrigated land, 27,100 ha of Rod Kohi land, and 73,700 ha of Barani land, respectively, under the "Without Project" conditions. The remaining cultivable land (26,900 ha) is scattered on grazing and/or cultivable waste lands. After construction of the irrigation facilities under "With Project" conditions, 100,800 ha in gross of Rod Kohi, Barani and grazing lands will be changed into irrigated land by use of pump irrigation water. Another alternation of land use will be a) housing, roads and others, and b) Irrigation/drainage canals, farm roads and field borders. Their increments will be 3,000 ha and 10,100 ha, respectively.

The two different scenarios of land use before and after the Project can be compared as follows:

(Unit: ha)			
Description	Without Project	With Project	Increment
<b>Cultivated Area:</b>			
- Irrigated area (C.C.A.)*	1,000	<u>115,600</u>	114,600
- Rod Kohi area	27,100	0	-27,100
- Barani area	73,700	0	-73,700
Grazing, Cultivable Wasted Land	26,900	0	-26,900
<b>Non-cultivated Land</b>			
Housing, road and others	1,400	4,400	3,000
Gullies and torrent beds	4,500	4,500	0
Irrigation/drainage canals, farm roads, field borders		10,100	10,100
<u>Total Project Area</u>	<u>134,600</u>	<u>134,600</u>	<u>0</u>

Remark: C.C.A. ; Cultivable Command Area / Net irrigation area

### E.5.2 Proposed Crops and Cropping Pattern

For selection of crops and formulation of future cropping pattern and intensity under ""With Project"" condition, the following basic principles have been adopted:

- a) The crops and cropping pattern create maximum benefits for the farmers as well as the nation as a whole,

- b) The crops and cropping pattern make optimum utilization of water to be supplied by the project, and
- c) The crops and cropping pattern should be practical and acceptable to the farmers.

The International Irrigation Management Institute (IIMI) implemented the survey in the CRBC irrigation area in 1992 and reported significant discrepancy on area under crops and cropping intensity between the original plan and the present condition. Present cropping intensity fell from the target of 60 % to 42 % on the average in the Kharif season, 1992. Farmers have no understandings how to share and utilize irrigation water properly under the same system. Crops with high water requirement such as rice and sugarcane are prevailing against the original plan. In addition, wastage of irrigation water, appearance of water logging and salinity have been observed.

#### (1) Selection of crops

In due consideration of the basic principles described above, food grains (wheat, maize and pulses), cash crops (sugarcane, oilseeds, cotton), fodder crops, fruits and vegetables have been selected for making a proposed cropping pattern as the major crops. According to the field survey in the Project Area, these crops were widely grown, and the farmers have long experience in the Kharif and Rabi season cultivation. Profitability and marketability for new crops such as fruits and vegetables are limited in the Project Area, hence their introduction in the proposed cropping pattern with a large area is not recommendable. Their large production aiming at cash crops will require new development measures such as introduction of additional new farming technologies, development of new markets including foreign countries, establishment of cold storage facilities, etc. New crop production in the Project Area should be limited at local consumption level.

For selection of crops, comparative studies were also made on the basis of climatic condition, crop suitability of soil, profitability and marketability, labor requirement and water requirement for each crop. The profitability of each crop by net production value per ha is calculated based on farm gate price at 1994. The soil suitability, marketability, net return per ha, unit net production values per man-day of labor and per m<sup>3</sup> of irrigation water for each crop are shown below:



Crops	Soil Suitability	Market-ability	Profitability			Total Score
			Net Return (Rs./ha)	Labor (Rs./M.D.)	Water (Rs./m <sup>3</sup> )	
<b>Kharif Season Crops:</b>						
Maize	B	C	9,200	230.0	1.37	B
Paddy	C	A	3,500	58.3	0.24	C
Pulses (mung bean)	B	A	13,250	331.3	1.87	A
Cotton	C	B	12,500	227.3	1.14	B
Fodder (millet)	B	B	5,750	191.7	1.05	B
Vegetables, others	B	B	21,220	303.1	3.08	B
<b>Rabi Season Crops:</b>						
Wheat	A	A	8,550	213.8	1.16	A
Pulses (gram)	B	A	14,010	350.3	2.42	A
Oil Seeds(mustard)	B	A	13,230	264.6	2.50	A
Fodder (berseem)	B	B	8,640	216.0	1.66	B
Sugarcane	C	A	12,700	158.8	0.60	B
Fruits	C	C	16,440	121.8	0.91	B
Vegetables, others	B	B	38,150	448.8	8.12	B
<b>Spring Season Crops:</b>						
Maize (seed)	B	B	10,280	257.0	1.39	A
Oil Seed (sunflower)	B	A	12,630	315.8	2.11	A

Note: M.D. ; man-day, Ref.: Table 5.2.1.1

For the formulation of future proposed cropping pattern, rice (paddy) has been removed based on above evaluation and the following into consideration:

- a) high water requirement, especially at land preparation time,
- b) prospective water logging and salinity problems,
- c) high labor requirement at transplanting and harvesting periods against the present labor availability,
- d) high water charge than other crops, if apply water rates according to real water consumption,
- e) no farmers' experience on cultivation and water management for rice in the Project Area.

(2) Crop rotation

Proper crop rotation is very important, and should be introduced in the Project Area due to the following reasons ;

- a) to get maximum profit from the same piece of land,
- b) to maintain soil in good physical and chemical conditions,
- c) eradication of insects pests, diseases and weeds,

- d) to increase productivity of the soil, and
- e) proper utilization of irrigation water.

Keeping in view the soil and climatic conditions of the Project Area as well as market availability for the farm produce and fodder availability for the animals, the following three (3) crop rotations should be adopted in the Project Area for proper utilization of soil, water and other resources as well as getting maximum profit.

Year/ Seasons	Type- I	Type - II	Type - III
<u>1st Year:</u>			
Rabi season	-	Wheat/fodders	Fodders
Spring season	Maize/oilseeds	-	Sugarcane (April)
Kharif season	Fallow/fodders	Maize/pulses	Sugarcane (September)
<u>2nd Year:</u>			
Rabi season	Wheat/pulses	Oilseeds/pulses	Sugarcane (ratoon)
Spring season	-	-	Sugarcane (ratoon)
Kharif season	Maize/pulses	Maize/fodders	Sugarcane (ratoon)
<u>3rd Year:</u>			
Rabi season	Wheat/oilseeds	Wheat/fodders/oilseeds	-.....
Spring season	-	-	Maize/oilseeds
Kharif season	Cotton	Maize/pulses	Fallow .....

(3) Proposed cropping pattern and cropping intensity

Based on the above conditions, the proposed cropped area for each crop is estimated based on the following conditions:

- a) Production of food grains and cash crops have been planned to meet home consumption and domestic market demand which will increase substantially due to growing population and rural development,
- b) Production of fodder crops have been planned basically to meet home consumption by livestock and to contribute to the farm economy with some marketable surplus, and
- c) Fruits and vegetables have been kept at the present proportion of the irrigated area.

For determination of cropping intensity referring to the cropping patterns proposed by WAPDA (PC-I proforma, 1973) and the feasibility report for CRBC Stage-I, -II and -III and present cropping pattern, the following three (3) alternative proposed cropping patterns are studied:

- a) Pattern-A ; Proposed by WAPDA PC-I Proforma, 1973
- b) Pattern-B ; Proposed by CRBC Stage-III. 1990
- c) Pattern-C ; Proposed by the JICA Study Team

These patterns are shown as follows ;

(Unit:%)			
Seasons/ Crops	Pattern-A (proposed by PC-I)	Pattern-B (CRBC Stage-III)	Pattern-C (proposed by JICA)
<b><u>Kharif Season</u></b>			
Rice	2	14	0
Maize	10	20	20
Millet	3	0	0
Cotton	10	12	10
Pulses	0	0	5
Fodder	10	8	10
Sugarcane	15	5	10
Fruits and vegetables	5	3	5
Miscellaneous	5	0	0
<u>Sub-total</u>	<u>60</u>	<u>62</u>	<u>60</u>
<b><u>Rabi Season</u></b>			
Wheat	45	50	45
Pulses	5	5	10
Sugarcane	15	5	10
Fodder	10	10	10
Oilseeds	5	10	10
Fruits and vegetables	5	3	5
Miscellaneous	5	0	0
<u>Sub-total</u>	<u>90</u>	<u>83</u>	<u>90</u>
<b><u>Spring Season</u></b>			
Maize	0	0	5
Oilseeds	0	5	5
<u>Sub-total</u>	<u>0</u>	<u>5</u>	<u>10</u>
<b>Annual Cropping Intensity</b>	<b>150</b>	<b>150</b>	<b>160</b>

The future proposed cropping pattern has been decided for the Project as a result of net return (net crop production value), water requirement and maximum irrigable area, and summarized as below ;

Crops	Pattern-A (proposed by PC-I)	Pattern-B (CRBC Stage-III)	Pattern-C (proposed by JICA)
<b>Net Return per Ha (Rs./ha):</b>			
Kharif season crops	6,130	5,490	6,640
Rabi season crops	8,780	8,330	9,500
Spring season crops	0	630	1,140
<b>Total</b>	<b>14,910</b>	<b>14,350</b>	<b>17,180</b>
<b>Water Requirement per Ha (m<sup>3</sup>/ha):</b>			
Kharif season crops	6,030	6,190	5,420
Rabi season crops	5,870	5,460	5,750
Spring season crops	0	300	670
<b>Total</b>	<b>11,900</b>	<b>11,950</b>	<b>11,840</b>
<b>Max. Irrigable Area (ha):</b>			
Kharif and spring season crops	130,600	121,400	129,300
Rabi season crops	115,000	123,600	117,400
<b>Total</b>	<b>245,600</b>	<b>245,000</b>	<b>246,700</b>

Ref.: Tables E.5.2.2 and E.5.2.3

The above table reveals that maximum net return (net crop production value) per ha for Kharif, Rabi and Spring season crops can be obtained by adopting Pattern-C which gives a total value of 17,180 Rs./ha as compared to Pattern-A (14,190 Rs./ha) and Pattern-B (14,450 Rs./ha). By adopting Pattern-C, water requirement will minimize to 11,840 m<sup>3</sup>/ha as compared to 11,900 m<sup>3</sup>/ha of Pattern-A and 11,950 m<sup>3</sup>/ha of Pattern-B. Taking into consideration the maximum irrigable area, Pattern-C (246,700 ha) is again superior to the other two patterns as can be seen in the table. In light of the above facts and benefits, Pattern-C is recommended for the Project Area, and shown in Fig. E.3.2.1.

### E.5.3 Proposed Farming Practices, Farm Inputs and Labor Requirement

#### (1) Land preparation

For proper seed bed preparation, land should be ploughed once with a tractor mounted disc or mould-board plough to pulverize the soil, control weeds and insects/pests and bury residue of the previous crops. After that a tractor mounted harrow be used to break the clods which should be followed by leveling with a tractor mounted blade. Before sowing the crop, irrigation should be applied to the field. When the field becomes in workable conditions, it should be tilled twice with a tractor mounted tiller and/or a rotavator used for breaking the clods. Some of the farmers can also use a wooden plank instead of the rotavator to reduce land preparation cost. In areas where agriculture has not mechanized, land preparation be done by

ploughing the land 2 - 3 times using the bullock power. After that, planking be done to level the land while mala (wooden clod-breaker) be used for clod breaking. If farmers use only tractor mounted tiller for preliminary tillage, then, it is recommended that tractor mounted plough should be used every third year to break the hard-pan beneath the soil surface.

(2) Fertilizer application

At present farming in the Project area, the use of fertilizers is very rare due to the poor economic conditions of the farmers. The most popular fertilizers are Urea, DAP (Di-ammonium Phosphate), TSP (Triple Super Phosphate) and SOP (Sulfate of Potash). Half of the Urea and all DAP/TSP and SOP for basal dose should be applied at the time of seed bed preparation while the remaining Urea be applied as top dressing with 1st irrigation to most of the crops. The recommended method of fertilizer application is by broadcasting in the field and mixing it well with the soil by tillage operation. Another method of applying DAP is by mixing it with the seed in the drill and then drilled with the seed. Urea should not be used by this method as it adversely affects seed germination. Farmyard manure (FYM) should be applied evenly at least one month before the field operation. The recommended doses of fertilizers for various crops are given in Table E. 5.3.1.

(3) Agro-chemical application

A large number of agro-chemicals are recommended for use in various crops depending upon the insect species and other vertebrate pests such as rats, porcupine, wild pig, etc. The following three methods of agro-chemical application are recommended.

- a) Liquid type agro-chemicals be mixed with water and sprayed with a hand or power sprayer.
- b) Granule types be applied to the plant parts where insect/pests are hiding while powder forms be either mixed with water and sprayed with sprayer or broadcasted by mixing them with ash.
- c) For the control of vertebrate pests, the poison should be applied to potato pieces, beef pieces or any other feed of the pest and the poisoned feed be scattered in the field so the pest may eat it and die.

(4) Weed control

In order to get maximum benefit from the crops, control of weeds is very important.

Weeds compete with the crops for water, nutrients and light. It has been estimated that crop yields are reduced by 20 - 30 % due to weeds infestation. There are two major types of weeds i. e. broad-leaf and grassy types. Weed control should be done by the following methods ; a) crop-rotation, b) mechanical control, c) manual control and d) chemical control. In case of crop rotation, different crops should be grown on the same piece of land to control weeds. For example to control wild oats, barley and other grassy weeds in wheat, fodder crops like berseem should be used in the rotation. In case of mechanical control, bar-harrow should be used for weed control. If enough labor is available, then weeds should be controlled by using hand sickles, hand hoe, kahi and rambas. The above three methods do not cause any environmental pollution. At present, a large number of herbicides are available in the market for weed control. Some herbicides kill only broad-leaf weeds while others kill both grassy and broad-leaf weeds. For wheat, Dicuran-MA (2.5 kg/ha of dosage) should be used for the control of both kinds of weeds after 1st irrigation. Buctril-M (1.5 lit./ha) should be sprayed when only broad-leaf weeds are a problem. In sugarcane, Gizapex combe (7.5 lit./ha) or DM-6 (1.25 lit./ha) should be used for weed control. In cotton, Stomp-330E (4.25 lit./ha) is recommended for weed control. As chemical herbicides are poisonous, great care should be taken while using these. A mask should be used to avoid inhaling of mist of the spray. Similarly hand-gloves should be used while handling these chemicals. In case of emergency, immediate medical help should be sought.

#### (5) Water management

Water management in the field is different for crops, fodders, vegetables and fruits. In case of field crops and fodders, water should be applied by using the flood irrigation method. For vegetables and fruits, furrow irrigation is recommended for judicious use of water. To get maximum benefit from irrigation water, the field should be well leveled in case of flood irrigation and the furrows be kept clean in case of furrow irrigation. Trickle (drip) irrigation be used in fruits. Excessive or too little irrigation reduces yields, therefore, water should be applied in optimum quantity whenever it is needed.

#### (6) Harvesting and threshing

In case of wheat, oilseeds and pulses, well ripened crop should be harvested, tied into bundles, and transported to a threshing floor into bullock carts or tractor trolleys. After drying these to a particular moisture content, threshing should be preferably carried out with a tractor-driven thresher. If a thresher is not available, the traditional

method of treading the harvested material with bullock hoofs can be used. In this case a pole be fixed in the middle of the threshing floor and the bullocks be tied neck-to-neck and driven together around the pole on the threshing floor over the harvesting materials. Later on the seed and straw should be separated by taking advantage of blowing wind.

Seed cotton harvesting should be done through picking it from the mature and opened bolls. Two to three pickings are enough with an interval of 15 - 20 days. The sticks should be harvested manually with sickles. Sugarcane should be harvested with sickles and tied into bundles for transportation to the sugar mills for processing. Maize cobs should be harvested from plants and transported to a threshing floor. Threshing should be done with maize-sheller or manually. Vegetables and fruits should be picked when mature and transported to the market.

Rabi fodder (berseem alone or mixed with oats) is ready for 1st cutting during the last week of November or 1st week of December if planted at the optimum time and well managed. Later cuttings be taken with an interval of 30 - 35 days up to May. Crop meant for seed production should not be harvested after February. After cutting, the fodder should be transported to the cattle shed and cut into pieces with an electric or manual fodder cutter. It should be mixed with wheat bhoosa (pieces of straw) before feeding to the animals. Kharif fodders like maize and sorghum should be cut with a sickle when the grain is in milk stage. At this stage, they provide maximum nutrition. Millet should be harvested when it is tender and juicy (usually 60 days after sowing). Kharif fodders should also be cut into pieces with manual or electric fodder cutter and mixed with some dry matter like bhoosa etc. before feeding.

#### (7) Storage and processing

Post harvest losses of field crops, vegetables and fruits are very high in Pakistan. Therefore, it is very important that the farm produce is properly stored and processed to reduce these losses. In case of cereal crops, the seed should be dried upto 9 - 12 % moisture content before storage. The produce should be put into clean bags and stored into pest free and well-ventilated rooms on wooden stacks 5 - 10 cm above floor surface. Fumigation should be carried out to check the attack of stored grain pests. For processing, the produce be supplied to flour mills.

Vegetables and fruits should be sold as fresh product in the various markets. Quick transportation is very important to the market. For this purpose, the product should be packed into cartes for transportation by trucks. Some of the vegetables and fruits

should be stored into cold storage for selling at time when fresh product is not available. In order to make beverages, some fruits are processed as pure juices or as squashes. Similarly vegetables are processed to make pickles and ketchup/sauces.

Cotton be processed in the ginning factory to separate seed from lint. Cotton seed be processed to make cooking oil and oil-cakes. Sugarcane should be transported to the sugar mill as soon as possible to avoid moisture loss.

The recommended amount of farm inputs and labor requirement per ha are given in Tables E.3.3.1 and E.3.3.2. According to labor requirement for recommended farming practices, maximum labor requirement per ha for the proposed cropping pattern under "With Project" condition are 3.70 man-day, and given in Table E. 5.3.3.

#### **E.5.4 Anticipated Crop Yields and Crop Production**

In the "Without Project" condition, the future anticipated unit yields of crops are set at the levels of the present unit yields which are estimated on the five (5) years average of 1987/88 to 1992/93 in D. I. Khan District. It is considered that the present constraints of water shortage, traditional farming practices and poor agricultural supporting services remain unchanged.

After completion of the Project, it is expected that the unit yields of crops would stabilize and increase on account of increasing irrigation water by lift and by introduction of improved farming practices. However, a little data are available on the crop yields under full irrigated condition and proper fertilization in and around the Project Area. There are experimental data of yield trials for major crops from research plots as well as from farmer's plots in the Annual Progress Report, 1991-92 prepared by Agricultural Research Institute, D. I. Khan.

These maximum crop yields for selected crops are given in Table E. 5.4.1, and summarized as follows ;



<u>Crops</u>	<u>Name of Trial</u>	<u>Unit Yield</u>	<u>Remarks</u>
Wheat:	Fertilizer trial ; 120-N 90-P 100-K	5.92 t/ha	Pirsabak-85
	Sowing date ; 16 November 1991	5.79 t/ha	Pirsabak-85
Maize:	Fertilizer trial ; 120-N 200-P 60-K	7.46 t/ha	Azam
Sorghum:	Variety trial ; CSH-11	3.12 t/ha	100-N, 50-P
Sugarcane:	Fertilizer trial ; 135-N 110-P 250-K	94.00 t/ha	CP51/213, COL-75
	Sowing date ; 15 September, 1991	95.56 t/ha	CP75/324
	15 September, 1991	45.95 t/ha	ratoon, CP75/324
Cotton:	Fertilizer trial ; 200-N 50-P 0-K	2.91 t/ha	DNH-25
Rape/ Mustard:	Row spacing ; 15cm (90-N,60-P)	3.20 t/ha	BM-1, Altex
Cauliflower ;	Sowing date ; 7 Sept., 1991	26.00 t/ha	50-N, 80-P, 90-K
Pea:	Sowing date ; 30 October, 1991	6.40 t/ha	50-N, 100-P, 80-K
Onion:	Transplanting date ; 16 Jan. 1991	28.00 t/ha	50-N, 100-P, 80-K

The anticipated unit yields "With Project" condition are estimated with reference to the above unit yields of crops and target crop yields of CRBC Stage-III in the feasibility study report, 1990. The target yields of other crops are projected at nearly the same level of present averaged crop yields under full irrigation condition in CRBC Stage-I area. The anticipated unit yields under the future "Without and With Project" conditions are estimated as below ;

(Unit: t/ha)			
Crops	Without Project*	With Project	Increment
<b><u>Kharif Season Crops :</u></b>			
Maize	0.63	3.50	2.87
Pulses (Mung beans)	0.52	2.00	1.48
Cotton	1.36	2.00	0.64
Fodder (Millet, Sorghum)	11.86	45.00	33.14
Vegetables (Eggplant)	2.80	10.00	7.20
<b><u>Rabi Season Crops :</u></b>			
Wheat	1.04	4.00	2.96
Pulses (Gram)	0.60	2.50	1.90
Oilseeds (rape/Mustard)	0.52	2.50	1.98
Fodder (Berseem)	13.30	55.00	41.70
Sugarcane	35.55	70.00	34.45
Ratoon	-	40.00	
Fruits (Mango)	3.00	10.00	7.00
Vegetables (Cauliflower)	5.50	12.00	6.50
<b><u>Spring Season Crops :</u></b>			
Maize (seed)	0.60	3.50	2.90
Oilseeds (Sunflower)	0.80	2.50	1.70

Note: (\*); Unit yields are estimated based on weighted average of present irrigation, Rod Kohi and Barani area.

In order to achieve the anticipated unit yields in the future under the "With Project" condition, it is necessary that the farmers be informed and trained on the improved farming practices supported by the agricultural research institute and the agricultural extension service. The unit yield will increase gradually from the present level and reach the target yield in the 7th year after the completion of the irrigation and drainage facilities.

Total production of the crops is estimated by multiplying the target unit yield with the future cultivable commanded area (CCA) for both future with and without Project conditions as follows ;

Crops		Without Project	With Project	Increment			
<b>Kharif Season Crops :</b>							
Sorghum	: P.A. (ha)	2,440	0	-2,440			
	: Prod. (tons)	1,760	0	-1,760			
Millet	: P.A. (ha)	2,390	0	-2,390			
	: Prod. (tons)	1,810	0	-1,810			
Maize	: P.A. (ha)	20	23,100	23,080			
	: Prod. (tons)	15	80,850	80,835			
Pulses	: P.A. (ha)	10	5,800	5,790			
	: Prod. (tons)	5	11,600	11,595			
Cotton	: P.A. (ha)	60	11,500	11,440			
	: Prod. (tons)	80	23,000	22,920			
Fodder	: P.A. (ha)	10	11,500	11,490			
	: Prod. (tons)	120	517,500	517,380			
Guara	: P.A. (ha)	210	0	-210			
	: Prod. (tons)	330	0	-330			
Vegetables	: P.A. (ha)	30	3,000	2,970			
	: Prod. (tons)	85	30,000	29,915			
<b>Rabi Season Crops :</b>							
Wheat/	: P.A. (ha)	8,500	52,000	43,500			
Barley	: Prod. (tons)	8,870	208,000	199,130			
Pulses	: P.A. (ha)	4,280	11,500	7,220			
	: Prod. (tons)	2,575	28,750	26,175			
Oilseeds	: P.A. (ha)	2,400	11,500	9,100			
	: Prod. (tons)	1,240	28,750	27,510			
Fodder	: P.A. (ha)	60	11,500	11,440			
	: Prod. (tons)	800	632,500	631,700			
Sugarcane	: P.A. (ha)	30	11,500	11,470			
	: Prod. (tons)	1,070	632,500	631,430			
Fruits	: P.A. (ha)	15	3,000	2,985			
	: Prod. (tons)	50	30,000	29,950			
Vegetables	: P.A. (ha)	15	3,000	2,985			
	: Prod. (tons)	80	45,000	44,920			
<b>Spring Season Crops :</b>							
Maize	: P.A. (ha)	0	5,800	5,800			
	: Prod. (tons)	0	20,300	20,300			
Oilseeds	: P.A. (ha)	0	5,800	5,800			
	: Prod. (tons)	0	14,500	14,500			
<b>Annual Cropping Area:</b>							
Kharif Season Crops		5,200	5%	69,400	60%	64,200	55%
Rabi Season Crops		15,300	15%	104,000	90%	88,700	75%
Spring Season Crops		0		11,600	10%	11,600	10%
Total		20,500	20%	185,000	160%	164,500	140%

Note: P.A; Planted Area, Prod ;Production (Ref.: Table E.5.4.2, 5.4.3 and 5.4.4)

Above increased crop production under the Project will be consumed in the Project Area, and marketable surplus will be traded out of the Project Area. This will contribute to the improvement of income of farmers and nutrition of the local people.

It is estimated that several thousand tons of wheat, maize, pulses, oilseeds, fodder, fruits and vegetables will be transported to whole NWFP and other provinces of the country.

### **E.5.5 Marketing Forecast**

#### **(1) Support Price Policy**

The federal government has taken support price policy with a view to provide economic incentives to the growers. Since this support program is positively evaluated by the government in general, this policy will be maintained in the future. Wheat, rice (paddy), sugarcane, cotton, gram, onion, potatoes, and non-traditional oil seeds, namely sunflower, safflower, and soyabean are designated as crops for support price program at present.

#### **(2) Food Balance in NWFP**

##### Wheat and coarse grains

According to the estimation in 1993-2020, the gap between the total requirement and the total production in NWFP will not be filled in terms of wheat and other coarse grains as shown in Fig. E.5.5.1. Wheat production is, therefore, essential in order to alleviate the imbalance of food grain. The result comes from the assumptions that (i) production of wheat in NWFP is 1,163,383 tons and that of other grains (millet, sorghum and barley) is 85,019 tons in 1991/92; (ii) per capita requirement of wheat is 129 kg in a year, which is based on the data in the Provincial Food Department in NWFP; (iii) per capita requirement of other grains is 4.6 kg in a year; (iv) population estimated in NWFP is 16,012 thousand in 1992 (and 16,555 thousand in 1993), which are based on the past annual trend of population increase at 3.42% since 1981; and (v) annual production growth rate is 4.73 % assuming that the production in 2006/7 will be double compared with that of 1991/92 in fifteen years and after the year 2006/7 onwards, the same growth rate is applied.

##### Oil seeds

In NWFP, as shown in Fig. E 5.5.2, the estimated gap between total requirements and the total production on edible oil is very large and seems to be larger in the future. The result comes from the assumptions that (i) production of oil seeds (rape and mustard seed, cotton seed, sesame and soyabean) in NWFP is 18,194 tons in 1991/92, of which rape and mustard seed accounts for 90.1% (16,479 tons); (ii) per capita requirement of edible oil is 11.4 kg in a year based on the Seventh Five Year Plan and Perspective Plan; (iii) population estimated in NWFP is 16,012 thousand in

1992 (and 16,555 thousand in 1993), which are based on the past annual trend of population increase at 3.42% since 1981; (iv) annual production growth rate is 7.18 % assuming that the production in 2001/2 will be double compared with that of 1991/92 in ten years, and after the year 2001/2 onwards, the same growth rate is applied; and (v) extraction rate on oil seeds is 32 % in average based on the Report of the National Commission on Agriculture (1988).

#### Other crops

Rice is likely to have a deficit in NWFP like wheat. Maize itself will have a surplus in terms of per capita requirement basis, but will be utilized as a substitute for wheat and as raw material for concentrated feed. Pulses / gram will have a deficit. Refined sugar will be deficit for the time being although the production of sugarcane will increase and a utilization rate of it by sugar mills will be higher. Fruits and vegetables are highly seasonal and the balance will fluctuate.

### (3) Processing and Storage Facilities

#### Wheat

Wheat production in the D. I. Khan district was 115,264 tons in 1991/92, while processing capacity is estimated at 372,000 tons. Wheat production can be, therefore, increased by about 256,700 tons additionally on the condition that flour mills in D. I. Khan district will use the raw materials within the same district. Since the incremental production of wheat by the Project amounts to 200,000 tons approximately, the processing capacities seems to be almost sufficient. As for storage facilities, capacities of public storage in the Food Department and other authorities seem not to be enough for the incremental production.

#### Oil seeds

One solvent oil extraction plant with the installed capacity of 14,000 tons in a year (70 tons per day times 200 days) in D. I. Khan can take most of sunflower since its incremental production by the Project is 14,500 tons. Rape and mustard seeds can be processed in small oil mills and large oil mills with the total capacities of 10,000 tons approximately in D. I. Khan district. The surplus will be transported to other oil mills in surrounding districts in NWFP and Punjab. Storage facilities will be taken care of by the millers.

#### Sugarcane

According to Chashma and Fecto sugar mills, the crushing capacity of each mill will be increased from 3,000 to 6,000 tons per day in the 1994/95 season. Therefore,

total incremental capacities, which is 900 thousand tons in both mills, can absorb the estimated incremental crop production of 690 thousand tons by the Project. Storage facilities will be handled by sugar mills.

#### Other crops

Seed cotton will be processed in ginning factories in Bhakkar or other districts in Punjab. A portion of pulses will be processed (split and washed) in millers in Punjab. Incremental production of fresh fruits and vegetables by the Project will be basically marketed in D. I. Khan district and other districts in provinces, but some portions may be processed in D. I. Khan in the future.

#### (4) Future market conditions

##### Wheat, other cereals and pulses

Since procured and open marketed wheat in D. I. Khan district is sold to flour millers and then marketed to Kohat, Bannu, Swat and Federally Administrative Tribal Area (FATA) as well as D. I. Khan at present, this marketing network will function in the future. Although maize comes from Peshawar, Bannu and other districts in NWFP to D. I. Khan market at present because it is short in the district, the increase of maize production by the Project may change this pattern, and maize will be marketed in neighboring districts and FATA area, where wheat will have a deficit, as a cereal and raw material for concentrated feed. Other cereals, namely millet and sorghum, will be marketed in the district market and other districts in NWFP. Since pulses and gram are marketed in the D. I. Khan district, Kohat, Bannu, Swat and FATA area at present, the market pattern will be the same in the future.

##### Oil seeds

Rape and mustard seeds will be marketed according to the present system in D. I. Khan or neighboring districts in NWFP and Punjab. Sunflower seed can be openly marketed in D. I. Khan market to private millers and oil extraction plants, or can be procured by PASSCO.

##### Sugarcane and Cotton

Since the installed capacities of two sugar mills within and adjacent to the district of D. I. Khan will increase by 900 thousand tons in total from the crushing year of 1994/95, the incremental production in the Project will be fully marketed. Seed cotton will be marketed through dealers in D. I. Khan district and shipped to ginning factories in Punjab.

### Other crops

Fodder is short in D. I. Khan district at present. Since it is estimated that the demand of fodder for livestock will reach 1.4 million tons in 2003 in this district, the incremental quantity (1.1 million tons approximately) by the Project can be taken in this market. Some of green fodder may be needed to dry for convenient transportation. Fruits and vegetables are seasonally marketable in D. I. Khan district and other districts in NWFP and other provinces at present. The almost same situation is foreseeable in the future. Fruits and vegetables will be seasonally marketed in D. I Khan district and other districts.

#### (5) Total rating of market forecast

Market forecast as a whole is given below. Wheat, paddy (rice), pulses, oil seeds, and sugarcane are most appropriate crops from the point of marketability.

Crops Policy (1)	Government in NWFP (2)	Food Balance Storage in D. I. Khan (3)	Processing/ Conditions (4)	Future Market Rating (5)	Total Total
Wheat	a	a	a	a	A
Paddy/rice	a	a	c	a	A
Maize	b	c	b	b	C
Millet/sorghum	b	b	b	b	B
Pulses/gram	a	a	c	b	A
Oil seeds	a	a	b	a	A
Sugarcane	a	a	a	a	A
Cotton	a	-	c	b	B
Fodder	b	-	-	b	B
Vegetables	a	a	c	c	B
Fruits	b	a	c	c	C

(1) Crops, which procured prices are set: "a", others: "b"

(2) Crops, which will have a deficit: "a", balanced: "b", a surplus: "c"

(3) Sufficient facilities: "a", capable: "b", short or depending outside: "c"

(4) Well marketed: "a", possibly marketed "b", unknown: "c"

(5) Total Rating: More than 2 points in average = A, 2 points = B,

Less than 2 points = C (here, a = 3 points, b = 2 points, c = 1 point)

#### **E.5.6 Crop Budget under Without and With Project Conditions**

Crop production costs and value per ha under without and with Project conditions are estimated based on financial prices as of March in 1994 and given in Tables E.3.10.6, 7, 8. Detailed crop budget per ha are given in Tables E.5.6.1 and E.5.6.2, and summarized as follows ;

(Unit: Rs./ha)			
Crops	Without Project	With Project	Increment
<b><u>Kharif Season Crops :</u></b>			
Maize	526	9,198	8,672
Pulses	2,363	13,248	10,885
Cotton	9,930	12,498	2,568
Fodder	484	5,749	5,265
Vegetables	3,172	21,223	18,051
<b><u>Rabi Season Crops :</u></b>			
Wheat/Barley	3,998	8,552	4,554
Pulses	4,238	14,008	9,770
Oilseeds	2,895	13,231	10,336
Fodder	760	8,636	7,876
Sugarcane	3,143	9,805	6,662
Fruits	-	16,440	-
Vegetables	6,841	38,153	31,312
<b><u>Spring Season Crops :</u></b>			
Maize	-	10,283	-
Oilseeds	-	12,626	-

#### **E.5.7 Financial Irrigation Benefit**

Irrigation benefit by the Project to be expected is difference of net return value from crops between future without and with Project conditions. The financial irrigation benefit at full development stage as shown in Tables E.5.6.3 and E.5.6.4 and summarized as follows:



(Unit: Rs. ,000)

Crops	Without Project	With Project	Increment
<b><u>Kharif Season Crops :</u></b>			
Sorghum	5,395	0	-5,395
Millet	6,827	0	-6,827
Maize	11	212,474	212,463
Pulses	24	76,838	76,815
Cotton	596	143,727	143,131
Fodder	5	66,114	66,109
Guara	863	0	-863
Vegetables	95	63,669	63,574
<b>Sub-total</b>	<b>13,816</b>	<b>562,882</b>	<b>549,006</b>
<b><u>Rabi Season Crops :</u></b>			
Wheat/Barley	18,712	444,704	425,992
Pulses	18,147	161,092	142,945
Oilseeds	6,946	152,157	145,211
Sugarcane	94	112,758	112,663
Fodder	46	99,314	99,268
Fruits	57	12,714	12,657
Vegetables	103	114,459	114,356
<b>Sub-total</b>	<b>44,103</b>	<b>1,097,197</b>	<b>1,053,093</b>
<b><u>Spring Season Crops :</u></b>			
Maize	0	59,641	59,641
Oilseeds	0	73,231	73,231
<b>Sub-total</b>	<b>0</b>	<b>132,872</b>	<b>132,972</b>
<b>Total</b>	<b>57,920</b>	<b>1,792,891</b>	<b>1,734,971</b>

## **TABLES**



**Table E.2.1.1 Gross Domestic Product at Constant Factor Cost of 1980-81**

Sector	1987/88	1988/89	1989/90	1990/91	1991/92	(Unit : Rs. Million)	
						1992/93 (R)	1993/94 (P)
I. Agriculture	99,108	105,917	109,127	114,542	125,425	118,802	121,932
Crops	65,208	70,047	70,942	74,561	83,503	74,340	74,913
Livestock	28,906	30,614	32,481	34,105	36,133	38,308	40,599
Fishing	3,776	3,999	4,325	4,430	4,650	4,909	5,075
Forestry	1,218	1,257	1,379	1,446	1,139	1,245	1,345
II. Industry	86,214	89,308	94,059	99,935	107,455	113,259	119,242
Mining & quarrying	2,029	2,071	2,269	2,504	2,565	2,642	2,794
Manufacturing	67,622	70,300	74,324	78,969	85,324	89,916	94,981
Construction	16,563	16,937	17,466	18,462	19,566	20,701	21,467
III. Services	200,094	208,723	219,298	231,528	247,533	259,284	269,629
GDP at factor cost	385,416	403,948	422,484	446,005	480,413	491,345	510,803
Indirect taxes less subsidies	47,003	49,918	51,618	53,955	58,718	58,130	57,058
GDP at market cost	432,419	453,866	474,102	499,960	539,131	549,475	567,861
Population (Million)	103.82	107.04	110.36	113.78	117.31	120.83	124.45
Per capita GDP at factor cost	3,712	3,774	3,828	3,920	4,095	4,066	4,104

Note : R ; Revised. P ; Provisional.

Source : Federal Bureau of Statistics.

**Table E.2.1.2 Gross Domestic Product at Current Factor Cost**

Sector	1987/88	1988/89	1989/90	1990/91	1991/92	(Unit : Rs. Million)	
						1992/93 (R)	1993/94 (P)
I. Agriculture	156,375	184,074	197,441	233,130	282,374	297,816	349,592
Crops	92,798	111,742	115,065	138,132	171,966	167,448	194,787
Livestock	57,438	65,038	74,237	86,219	100,726	117,792	141,191
Fishing	4,492	5,442	5,792	6,072	7,158	9,536	9,948
Forestry	1,647	1,852	2,347	2,707	2,524	3,040	3,666
II. Industry	130,837	146,155	169,784	203,449	237,761	264,778	305,724
Mining & quarrying	4,811	4,932	5,403	6,437	7,117	7,403	8,712
Manufacturing	100,917	113,517	132,329	158,840	186,832	207,568	241,932
Construction	25,109	27,706	32,052	38,172	43,812	49,807	55,080
III. Services	313,813	352,909	392,629	471,795	557,808	637,861	744,058
GDP at factor cost	601,025	683,138	759,854	908,374	1,077,943	1,200,455	1,399,374
Indirect taxes less subsidies	74,364	86,607	96,092	112,226	133,442	141,500	155,200
GDP at market cost	675,389	769,745	855,946	1,020,600	1,211,385	1,341,955	1,554,574
Population (Million)	103.82	107.04	110.36	113.78	117.31	120.83	124.45
Per capita GDP at factor cost	5,789	6,382	6,885	7,984	9,189	9,935	11,244

Note : R ; Revised. P ; Provisional.

Source : Federal Bureau of Statistics.

**Table E.2.1.3 Growth Rate of Gross Domestic Product**

Sector	(Unit : % / year)						
	1987/88 -1988/89	1988/89 -1989/90	1989/90 -1990/91	1990/91 -1991/92	1991/92 -1992/93	1992/93 -1993/94	1987/88 -1992/93
					(R)	(P)	(R)
I. Agriculture	6.87	3.03	4.96	9.50	-5.28	2.63	3.69
Crops	7.42	1.28	5.10	11.99	-10.97	0.77	2.66
Livestock	5.91	6.10	5.00	5.95	6.02	5.98	5.79
Fishing	5.91	8.15	2.43	4.97	5.57	3.38	5.39
Forestry	3.20	9.71	4.86	-21.23	9.31	8.03	0.44
II. Industry	3.59	5.32	6.25	7.52	5.40	5.28	5.61
Mining & quarrying	2.07	9.56	10.36	2.44	3.00	5.75	5.42
Manufacturing	3.96	5.72	6.25	8.05	5.38	5.63	5.86
Construction	2.26	3.12	5.70	5.98	5.80	3.70	4.56
III. Services	4.31	5.07	5.58	6.91	4.75	3.99	5.32
GDP at factor cost	4.81	4.59	5.57	7.71	2.28	3.96	4.98
Per Capita GDP	1.67	1.43	2.40	4.46	-0.71	0.93	1.84

Note : R ; Revised, P; Provisional

Source : Federal Bureau of Statistics

**Table E.2.1.4 Sectoral Share in Gross Domestic Product**

Sector	(Unit : %)						
	1987-88	1988-89	1989-90	1990-91	1991-92	1992-93 (R)	1993-94 (P)
I. Agriculture	25.7	26.2	25.8	25.7	26.1	24.2	23.9
Crops	16.9	17.3	16.8	16.8	17.4	15.1	14.7
Livestock	7.5	7.6	7.7	7.6	7.5	7.8	7.9
Fishing	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Forestry	0.3	0.3	0.3	0.3	0.2	0.3	0.3
II. Industry	22.3	22.1	22.2	22.4	22.4	23.0	23.3
Mining & quarrying	0.5	0.5	0.5	0.6	0.5	0.5	0.5
Manufacturing	17.5	17.4	17.6	17.7	17.8	18.3	18.6
Construction	4.3	4.2	4.1	4.1	4.1	4.2	4.2
III. Services	52.0	51.7	52.0	51.9	51.5	52.8	52.8
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Note : R ; Revised, P; Provisional

Source : Federal Bureau of Statistics

**Table E.2.1.5 Labour Force by Major Industry**

Sector	Pakistan			
	1993/94		1987/88	
	Million	(%)	Million	(%)
1. Labour Force	34.98		29.93	
2. Unemployment	2.05	(5.9)	0.94	(3.1)
3. Employed Labour Force	32.93	(100.0)	28.99	(100.0)
- Agriculture	15.94	(48.4)	14.83	(51.2)
- Industry	6.22	(18.8)	5.57	(19.2)
Mining & manufacturing	4.13	(12.5)	3.72	(12.8)
Construction	2.09	(6.3)	1.85	(6.4)
- Services	10.77	(32.8)	8.59	(29.6)

Source : Federal Bureau of Statistics, NWFP Development Statistics 1991

**Table E.2.2.1 Outline of Seventh Five Year Plan (1988/89 - 1992/93)**

**I. Basic Objectives**

- (1) Movement towards full-employment, specially of the educated ;
- (2) Provision of adequate nutrition, shelter, health, education, transport and other public services ;
- (3) Development of human resources , with emphasis on education and training of manpower ;
- (4) Progressive achievement of self-reliance in all spheres of life, including the gradual reduction of dependence on foreign loans, technology and know-how ;
- (5) Promotion of private sector activity through further deregulation of economy in order to transfer the bulk of the financial burden of investment and growth from the government's budgetary resources to the private sector's own resources ;
- (6) Restoration of equilibrium in public finances by a concrete program of balancing the revenue budget, and eliminating the imbalance between the government's expenditure requirements and its revenue raising capacity ;
- (7) Straightening of the balance of payments by the aggressive promotion of exports, through industrial, commercial and exchange rate policies and achievement of a better balance between imports and exports ; and
- (8) Pursuit of a restrained monetary policy to ensure continued price stability.

**II. Strategy**

- (1) To increase yields per hectare through more efficient use of fertilizer, improvement in on-farm water management and development of appropriate farm technology
- (2) To develop high-yielding crop varieties, with high tolerance to heat, salinity and drought ;
- (3) To develop improved varieties of fruits and vegetables in size, seasonality and longevity for exports ;
- (4) To regain self-sufficiency in the production of sugar ;
- (5) To establish a foot-hold in export markets for high value crops ;
- (6) To meet 39 per cent of the national demand for crude oil through domestic production ;
- (7) To expand the industrial base through the development of steel-based, electronic, and high-technology industries ;
- (8) To expedite the implementation of deletion programs so as to reduce dependence on imported components and technology ;
- (9) To provide export credit to developing countries for the import of engineering goods from Pakistan ;
- (10) To provide appropriate protection to the local engineering industry through supportive tariff and trade policies ;
- (11) To encourage investment in labour-incentive technologies ; and
- (12) To explore new markets for manpower exports.

**III. Macro Economic Framework**

Item	Target Annual
	Growth Rate (%, 1987/88 - 1992/93)
Agriculture	4.7
Crops	4.4
Livestock	5.3
Fishing	4.9
Forestry	2.6
Industry	8.1
Mining & quarrying	8.0
Manufacturing	8.1
Construction	8.0
Services	6.5
GDP (Factor cost)	6.5
Per Capita GDP	3.3

**IV. Major Crop Production Target**

Crops	Actual	Target	Target Annual
	Production 1987/88 ( '000 ton)	Production 1992/93 ( '000 ton)	Growth Rate (%, 1987/88 - 1992/93)
Rice	3,241	4,420	6.4
Basmati	943	1,290	6.5
Others	2,298	2,930	5.0
Wheat	12,675	16,380	5.3
Maize	1,127	1,470	5.5
Sugarcane	33,029	40,320	4.1
Cotton	1,468	1,649	2.4
Fruits	3,586	5,000	6.9
Vegetables	2,518	3,175	4.7

**Table E.2.2.2 Agricultural Production during Seventh Plan Period**

Items	(Unit : '000 Ton)						
	Actual		Seventh Plan	Estimated	Annual Growth Rate		Target
	1987/88	1992/93	Target (1992/93)	Achievement (%)	(1987/88-1992/93, %/a.n)	Actual	
	(a)	(b)	(a)/(b)				
<b>Foodgrain</b>	17,468	21,051	22,770	92	3.8	5.4	
Wheat	12,672	16,157	16,380	99	5.0	5.3	
Rice	3,241	3,116	4,220	74	-0.8	5.4	
- Basmati	943	1,124	1,290	87	3.6	6.5	
- Others	2,298	1,992	2,930	68	-2.8	5.0	
Maize	1,127	1,178	1,470	80	0.9	5.5	
Others	428	600	700	86	7.0	10.3	
<b>Cash Crops</b>							
Cotton	1,463	1,548	1,650	94	1.1	2.4	
Sugarcane	33,029	38,059	40,320	94	2.9	4.1	
Tobacco	70	102	93	110	7.8	5.8	
<b>Pulses</b>	560	547	900	61	-0.5	10.0	
Gram	375	347	650	53	-1.5	11.6	
Others	185	200	250	80	1.6	6.2	
<b>Oilseeds</b>							
Traditional	3,189	3,443	3,745	92	1.5	3.3	
Cotton seed	2,926	3,096	3,300	94	1.1	2.4	
Rape & mustard	204	207	340	61	0.3	10.8	
Others	59	140	105	133	18.9	12.2	
Non-traditional	44.5	60.5	321	19	6.3	48.5	
<b>Vegetables</b>	3,714	4,805	4,675	103	5.3	4.7	
Potato	563	854	750	114	8.7	5.9	
Onion	633	933	750	124	8.1	3.5	
Others	2,518	3,018	3,175	95	3.7	4.7	
<b>Fruits</b>	3,586	4,112	5,000	82	2.8	6.9	
<b>Livestock</b>					(5.7)	(5.3)	
Meat production	1,357	1,795	1,700	106	5.8	4.6	
Milk production	13,319	17,120	16,470	104	5.1	4.3	
Eggs production(Million No.)	4,140	5,379	6,085	88	5.4	8.0	
Hides(Million No.)	5.8	6.1	7.51	81	1.0	5.3	
Skin(Million No.)	30.6	36.6	39.62	92	3.6	5.3	
Wool	44.7	50.5	57.87	87	2.5	5.3	
<b>Forestry Products('000 m<sup>3</sup>)</b>	779	877	886	99	2.4	2.6	
<b>Fish Production</b>	445	520	565	92	3.2	4.9	

**Table E.2.2.3 Financial Allocation and Utilization of Seventh Plan**

Item	Allocation	Utilization	(Unit : Million Rs.)
			Percent Utilization
1. Government storage	460.0	359.7	78
2. Agri. education	593.0	517.6	87
3. Agri. extension	1,425.0	1,767.7	124
4. Oil seed maximization program	571.0	400.1	70
5. Agri. research	1,439.0	1,360.6	95
6. Agri. marketing	100.0	76.2	76
7. Cooperatives	40.0	39.1	98
8. Agri. economics & statistics	182.0	220.3	121
9. Improved seed	101.0	105.4	104
10. Horticulture	400.0	93.9	23
11. Soil and fertilizer	213.0	146.4	69
12. Plant protection	22.0	77.5	352
13. Mechanization	319.0	138.7	43
14. Soil conservation & land development	177.0	82.1	46
15. Livestock & poultry development	1,137.0	681.8	60
16. Forestry & wildlife	1,450.0	1,274.9	88
17. Watershed, aridzone & riverian areas	421.0	19.6	5
18. Barani areas	450.0	62.7	14
19. Range management	56.0	34.9	62
20. Fisheries	900.0	1,043.6	116
21. Special areas	590.0	1,182.1	200
22. Public corporations	264.0	0.0	0
23. Block allocation for NCA recommendations	1,000.0	0.0	0
24. PEP program	0	905.0	-
25. Miscellaneous	0	1.1	-
<b>Total</b>	<b>12,310.0</b>	<b>10,591.0</b>	<b>86</b>
Subsidy on fertilizer	3,328.0	5,369.0	161

**Table E.2.2.4 Provincial (NWFP) Development Budget Allocation and Number of Development Schemes by Sector**

Sector/ Sub-sector	(Unit: Rs. '000)										II. Number of Schemes			
	1990-91		1991-92		1993-94		Average (1990-91-1991-92)		1993-94		1990-91	1991-92	1993-94	Average (1990-91)
	Province	Local	Province	Local	Province	Local	Province	Local	Province	Local	Total	Total	Total	(%)
<b>I. Agriculture</b>	92,989	49,011	142,000	155,969	101,721	41,384	143,115	101,401	47,487	148,988	89	82	72	85.5 (6.5)
1. Agricultural extension	18,395	7,206	25,601	32,791	22,355	5,285	27,640	16,241	7,956	24,197	13	14	16	13.5
2. Agricultural mechanization	19,050	2,250	21,300	18,160	14,680	3,080	18,900	16,850	2,880	19,730	7	8	16	7.5
3. On-farm water management	26,088	9,842	36,030	36,435	29,825	19,136	48,965	29,825	6,407	36,233	7	7	4	7
4. Agricultural research systems	12,231	13,327	25,558	11,687	12,911	19,300	12,907	19,300	12,907	31,807	14	14	10	14
5. Seeds and fertilizers	4,568	1,363	5,931	7,956	2,093	3,566	5,656	4,796	2,138	6,934	3	4	3	3.5
6. Agricultural planning	1,706	0	1,706	675	2,603	0	2,603	1,191	1,191	2,382	1	1	2	1
7. Livestock and fish development	5,205	18,531	4,031	20,505	32,366	3,823	36,191	14,900	14,900	19,518	37	27	15	32
8. Veterinary research	0	1,597	1,597	3,000	11,782	0	11,782	1,500	1,799	2,299	1	1	3	1
9. Cooperatives	2,293	0	2,293	2,291	7,291	0	7,291	2,292	0	2,292	3	3	3	3
10. Fruit and vegetable development	3,453	0	3,453	6,120	0	0	6,120	4,787	0	4,787	3	0	0	3
<b>II. Forestry and Fishery</b>	15,800	25,200	41,000	44,700	17,380	133,125	148,535	16,391	26,260	42,651	38	32	59	35 (2.7)
1. Forestry	6,700	20,380	27,080	9,317	20,720	30,037	5,157	106,022	8,099	20,550	22	18	36	20
2. Wildlife	1,800	1,800	3,600	3,500	2,600	14,683	24,936	1,950	1,400	3,350	5	5	15	6.5
3. Sericulture	1,000	500	1,500	1,100	1,100	0	0	1,050	250	1,300	2	1	0	1.5
4. Fisheries	6,800	2,420	9,220	4,363	5,700	10,063	12,420	5,382	4,050	9,432	6	8	8	7
<b>III. Rural Development</b>	8,486	134,494	142,980	32,890	168,815	201,705	143,960	473,700	151,635	172,343	35	58	61	46.5 (3.5)
1. Rural road program	2,380	49,870	52,250	5,490	84,191	89,681	143,960	67,966	84,624	149,590	16	16	35	25.5
2. Union council program	0	84,624	84,624	0	84,624	0	19,200	84,624	0	16,753	4	6	0	5
3. Miscellaneous works program	6,106	0	6,106	27,400	0	0	0	0	0	0	0	0	0	0
4. Rural works program	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5. Local development program	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>IV. Water and Power</b>	141,000	52,000	193,000	137,267	69,004	206,271	130,321	139,134	60,502	199,636	94	66	40	90 (6.1)
1. WAPDA	92,500	0	92,500	0	0	0	0	46,250	0	46,250	10	0	0	3
2. Power	2,500	0	2,500	1,900	0	1,900	0	2,200	0	2,200	3	4	0	3.5
3. Irrigation	46,000	52,000	98,000	135,367	69,004	204,371	140,321	90,684	60,502	151,186	81	62	40	71.5
<b>V. Industry</b>	51,900	0	51,900	60,000	0	60,000	27,088	55,950	0	55,950	31	29	8	30 (2.3)
<b>VI. Minerals</b>	40,000	0	40,000	39,000	0	39,000	0	39,500	0	39,500	17	16	0	16.5 (1.3)
<b>VII. Transport and Communication</b>	45,000	260,000	305,000	382,000	7,758	369,741	377,699	60,000	283,500	343,500	107	88	103	97.5 (7.4)
1. Major roads and bridges	30,000	39,952	69,952	61,284	41,144	102,428	377,699	45,642	40,548	86,190	16	13	103	14.5
2. Rural roads	15,000	220,048	235,048	13,716	265,856	279,572	0	14,358	242,952	257,310	91	75	0	83
<b>VIII. Physical Planning and Housing</b>	160,200	319,800	480,000	161,040	388,060	549,100	620,602	160,620	353,950	514,550	485	508	403	496.5 (37.9)
1. Public health engineering	10,200	231,800	242,000	4,580	284,520	289,100	596,515	7,390	218,160	265,550	417	443	362	300
2. Building and housing	65,000	88,000	153,000	63,460	105,540	167,000	58,257	64,230	95,770	160,000	50	50	30	50
3. Urban development	85,000	0	85,000	93,000	30,000	25,830	55,830	89,000	0	89,000	18	15	11	16.5
<b>IX. Education and Training</b>	60,000	499,000	559,000	630,385	693,700	187,204	859,660	61,654	564,699	626,353	259	276	499	267.5 (20.4)
1. Primary education	10,000	201,842	211,842	12,255	256,985	269,240	128,452	308,881	11,128	229,414	61	63	233	77
2. Secondary education	11,951	229,659	241,610	10,000	259,802	269,802	421,163	10,976	244,566	255,542	119	106	187	112
3. College education	0	39,176	39,176	0	70,345	70,345	14,892	84,572	54,766	139,338	32	35	39	33.5
4. Technical education	0	28,343	28,343	0	43,563	43,563	68,544	0	35,953	35,953	19	18	21	18.5
5. Teachers education	15,900	0	15,900	16,900	5,300	16,400	5,300	16,400	0	16,400	10	9	4	9.5
6. Scholarships	14,100	0	14,100	15,480	0	15,480	17,000	14,775	0	14,775	6	7	5	6.5
7. Miscellaneous education	8,049	0	8,049	8,700	0	8,700	5,460	8,375	0	8,375	12	9	10	10.5
<b>X. Health</b>	158,200	215,800	374,000	170,278	277,822	448,100	176,822	164,239	246,811	411,050	118	108	116	113 (8.6)
<b>XI. Social Welfare</b>	9,670	0	9,670	13,100	0	13,100	18,550	11,365	0	11,365	20	23	26	21.5 (1.6)
<b>XII. Manpower and Training</b>	10,700	0	10,700	11,700	0	11,700	4,185	11,200	0	11,200	3	6	5	4.5 (0.3)
<b>XIII. Research and Development</b>	33,121	0	33,121	33,655	0	33,655	9,769	33,388	0	33,388	13	20	1	16.5 (1.3)
<b>XIII. Others</b>	107,000	0	107,000	161,000	0	161,000	0	134,000	0	134,000	1	2	0	1.5 (0.1)
<b>Total</b>	934,066	1,555,395	2,489,371	1,914,576	3,000,000	740,000	2,960,000	3,703,000	1,009,750	1,734,944	1,310	1,314	1,393	1,312 (100.0)

Source: Planning and Development Department, NWFP



**Table E.2.2.5 D.I.Khan District Development Budget Allocation and Number of Development Schemes by Sector**

Sector/ Sub-sector	Budget Allocation ('000 Rs.)					Average (1990/91 -1992/93) (%)	No. of Schemes				
	1990-91	1991-92	1992-93	1993-94 (Prospect)	Average (1990/91 -1992/93) (%)		1990- 91	1991- 92	1992- 93	1993- 94 (1990/91- 1992/93)	Average
<b>I. Agriculture</b>	7,342	5,536	10,820	21,138	7,899	(6.2)	6	5	5	9	5.4
1. Agricultural extension	50	50	50	450	50		1	1	1	3	1.0
2. Agricultural mechanization	0	0	0	0	0		0	0	0	0	0
3. On-farm water management	1,900	1,900	9,920	19,136	4,573		1	1	3	4	1.7
4. Agricultural research systems	3,042	2,300	0	0	1,781		1	1	0	0	0.7
5. Seeds and fertilizers	0	0	0	0	0		0	0	0	0	0
6. Agricultural planning	0	0	0	0	0		0	0	0	0	0
7. Livestock and dairy development	2,350	1,286	850	1,552	1,495		3	2	1	2	2.0
8. Veterinary research	0	0	0	0	0		0	0	0	0	0
9. Cooperatives	0	0	0	0	0		0	0	0	0	0
10. Fruit and vegetable development	0	0	0	0	0		0	0	0	0	0
<b>II. Forestry and Fishery</b>	89	800	4,000	10,483	1,630	(1.3)	1	1	2	5	1.4
1. Forestry	89	0	3,000	7,473	1,030		1	0	1	4	0.7
2. Wildlife	0	0	0	0	0		0	0	0	0	0
3. Sericulture	0	0	0	0	0		0	0	0	0	0
4. Fisheries	0	800	1,000	3,010	600		0	1	1	1	0.7
<b>III. Rural Development</b>	8,911	10,858	6,057	20,500	8,609	(6.7)	2	3	2	3	2.3
1. Rural road program	3,493	5,440	3,600	19,500	4,178		1	2	1	2	1.3
2. Union councils' program	5,418	5,418	2,457	1,000	4,431		1	1	1	1	1.0
3. Miscellaneous works program	0	0	0	0	0		0	0	0	0	0
4. Rural works program	0	0	0	0	0		0	0	0	0	0
5. Local development program	0	0	0	0	0		0	0	0	0	0
<b>IV. Water and Power</b>	4,000	8,180	750	0	4,310	(3.4)	6	3	1	0	3.3
1. WAPDA	0	0	0	0	0		0	0	0	0	0
2. Power	0	0	0	0	0		0	0	0	0	0
3. Irrigation	4,000	8,180	750	0	4,310		6	3	1	0	3.3
<b>V. Industry</b>	0	0	700	0	233	(0.2)	0	0	1	0	0.3
<b>VI. Minerals</b>	0	0	0	0	0		0	0	0	0	0
<b>VII. Transport and Communication</b>	16,000	21,400	25,577	18,689	20,992	(16.4)	6	5	5	8	5.3
1. Major roads and bridges	0	0	0	18,689	0		0	0	0	8	0
2. Rural roads	16,000	21,400	25,577	0	20,992		6	5	5	0	5.3
<b>VIII. Physical Planning and Housing</b>	21,027	19,394	32,025	32,000	24,149	(18.9)	34	35	27	21	32.0
1. Public health engineering	15,450	18,494	31,350	32,000	21,765		32	34	26	21	30.7
2. Building and housing	5,577	900	675	0	2,384		2	1	1	0	1.3
3. Urban development	0	0	0	0	0		0	0	0	0	0
<b>IX. Education and Training</b>	30,929	41,606	62,242	34,551	44,926	(35.1)	10	12	19	26	13.6
1. Primary education	10,445	17,088	38,649	9,658	22,061		4	6	9	12	6.3
2. Secondary education	19,998	17,559	11,412	15,739	16,323		5	4	5	9	4.7
3. College education	486	6,959	10,559	8,154	6,001		1	2	4	4	2.3
4. Technical education	0	0	1,622	1,000	541		0	0	1	1	0.3
5. teachers education	0	0	0	0	0		0	0	0	0	0
6. Scholarships	0	0	0	0	0		0	0	0	0	0
7. Miscellaneous education	0	0	0	0	0		0	0	0	0	0
<b>X. Health</b>	14,027	18,336	12,544	10,980	14,969	(11.7)	6	4	4	4	4.7
<b>XI. Social Welfare</b>	0	0	550	600	183	(0.1)	0	0	1	1	0.3
<b>XII. Manpower and Training</b>	0	0	0	0	0		0	0	0	0	0
<b>XIII. Research and Development</b>	0	0	0	0	0		0	0	0	0	0
<b>XIII. Others</b>	0	0	0	0	0		0	0	0	0	0
<b>Total</b>	102,325	126,110	155,265	148,941	127,900	(100.0)	71	68	67	77	68.6

Note : /\_1 ; Prospect

Source : Planning and Development Department, NWFP

**Table E.2.2.6 On-Going Development Plans and Projects in D.I.Khan District**

Sector	Name of Project	Project Components and Activities	Estimated Cost (Rs. Million)	Work Completion (%)
I. Agriculture	1. Agriculture Extension	1. Command Area Development Project CRBC Stage II D.I.Khan (Extension Component)	6.825	
	2. On Farm Water Management	2. On Farm Water Management CRBC Stage II D.I.Khan (ADB Assisted)	93.038	
	3. Livestock and Dairy Development	3. Command Area Development CRBC Project Stage II (Live Stock Component) in D.I.Khan District	15.598 (115.461)	
II. Forestry and Fishery	1. Forestry	4. Afforestation in Sheikh Buddin 5. Reserved Forest D.I.Khan	24.945	
	2. Fisheries	6. Establishment of Fish Nurseries in D.I.Khan	6.779 (31.724)	
III. Transport and Communication	1. Major Roads and Bridges	7. Construction of black topped road from Chaudhwan to Kiri Sharozai (27 km)	30.059	17%
		8. Construction of shingled road off taking from Abdul Khel to Katta Khel to Kiri Khaisora via Ali Wand (19 km)	25.247	79%
		9. Construction of black topped road from Giloti to Hathala via Takwara(24.7 km)	48.079	67%
		10. Construction of black topped road from Octroi post Dera Daraban road to Gaudi Umer Khan via Ara Bigwani (33 km)	67.659	91%
		11. Improvement and widening of Hathala Kulachi Dara Ban road (39.32 km)	71.187 (242.231)	48%
IV. Physical Planning and Housing	1. Public Health Engineering	12. Water Supply Scheme Zafar Abad Colony and Adjacent villages	2.403	54%
		13. Drainage Scheme Mouza Dewala	3.541	36%
		14. Water Supply Scheme Rora Nair	6.925	32%
		15. Water Supply Scheme Ramak Phase-I	3.352	45%
		16. Water Supply Scheme Muryali	4.97	80%
		17. Water Supply Scheme Shero Khana and Shero Nan etc.	3.539	22%
		18. Water Supply Scheme Makkar and adjacent villages	2.885	52%
		19. Water Supply Scheme Chehkan, Pota	4.977	72%
		20. Water Supply Scheme Chaudhwan Phase-I	14.341	20%
		21. Improvement and extension of tube well Attal, Gara Abdullah	4.798	83%
		22. Water Supply Scheme Musazai to Garah Alam Phase-I	3.166	60%
		23. Sanitation Scheme Kulachi	3.066	20%
		24. Improvement and Extension to water supply scheme Daraban Kalan	6.623	12%
		25. Improvement and extension of water supply Maddi	3.066	1%
26. Water Supply Scheme Yarik to Wanda Sohlan and Khaji	2.303	50%		
27. Water Supply Scheme Rehmani Khel village Burzwali via Wanada	3.000 (69.955)	52%		
V. Education and Training	1. Primary Education	28. Reconstruction of Building for 10 primary schools (5 for girls)	3.122	
		29. Establishment and opening of 31 primary schools (c.o)	9.456	
		30. Construction of 36 rooms in existing primary schools (c.o)	5.004	
	2. Secondary Education	31. Construction of 7 class rooms in middle high schools	1.057	
		32. Upgrading of 8 primary schools to middle status (3 for girls)	6.433	
	3. College Education	33. Upgrading of 3 middle schools to high status (1 for girls)	3.876	
		34. Construction of building of Government College No.2 D.I.Khan	13.000	
35. Construction of 5 laboratories/lecture theatres, stairs, hall museum and corridors in Govt. Inter College Paharpur		5.466		
	36. Construction of science block, additional class rooms, auditorium and administration block at Govt. College D.I.Khan No.1	3.247		
	37. Upgrading of Govt. Inter College Kulachi to degree level (Construction of science block)	3.559 (41.220)		
VI. Health	1. Rural Health Service	38. Completion of incomplete building and removal of deficiencies in existing basic health units and Rural health centers	15.627	47%
		39. Expansion of Zanana hospital D.I.Khan under the President's directive	13.200	
	2. General Hospitals	40. Removal of deficiencies in district headquarter hospital D.I.Khan 41. Construction of new divisional hospital D.I.Khan under the Prime Ministers directive	10.870 172.100 (211.797)	19%
VII. Social Welfare		42. Establishment of Govt. Institute for the blind at D.I.Khan	2.789 (2.789)	
			Total	(715.177)

Source : Provincial Initiative Program 1993/4, NWFP

**Table E.2.2.7 Sectoral Growth Achievement and Target in 7th and 8th Plans**

Sector	7th Plan		8th Plan		Annual Growth Rate (%)
	Annual Growth Rate (%)		1992 - 93	1997 -98	
	Target	Achievment	Bench Mark (Rs.Billion)	Actual (Rs.Billion)	
I. Agriculture	4.7	3.7	301.9	382.8	4.9
Crops	4.4	2.7	176.6	217.0	4.2
Livestock	5.3	5.8	113.9	152.7	6.0
Fishing	4.9	5.4	7.8	9.0	2.9
Forestry	2.6	0.4	3.6	4.1	2.8
II. Industry	8.1	5.6	323.3	505.9	9.4
Mining & Quarrying	8.0	5.4	8.5	14.6	11.4
Manufacturing	8.1	5.9	218.5	349.9	9.9
Construction	8.0	4.6	54.4	79.2	7.8
Electricity & Gas Dist.	-	10.9	41.9	62.2	8.2
III. Services	6.5	5.3	606.6	838.6	6.7
Transport,Storage & Comm:	-	5.0	113.3	150.2	5.8
Commerce	-	4.9	208.4	310.1	8.3
Financial Inst. & Insurance	-	3.4	41.8	55.4	5.8
Ownership of Dwellings	-	5.3	53.3	69.0	5.3
Public Admn & Defence	-	3.8	96.0	125.4	5.5
Services	-	6.5	93.8	128.6	6.5
GDP(Factor Cost)	6.5	5.0	1,231.8	1,727.3	7.0
Per Capita GDP	3.3	1.8	1,018.7	1,242.4	4.1

Source: Eighth Five Year Plan (1993-98)

**Table E.2.2.8 Eighth Plan Objectives and Strategy (1/2)**

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**EIGHTH PLAN OBJECTIVES**

1. Obtain growth rate higher than population growth to ensure food security, self-sufficiency and exportable surpluses.
2. Sustain and strengthen the process of agricultural transformation and modernization by increasing agricultural productivity.
3. Evolve disease resistant, high yielding varieties of crops and develop appropriate package of technology for increasing crop productivity.
4. Develop agriculture and irrigation facilities in an integrated manner in order to optimize the use of scarce land and water resources.
5. Increase the production of oil seeds in order to reduce the dependence on imports.
6. Diversification of agriculture towards high value crops.
7. Provide remunerative support price to farmers and improve marketing facilities.
8. Improve the productivity of livestock, fisheries and forestry.
9. Arrest the degradation of environment and conserve natural resources.
10. Introduce integrated pest management for control of pests and diseases.
11. Improve agricultural productivity of barani areas.
12. Improve the productivity of small and medium size farmers through transmission of appropriate production technology and provision of credit facilities for purpose of the required inputs.
13. Promotion of non-farm activities such as livestock, forestry and agro-industries in rural areas.

**EIGHTH PLAN STRATEGY**

1. Emphasis will be laid on productivity increasing agricultural research and its transmission to farmer. The Pakistan Agricultural Research Council and the provincial agricultural research institutes will carry out site specific, problem oriented research, the result of which will be transmitted to the farmers through the agricultural extension system. For this purpose, linkages between research and extension would be strengthened.
  2. Research and development activities will be undertaken for the production of improved seed specially of sugarcane, rice, wheat, oilseeds and pulses.
  3. Crop productivity will be enhanced by improving the efficiency of agricultural inputs particularly fertilizer and water. Integrated pest management would be promoted for control of insects and pests.
  4. Improved irrigation practices will be popularized and farmers will be guided on the water requirement and frequency of irrigation of different crops. Conjunctive use of water (tubewell and canal water) would be encouraged in water deficit areas where the ground water is suitable for irrigation.
  5. Sprinkler, trickle and drip irrigation system will be introduced in water scarce areas, particularly for orchards and other high value crops.
  6. Proper soil management will be promoted under the Productivity Enhancement Program by providing deep tillage equipments to the farmers for breaking of the hard pan where necessary and conservation of soil moisture in barani areas. Precision land leveling will also be encouraged.
  7. The availability of certified quality seed of high yielding varieties of major crops, fruits, vegetables and oilseeds would be ensured. Private sector would be further encouraged to undertake production and distribution of good quality seed.
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**Table E.2.2.8 Eighth Plan Objectives and Strategy (2/2)**

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**EIGHTH PLAN STRATEGY**

8. The availability of agricultural credit will be ensured particularly for small and medium farmers through supervised credit system, in order to enable them to purchase agricultural machinery, equipment and other inputs.  
The activities of the Agricultural Development Bank of Pakistan and Federal Bank for Cooperatives will be expanded to meet the credit requirements.
  9. In the field of agricultural extension, the traditional emphasis of personal contact between extension workers and farmers will be supplemented by intensive use of audio-visual media, thus making more effective use of the limited number of expert communicators available in the country.  
A substantial portion of the facility of the second television channel will be used for agricultural programs.
  10. In barani areas, high yielding, drought tolerant varieties of food and fodder crops shall be further promoted, with a view to improve the agricultural productivity and farm incomes of people of these areas. Dryland farming techniques will be disseminated among the farmers.
  11. The private sector will be encouraged to establish supply centers for providing standard agricultural inputs in every union council.
  12. Consolidation of land holdings would be encouraged in order to arrest the declining production trend of farmlands subjected to continued fragmentation.  
The provincial Governments should take appropriate measures in this regard.
  13. The livestock research and extension will be strengthened in order to increase the production of milk, meat and other livestock products.  
Feed and fodder resources will be developed in order to provide a balanced and nutritious feed to livestock.
  14. Intensive forest management will be carried out on Government forests and farm forest will be promoted on private lands, to meet the growing demand for timber and firewood.
  15. Comprehensive programs will be implemented to reduce the degradation of land and water resources and environmental protection.
  16. In order to increase the production of fish, aquaculture and marine fisheries will be promoted.  
For inland fisheries, the existing hatcheries and research facilities will be strengthened. In case of marine fisheries, the infrastructure facilities, equipment and management of fish harbour would be further improved.
  17. In case of high value crops, special emphasis will be laid on growing for the export market. The private sector will be encouraged to establish processing, grading, packaging and cold storage, etc. through provision of liberal credit.  
The Agri-Business Cell in the Ministry of Food and Agriculture would provide advice to entrepreneurs regarding quality standards and other requirements of the different export markets.
  18. Commercial tea cultivation will be promoted in Mansehra district of NWFP by providing extension services and credit facilities to the growers.
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**Table E.2.2.9 Crop and Livestock Production Targets for Eighth Plan**

Items	(Unit : '000 Ton)			
	Bench Mark	Eighth Plan	Annual Growth Rate(%/a.n)	
	Eighth Plan 1992/93	Target 1997/98	Seventh Plan Actual	Eighth Plan Target
Foodgrain	20,059	24,730	3.8	4.3
Wheat	15,000	18,250	5.0	4.0
Rice	3,250	4,250	-0.8	5.5
- Basmati	1,150	1,598	3.6	6.8
- Others	2,100	2,652	-2.8	4.8
Maize	1,210	1,472	0.9	4.0
Others	599	758	7.0	4.8
Cash Crops				
Cotton(lint/Million bales)	1,972	2,550	1.1	5.3
Sugarcane	36,000	46,000	2.9	5.0
Tobacco	72	82	7.8	2.6
Pulses	780	962	-0.5	4.3
Gram	560	681	-1.5	4.0
Others	220	281	1.6	5.0
Oilseeds				
Traditional	4,314	5,653	1.5	5.6
Cotton seed	3,944	5,103	1.1	5.3
Rape & mustard	250	300	0.3	3.7
Others	120	250	18.9	15.8
Non-traditional	90.0	180	6.3	14.9
Vegetables			5.3	3.9
Pototo	900	1,150	8.7	5.0
Onion	750	957	8.1	5.0
Others	2,950	3,453	3.7	3.2
Fruits	4,200	5,511	2.8	5.6
Livestock			5.7	
Meat production	1,795	2,484	5.8	6.7
Milk production	17,120	22,039	5.1	5.2
Eggs production(Million No.)	5,379	8,448	5.4	9.4
Hides(Million No.)	6.1	6.5	1.0	1.3
Skin(Million No.)	36.6	44.1	3.6	3.8
Wool	50.5	57.7	2.5	2.7
Forestry Products('000 m^3)	832	958	2.4	2.9
Fish Production	500	575	3.2	2.8

**Table E.2.2.10 Financial Allocation of Agriculture Sector for Eighth Plan**

Item	(Unit : Million Rs.)			
	On-Going Projectcts	New Projects	Total	Distribution (%)
1. Agri. research	921.7	1,166.6	2,088.3	40.3
2. Agri. extension	146.1	18.2	164.3	3.2
3. Oil seed maximization program	297.4	0	297.4	5.8
4. Agri. marketing	10.9	50.0	60.9	1.2
5. Agri. educationresearch	551.0	285.0	836.0	16.2
6. Improved seed	0	100.0	100.0	1.9
7. Agri. economics & statistics	66.6	50.0	116.6	2.3
8. Soil and fertilizer	42.0	116.4	158.4	3.1
9. Plant protection	0	18.0	18.0	0.3
10. Soil conservation & land development	7.1	0	7.1	0.1
11. Livestock & poulty development	51.0	197.0	248.0	4.8
12. Forestry & wildlife	343.9	420.0	763.9	14.8
13. Range management	49.1	0	49.1	0.9
14. Fisheries	59.5	202.5	262.0	5.1
Total	2,546.3	2,623.7	5,170.0	(80.7)
Subsidy on fertilizer	0	500.0	500.0	(7.8)
Agricultural program relating to Narcotics control			740.0	(11.5)
Ground Total			6,410.0	(100.0)

**Table E.3.1.1 Land Use and Irrigation Condition**

(1) Land Utilization in 1991-92 (unit : ha)

Description	NWFP		D.I. KHAN District		Study Area*	
<b>A. Cultivated Area :</b>						
A.1 Net sown area	1,553,862		194,854		21,430	
A.2 Current fallow area	355,086		93,479		85,210	
<u>Sub-total</u>	<u>1,908,948</u>	23%	<u>288,333</u>	32%	<u>106,640</u>	75%
<b>B. Cropped Area :</b>						
B.1 Area more than ones	526,349		5,990		130	
B.2 Total cropped area (A.1 +B.1)	<u>2,080,211</u>		<u>200,844</u>		<u>21,560</u>	
<b>C. Un-cultivated Area :</b>						
C.1 Cultivable waste area	1,032,034 (12%)		418,940 (47%)		28,800 (20%)	
C.2 Not available for cultivate	4,073,118		139,582		6,260	
C.3 Forest	1,331,069		49,319		0	
<u>Sub-total</u>	<u>6,436,221</u>	77%	<u>607,841</u>	68%	<u>35,060</u>	25%
<b>D. Total Land Area (A + C)</b>	<u>8,345,169</u>	100%	<u>896,174</u>	100%	<u>141,700</u>	100%

Source : Agricultural Statistics of NWFP for 1991 - 92, Agriculture Statistics Wing

(\*) The Study Area is estimated based on the topography map (scale : 1/50,000).

(2) Irrigation Area by Different Sources (unit : ha)

Description	NWFP		D.I. KHAN District		Study Area*	
<b>A. Canal :</b>						
A.1 Government	318,588		56,200		0	
A.2 Private	372,346		37,058		0	
<u>Sub-total</u>	<u>690,934</u>	88%	<u>93,258</u>	77%	<u>0</u>	
<b>B. Well :</b>						
B.1 Tube well	55,886		26,629		940	
B.2 Wells	34,547		0		0	
<u>Sub-total</u>	<u>35,987</u>	5%	<u>26,629</u>	22%	<u>940</u>	100%
<b>C. Others :</b>						
C.1 Lift pumps	28,992		711		0	
C.2 Others	29,231		192		0	
<u>Sub-total</u>	<u>58,223</u>	7%	<u>903</u>	1%	<u>0</u>	0%
<b>D. Total Irrigated Area</b>	<u>785,144</u>	100%	<u>120,790</u>	100%	<u>940</u>	100%
(Irrigation rate)	41.1%		41.9%		0.9%	
Total Cultivated Area	<u>1,908,948</u>		<u>288,333</u>		<u>106,640</u>	

Source : Agricultural Statistics of NWFP for 1991 - 92, Agriculture Statistics Wing

(\*) The number of the tube-well in the Study Area has investigated at twenty (20).

**Table E.3.2.1 Number and Area of Administrative Divisions in the Study Area**

Tehsil	Union Council	Area (ha)	No. of Mauza
<b>I. Administrative Divisions of Study Area (March, 1994)</b>			
D.I.Khan	Paniala	12,730	1
	Band Korai	5,410	2
	Yarik	24,620	5
	Keach	13,440	4
	Chahkan	24,340	14
	Zindani	26,390	34
	Lunda Sharif	10,280	16
	Naivala	7,450	2
	Mara	10,660	2
	Miran	29,550	5
	/_1 Ghara Isa Khan	19,310	9
	/_1 Musa Zia Sharif	3,840	2
	/_1 Chowdwan	15,350	6
	<b>Sub Total</b>	<b>203,370</b>	<b>102</b>
Kulachi	Muddi	4,820	2
<b>Total</b>		<b>208,190</b>	<b>(28.4)</b>
<b>2. D.I.Khan District (July, 1993)</b>			
	Number of Union Council	Total Area (ha)	Number of Mauza
D.I.Khan Tehsil	26	455,700	240
Kulachi Tehsil	8	276,800	119
<b>Total</b>	<b>34</b>	<b>732,500</b>	<b>(100.0)</b>
<b>3. North West Frontier Province (19 Districts)</b>			
	Number of Union Council	Total Area (ha)	Number of Mauza (Under Union Council)
	697	7,452,100	4,733

Note : /\_1 ; These unions were transferred from Kulachi Tehsil in 1994.  
/\_2 ; Data in 1991

Source : Revenue Department, D.I.Khan, NWFP Development Statistics 1991  
District Census of Rural Settlements, D.I.Khan. 1988



**Table E.3.2.2 List of Union Councils and Mouzas covering the Study Area**

Sr. Union No.	Union Council	Hadbast No.	Mouza	Total Area (ha)	Sr. Union No.	Union Council	Hadbast No.	Mouza	Total Area (ha)
<b>Tehsil D.I. Khan</b>					<b>G Lunda Sharif</b>				
A	Painiala	131	Painiala Janobi	12,726 (12,726)	186	Adha Khiara			961
B	Band Korai	62	Band Korai	3,527	189	Adil Sipra			2,515
		20	Khaliq Shah	1,886 (5,413)	184	Bali Janobi			175
C	Yarik	110	Budh	13,673	158	Balu Gama Nihal			632
		101	Rodikhel	3,193	156	Bobi			139
		108	Saddra	2,304	154	Chhigiri			552
		19	Talgi Rodi Khel	732	148	Ghulam Daider			280
		102	Yarik	4,718 (24,620)	183	Hayat Bochra			941
D	Keach	98	Hissam	3,047	149	Hayat Jorh			219
		100	Keach	4,752	153	Jumma Sharif			361
		99	Muqim Shah	1,949	150	Mahmood Bhatti			145
		111	Rahman	3,691 (13,439)	147	Mithy			801
E	Chakhan	115	Chakhan	4,558	182	Rora			1,113
		122	Durabari	1,574	185	Shahmear			758
		92	Garah Jamal	1,663	155	Umar Boba			77
		94	Gumal	3,659	187	Zaman Talokara			617 (10,286)
		93	Hayat Korai	1,299	H	Naivala	190	Malakhi	2,392
		116	Jowia Shai	995			188	Rashid	5,055 (7,447)
		113	Katera Chania	512	I	Mahra	197	Mahra	6,416
		119	Kot Isakhan	1,331			196	Sikander Janobi	4,246 (10,662)
		114	Moor	637	J	Miran	199	Bhutaisar	3,327
		118	Pota	2,291			207	Chirri Bhor	6,518
		112	Rakh Chena	221			209	Ghamsan	3,108
		121	Sikander Shummali	3,455			206	Miran	4,614
		117	Surab Hassar	465			208	Ramak	11,984 (29,551)
		120	Yara Manjhi Khel	1,682 (24,342)	L	Ghara Isa Khan	45	Dhul Ka Jadid	530
F	Zindani	132	Akhmed	445			47	Dhulka Kehna	427
		123	Bhabh	527			48	Gandi Umer Khan	8,249
		144	Bhoon	168			42	Gira Mir Alam Khan	2,782
		160	Bigwani Janubi	1,782			51	Gira Murid Shah	1,232
		125	Chaddar	563			46	Khawar	2,411
		137	Dad Mehar Baig	84			50	Khayara Basharat	414
		136	Dad Wala Shomali	93	M	Musa Zia Sharif	28	Gandi Ashiq	3,374
		129	Dar Wesha	1,034			43	Gandi Isab	461 (3,835)
		163	Dikhana	487	N	Chowdwan	53	Jandi	5,365
		130	Faqira	450			64	Kori Hoot	2,638
		170	Fatch	3,619			66	Kori Jamal	2,118
		135	Gahroka	97			52	Maroo	1,281
		145	Ghafoora	100			65	Mugha	1,356
		124	Haindan	1,877			67	Tilli Budha Shah	2,595 (15,353)
		127	Hasni	877	<hr/>				
		128	Hatoo	203	Total D.I.Khan Tehsil				
		126	Hawasi	98	203,376				
		151	Jandi	273	<b>Tehsil Kulachi</b>				
		134	Khodka	320	K	Muddi	25K	Muddi	4,391
		165	Khuthi	3,720			26K	Sigo Ganda Pur	425 (4,816)
		162	Loke	1,394	<hr/>				
		143	Mapal Janubi	195	Total Kulachi Tehsil				
		141	Mapal Shamali	268	4,816				
		142	Naurang Dau	166	<hr/>				
		146	Naurang Otra	721	Total Administrative Area covering Study Area				
		159	Nawab Patafi	170	208,192				
		161	Ruk Nau	869	<hr/>				
		152	Sewang	916	<hr/>				
		133	Shero Kohna	720	<hr/>				
		140	Sheru Nau	808	<hr/>				
		138	Sohna Shah	68	<hr/>				
		139	Taj	441	<hr/>				
		131	Tali	95	<hr/>				
		164	Zindani	2,741 (26,389)	<hr/>				

**Table E.3.3.1 Population and Household in the Administrative Area covering the Study Area**

Item	Figure		Share to (% in 1993)		Unit	Figure		Share to (% in 1993)	
	1981	1993	D.I. Khan	Pakistan		1981	1993	D.I. Khan	Pakistan
<b>I. Population</b>									
* 000									
Administrative Area covering Study Area					Person/household				
Urban	0	0	0	0		5.9	6.3	103.3	92.6
Rural	85.9	122.7	20.0	0.9		6.3	6.1	100.0	89.7
Total	85.9	122.7	17.0	0.7		6.2	6.1	100.0	89.7
D.I.Khan						6.5	6.3	103.3	92.6
Urban	92	126	100.0	4.7		6.8	6.8	111.5	100.0
Rural	402	599	100.0	4.3		6.7	6.3	103.3	92.6
Total	494	725	100.0	4.4					100.0
D.I.Khan Tehsil					km2				
Urban	77	97	77.0	3.6		2,082	2,082	28.4	2.8
Rural	319	490	81.8	3.5		7,325	7,325	100.0	9.8
Total	396	587	81.0	3.5		4,557	4,557	62.2	6.1
Kulach Tehsil						2,768	2,768	37.8	0.3
Urban	15	29	23.0	1.1		74,521	74,521	100.0	9.4
Rural	83	109	18.2	0.8		796,095	796,095	-	100.0
Total	98	138	19.0	0.9					
NWFP					/km2				
Urban	1,665	2,701	-	100.0		41	59	59.6	26.6
Rural	9,396	13,854	-	100.0		67	99	100.0	44.6
Total	11,061	16,555	-	100.0		87	129	130.3	58.1
Pakistan						35	50	50.5	22.5
Urban	23,842	38,065	-	100.0		148	222	224.2	100.0
Rural	60,412	82,775	-	100.0		106	152	153.5	68.5
Total	84,254	120,840	-	100.0					
<b>II. Household</b>									
* 000									
Administrative Area covering Study Area					Population Growth Rate % p.a (1981 - 1993)				
D.I.Khan	14.4	19.6	100.0	4.9		3.01	3.25	( D.I.Khan; 3.02, Kulach; 2.99)	
D.I.Khan Tehsil	64	97	81.5	4.0		3.33	2.89		
Kulach Tehsil	15	22	18.5	0.9		3.42	3.05		
NWFP	1,616	2,435	-	100.0					
Pakistan	12,588	19,181	-	100.0					

Note : Data on the administrative area covering the Study Area in 1993 are estimated on the basis of the JICA Farm Survey. Number of household is estimated at annual growth rate of 3.53% in D.I.Khan district (3.62% in D.I.Khan tehsil and 3.14% in Kulachi tehsil) and 3.34% in NWFP. Number of households in NWFP and Pakistan is estimated on the basis of the family sizes of 6.8 and 6.3 respectively taken from Household Income and Expenditure Survey. Source : Population Census D.I.Khan (1981). Important District-Wise Socio Economic Indicators NWFP (1991). NWFP Development Statistics 1991. Pakistan Statistical Yearbook 1991. Household Income and Expenditure Survey 1987-88.

Table E.3.3.2

Farm Survey Procedures

I. Sample Selection

1. Data Collection:

- (1) Identification of mouzas within the study area using:
  - Mouza boundary map
  - Topographic map (1:50,000)
  - Information from mouza revenue officers and agricultural officers
- \* Number of mouzas (104) in July 1995

	No. of Union Council	No. of Mouza
D.I.Khan Tehsil	10	85
Kulachi Tehsil	4	19
Total	14	104

- (2) Preparation of list of mouzas and union council by subit
- (3) Collection of data in the district revenue office on:
  - Total area
  - Agricultural land use (Irrigated, rainfed, Red Kohls by Rahi and Kharif season)
- (4) Collection of data from Population Census 1981, D.I.Khan on:
  - Population
  - Household

2. Data Analysis by 104 mouzas

- (1) Population Density = Population/Total Area in Sq. Km
- (2) Number of Households = Population/Family Size
- (3) Farm Density = Population / Cultivated Area in Sq. Km
  - \* Out of the 104 mouzas in the study area, 96 were settled and 8 were unsettled mouzas.
- (4) Classification of Mouzas by Farm Density
  - Geometric Mean 105
  - Average 168
  - Std. Deviation 206
  - Median 106
  - Percentile value of each mouza density
  - \* It was evident that the distribution of data is very skewed. (Coefficient of skewness: 3.15, Kurtosis: 14.51)

Instead of standard deviation away from means, the percentile values were applied for the classification of mouzas. Below 33rd percentile field density mouzas were categorized as low density, above 33 and below 67 as medium and above 67th percentile as high density mouzas.

The number of mouzas in each category are:

Density	Range of Density	Number of Mouzas
Low	7 to 70	32
Medium	73 to 145	32
High	149 to 1726	32
Unsettled	Not Applicable	8
Total		104

The above breakup was further cross checked with the median value of farm density which was 106.

3. Determination of Sample Mouzas:

- (1) Zoning of study area for the selection of mouzas ranging across the entire study area
  - Upper area / North
  - Middle area
  - Low area / South
- (2) Determination of number of mouzas by area and density type
  - 10% of 104 mouzas = 11 mouzas
  - By farm density (Percentage of each density type mouza : 31.33%)
    - High density 3
    - Medium density 4
    - Low density 4
  - 11 x 33.33% = 3.63
- (3) Random selection of sample mouzas on the map

4. Determination of Sample Size from Each Mouza

Sample size from each mouza =

$$\frac{\text{Total Sample size (210)} \times \text{Number of households in each mouza}}{\text{Total Households in selected 11 mouzas (3,310) in 1981}}$$

5. Design of Farm Sampling

- (1) Data Collection on Land Holding and Tenure
  - Revenue officers in the selected 11 mouzas
  - Available data (1989, 4 years old record)
  - List of owners (resident and absentee) and tenants
  - Farm holding and tenurial size
- (2) Updating of Data on Land Holding and Tenure
  - \* Farm now may have been subdivided into numerous parcels due to inheritance and marriage.
  - Confirmation of farm sub-division based on the data from village chief.
- (3) Data assessment of land holding and tenure condition
- (4) Determination of sampling frame design according to the distribution of land owners and tenants by scale

Classification	Scale of Land
Marginal	Under 1 ha
Small	1 to 3 ha
Medium	3 to 5 ha
Large	Above 5 ha

(for Tenants and Owners Operators)

6. Selection of Households

\*The selection of 210 households was made at respective 11 selected mouzas in proportion to the classification of farmers/farm size.

II. Pre-Testing of Questionnaire and Supplemental Data Collection

1. Pre-Testing of Questionnaires

- (1) Revision of questionnaire prepared in Japan
  - Investigation of questionnaire used in CRBC gravity irrigation area and in Bawabi areas of NWFP
  - Discussion on terms of questionnaires
  - Revision of questionnaires
- (2) Pre-testing of questionnaires revised
- (3) Discussion on the result of pre-testing
- (4) Finalization of questionnaire

2. Supplemental data collection

- (1) Population and household numbers in 11 selected mouzas
  - Interview to village chiefs
  - Data from mouza revenue officers
- (2) Land holding and tenure systems in 11 selected mouzas
  - Interview to village chiefs
  - Data collection on sub-division in land holding
- (3) Farming practices and productivity
  - Assessment of present land holding in number and area by classification of farmers and holding/operating size
  - Information and data from agricultural officers, D.I.Khan Research Station, and agricultural College.
- (4) Marketing
  - Observation of local rice mills, flour mills, and oil mills
  - Observation of local markets
  - Interview to agricultural officers
  - Data collection from agricultural officers

III. Farm Interview Survey (310 farmers, 11 selected mouzas)

IV. Analysis of 210 Samples

**Table E.3.3.3 Population and Household Estimates of the Administrative Area covering the Study Area (1/2)**

**I. Selected Mouzas (11)**

Tehsil Classification Mouza	Total Area (km <sup>2</sup> )	Year 1981				Year 1993				Growth Rate (%/a.n. 1981-1993)		
		Population	No. of House-hold	Average Family Size (fl.hold)	Population Density (Km <sup>2</sup> )	Population	No. of House-hold	Average Family Size (fl.hold)	Population Density (Km <sup>2</sup> )	Population	No. of House-hold	Population Density
<b>High Density</b>												
Chirri-Bhor	65.2	845	148	5.7	13	1,218	238	5.1	19	3.09	4.04	3.21
Kahliq-Shah (*)	(18.9)	(2,096)	(411)	(5.1)	(111)	(4,350)	(665)	(6.5)	(230.2)	(6.27)	(4.09)	(6.27)
Sheri Kohra	7.2	1,058	258	4.1	147	1,479	333	4.4	205	2.83	2.15	2.83
Sub-total	(91.3)	(3,999)	(817)	(4.9)	(44)	(7,047)	(1,236)	(5.7)	(77.2)	(4.83)	(3.31)	(4.80)
	72.4	1,903	406	4.7	26	2,697	571	4.7	37	2.95	2.88	3.05
<b>Medium Density</b>												
Chakhan	45.6	1,716	277	6.2	38	2,175	380	5.7	48	1.99	2.67	1.91
Hayat Bochara	9.4	561	75	7.5	60	870	114	7.6	93	3.72	3.55	3.68
Akhmed	4.4	431	72	6.0	98	522	76	6.9	119	1.61	0.45	1.60
Gandi Umar Khan	82.5	2,643	413	6.4	32	3,915	475	8.2	48	3.33	1.17	3.35
Sub-total	141.9	5,351	837	6.4	38	7,482	1,045	7.2	53	2.83	1.87	2.81
<b>Low Density</b>												
Durabari	15.7	315	52	6.1	20	522	95	5.5	33	4.30	5.15	4.31
Rashid	50.6	1,915	336	5.7	38	2,610	380	6.9	52	2.61	1.03	2.58
Rahman	36.9	819	134	6.1	22	1,218	190	6.4	33	3.36	2.95	3.44
Zindani	27.4	820	134	6.1	30	1,218	238	5.1	45	3.35	4.90	3.34
Sub-total	130.6	3,869	656	5.9	30	5,568	903	6.2	43	3.08	2.70	3.05
<b>Total</b>	<b>(363.8)</b>	<b>(13,219)</b>	<b>(2,310)</b>	<b>(5.7)</b>	<b>(36)</b>	<b>(20,097)</b>	<b>(3,184)</b>	<b>(6.3)</b>	<b>(55)</b>	<b>(3.55)</b>	<b>(2.71)</b>	<b>(3.59)</b>
	344.9	11,123	1,899	5.9	32	15,747	2,519	6.3	46	2.94	2.38	3.07

Note : Kahliq-Shah was previously unirrigated, now a part is under the CRIC gravity irrigation system, hence the growth rate is very high. Data of Kahliq-Shah is not taken to estimate growth rates for densely populated mouzas.

Source : 1981 D.I. Khan Census. NWFP Development Statistics 1991. Farm Survey in 11 mouzas (data from village chiefs)

**2. Master List (1/2)**

Tehsil Union Council Mouza	Total Area (km <sup>2</sup> )	Year 1981				Year 1993				Growth Rate (%/a.n. 1981-1993)			Population Density to Cult. Area
		Population	No. of House-hold	Average Family Size (fl.hold)	Population Density (Km <sup>2</sup> )	Population	No. of House-hold	Average Family Size (fl.hold)	Population Density (Km <sup>2</sup> )	Population	No. of House-hold	Population Density	
<b>1. D.I. Khan</b>													
<b>Paniata</b>													
Paniata Janobi	127.3	5,024	750	6.7	39	7,022	937	7.5	55	2.830	1.870	2.937	m
<b>Band Korai</b>													
Band Korai	35.3	5,087	783	6.5	144	7,211	1,185	6.1	204	2.95	3.51	2.96	h
Kahliq-Shah	18.9	2,096	411	5.1	111	4,350	665	6.5	230	6.27	4.09	6.27	h
<b>Yarik</b>													
Budh	136.7	3,863	678	5.7	28	5,476	953	5.7	40	2.95	2.88	3.04	h
Rodikhel	31.9	1,350	225	6.0	42	1,914	316	6.0	60	2.95	2.88	3.02	h
Saddra	23.0	730	118	6.2	32	1,020	147	6.9	44	2.83	1.87	2.77	m
Talgi Rodi Khel	7.3	0	0	0.0	0	0	0	0	0	0	0	0	l
Yarik	47.2	3,552	623	5.7	75	5,035	876	5.7	107	2.95	2.88	2.98	h
<b>Keach</b>													
Hissam	30.5	2,032	363	5.6	67	2,440	453	6.3	93	2.83	1.87	2.78	m
Keach	47.5	3,065	487	6.3	65	4,345	737	5.9	92	2.95	3.51	2.89	h
Muqim Shah	19.5	1,520	217	7.0	78	2,155	328	6.6	111	2.95	3.51	2.95	h
Rahman	36.9	819	134	6.1	22	1,218	190	6.4	33	3.36	2.95	3.44	l
<b>Chakhan</b>													
Chakhan	45.6	1,716	277	6.2	38	2,175	380	5.7	48	1.99	2.67	1.91	m
Durabari	15.7	315	52	6.1	20	522	95	5.5	33	4.30	5.15	4.31	l
Garah Jamal	16.6	173	30	5.8	10	249	41	6.0	15	3.08	2.70	3.44	l
Gumal	36.6	1,640	265	6.2	45	2,292	331	6.9	63	2.83	1.87	2.79	m
Hayat Korai	13.0	1,009	160	6.3	78	1,430	242	5.9	110	2.95	3.51	2.91	h
Jowia Shai	9.9	276	43	6.4	28	386	54	7.2	39	2.83	1.87	2.80	m
Kalera Chania	4.6	0	0	0.0	0	0	0	0	0	0	0	0	l
Kot Isa Khan	13.3	756	137	5.5	57	1,088	189	5.8	82	3.08	2.70	3.06	l
Moor	6.4	134	25	5.4	21	187	31	6.0	29	2.83	1.87	2.81	m
Pota	22.9	1,808	317	5.7	79	2,563	480	5.3	112	2.95	3.51	2.94	h
Rakhi Chera	2.2	0	0	0.0	0	0	0	0	0	0	0	0	l
Sikandar Shumali	34.6	219	40	5.5	6	315	55	5.7	9	3.08	2.70	3.53	l
Surab Hasar	5.1	26	6	4.3	5	37	8	4.5	7	3.08	2.70	3.20	l
Yara Manjhi Khel	16.8	383	56	6.8	23	543	85	6.4	32	2.95	3.51	2.87	h
<b>Zindani</b>													
Akhmed	4.4	431	72	6.0	98	522	76	6.9	119	1.61	0.45	1.60	m
Bhabh	5.3	0	0	0.0	0	0	0	0	0	0	0	0	l
Bhoon	1.7	64	10	6.4	38	92	14	6.7	54	3.08	2.70	3.00	l
Bigwani Janubi	17.8	1,029	163	6.3	58	1,481	224	6.6	83	3.08	2.70	3.05	l
Chaddar	5.6	0	0	0.0	0	0	0	0	0	0	0	0	l
Dad Mehar Baig	0.8	50	10	5.0	63	72	14	5.2	90	3.08	2.70	3.01	l
Dad Wala Shomali	0.9	247	40	6.2	274	350	56	6.2	389	2.95	2.88	2.96	h
Dar Weshia	10.3	293	52	5.6	28	422	72	5.9	41	3.08	2.70	3.21	l
Dikhana	4.9	114	18	6.3	23	164	25	6.6	34	3.08	2.70	3.18	l
Faqira	4.5	97	18	5.4	22	140	25	5.6	31	3.08	2.70	2.90	l
Fateh	36.2	1,723	278	6.2	48	2,442	391	6.2	68	2.95	2.88	2.88	h
Gahroka	1.0	59	10	5.9	59	82	12	6.6	83	2.83	1.87	2.83	m
Ghafoora	1.0	55	8	6.9	55	77	10	7.7	77	2.83	1.87	2.83	m

Note : h (high density), m (medium density), and l (low density) of population to cultivated area.

**Table E.3.3.3 Population and Household Estimates of the Administrative Area covering the Study Area (2/2)**

**2. Master List (2/2)**

Total Union Council Mouza	Total Area (km <sup>2</sup> )	Year 1981				Year 1993				Growth Rate (%a.n. 1981-1993)		Popu- lation Density to Cult. Area	
		Popu- lation	No. of House- hold	Average Family Size (/11.hold)	Popu- lation Density (/km <sup>2</sup> )	Popu- lation	No. of House- hold	Average Family Size (/11.hold)	Popu- lation Density (/km <sup>2</sup> )	Popu- lation	No. of House- hold		
<b>Zindani (cont.)</b>													
Haandan	18.8	360	64	5.6	19	518	88	5.9	28	3.08	2.70	3.16	l
Ilsani	8.8	136	23	5.9	15	196	32	6.2	22	3.08	2.70	3.32	l
Ilsaco	2.0	221	40	5.5	111	313	56	5.6	157	2.95	2.88	2.91	h
Ilawai	1.0	82	15	5.5	82	116	21	5.3	116	2.95	2.88	2.95	h
Jandi	2.7	431	80	5.4	160	611	112	5.4	226	2.95	2.88	2.93	h
Khodke	3.2	373	55	6.8	117	529	77	6.8	165	2.95	2.88	2.92	h
Khathi	37.2	977	155	6.3	26	1,406	213	6.6	38	3.08	2.70	3.17	l
Loka	13.9	317	54	5.9	23	456	74	6.1	33	3.08	2.70	3.00	l
Mapal Janubi	1.9	44	10	4.4	23	63	14	4.6	33	3.08	2.70	3.13	l
Mapal Shurmai	2.7	0	0	0	0	0	0	0	0	0	0	0	l
Nouning Dou	1.7	80	13	6.2	47	113	18	6.2	67	2.95	2.88	2.96	h
Nouning Ora	7.2	232	47	5.4	35	352	59	6.0	49	2.83	1.87	2.83	m
Nawab Pwafi	1.7	0	0	0.0	0	0	0	0	0	0	0	0	l
Rak Nau	8.7	681	105	6.5	78	952	131	7.3	109	2.83	1.87	2.86	m
Sawang	9.2	210	36	5.8	23	302	50	6.1	33	3.08	2.70	3.00	l
Shari Kobna	7.2	1,058	258	4.1	147	1,479	333	4.4	205	2.83	2.15	2.83	h
Sharu Nau	8.1	518	93	5.6	64	724	118	6.2	89	2.83	1.87	2.82	m
Sohna Shah	0.7	35	6	5.8	30	30	8	5.9	71	2.95	2.88	2.95	h
Tej	4.4	328	54	6.1	75	458	67	6.8	104	2.83	1.87	2.78	m
Tali	1.0	185	38	4.9	185	262	53	4.9	262	2.95	2.88	2.95	h
Zindani	27.4	820	134	6.1	30	1,218	238	5.1	45	3.35	4.90	3.34	l
<b>Lunda Sharif</b>													
Adha Khairo	9.6	193	33	5.8	20	278	45	6.1	29	3.08	2.70	3.12	l
Adil Sipra	25.2	1,175	218	5.4	47	1,642	272	6.0	65	2.83	1.87	2.77	m
Bali Janubi	1.7	0	0	0	0	0	0	0	0	0	0	0	l
Balu Gama Nihal	6.3	579	97	6.0	92	809	121	6.7	129	2.83	1.87	2.82	m
Bobli	1.4	509	88	5.8	364	721	124	5.8	515	2.95	2.88	2.94	h
Chigiri	5.5	238	38	6.3	43	343	52	6.5	62	3.08	2.70	3.14	l
Ghulam Daider	2.8	81	15	5.4	29	117	21	5.6	42	3.08	2.70	3.05	l
Hayat Bocha	9.4	561	75	7.5	60	870	114	7.6	93	3.72	3.55	3.68	m
Hayat Jorh	2.2	81	16	5.1	37	117	22	5.3	53	3.08	2.70	3.04	l
Jumna Sharif	3.6	200	32	6.3	56	280	40	7.0	78	2.83	1.87	2.77	m
Mahmood Bhatti	1.4	83	18	4.6	39	119	25	4.8	85	3.08	2.70	3.12	l
Midhy	8	184	34	5.4	23	265	47	5.7	33	3.08	2.70	3.08	l
Rora	11.1	931	150	6.2	84	1,301	187	6.9	117	2.83	1.87	2.81	m
Shahmar	7.6	260	49	5.3	34	369	69	5.3	49	2.95	2.88	3.00	h
Umar Boba	0.8	82	15	5.5	103	115	19	6.1	143	2.83	1.87	2.79	m
Zaman Talokara	6.2	68	14	4.9	11	98	19	5.1	16	3.08	2.70	3.06	l
<b>Naivala</b>													
Malakhi	23.9	1,013	169	6.0	42	1,416	211	6.7	59	2.83	1.87	2.90	m
Rashid	50.6	1,915	336	5.7	38	2,610	380	6.9	52	2.61	1.03	2.58	l
<b>Mahra</b>													
Mahra	64.2	3,114	537	5.8	49	4,353	671	6.5	68	2.83	1.87	2.74	m
Sikandar Janubi	42.5	1,280	267	4.8	30	1,789	333	5.4	42	2.83	1.87	2.86	m
<b>Miran</b>													
Bhutaiaar	33.3	1,213	221	5.5	36	1,696	276	6.1	51	2.83	1.87	2.93	m
Chiri-Bhor	65.2	845	148	5.7	13	1,218	238	5.1	19	3.09	4.04	3.08	h
Ghamaan	31.1	2,006	352	5.7	65	2,843	495	5.7	91	2.95	2.88	2.88	h
Miran	46.1	1,339	231	5.8	29	1,872	289	6.5	41	2.83	1.87	2.84	m
Ramak	119.8	4,867	885	5.5	41	6,803	1,105	6.2	57	2.83	1.87	2.75	m
<b>Ghara Isa Khan</b>													
Dhulka Kehra	4.3	55	8	6.9	13	79	11	7.2	18	3.08	2.70	2.94	l
Gandi Umar Khan	82.5	2,643	413	6.4	32	3,915	475	8.2	48	3.33	1.17	3.35	m
Khayars Faah Mohd.	3.9	216	38	5.7	55	302	47	6.4	77	2.83	1.87	2.89	m
Sigo Mian Kheil	28.8	337	51	6.6	12	485	70	6.9	17	3.08	2.70	2.84	l
Gira Mir Alam Khan	27.8	1,101	175	6.3	40	1,561	246	6.3	56	2.95	2.88	2.86	h
Dhul Ka Jadid	5.3	617	103	6.0	116	875	145	6.0	165	2.95	2.88	2.98	h
Gira Murid Shah	12.3	145	29	5.0	12	209	40	5.2	17	3.08	2.70	2.95	l
Khayars Baaharat	4.1	24	5	4.8	6	35	7	5.0	8	3.08	2.70	2.84	l
Khawar	24.1	999	156	6.4	41	1,396	195	7.2	58	2.83	1.87	2.92	m
<b>Musa Zia Sharif</b>													
Gandi Ashiq	33.7	1,312	185	7.1	39	1,860	260	7.2	55	2.95	2.88	2.94	h
Gandi Isab	4.6	362	67	5.4	79	513	94	5.4	112	2.95	2.88	2.91	h
<b>Chowdwan</b>													
Kori Hoot	26.4	563	128	4.4	21	787	160	4.9	30	2.83	1.87	2.96	m
Mughra	13.6	169	32	5.3	12	240	45	5.3	18	2.95	2.88	3.24	h
Tali Budha Shah	25.9	603	94	6.4	23	855	132	6.5	33	2.95	2.88	3.05	h
Maroo	12.8	323	54	6.0	25	451	67	6.7	35	2.83	1.87	2.92	m
Jandi Babar	53.7	680	89	7.6	13	979	123	8.0	18	3.08	2.70	2.84	l
Kori Jamal	21.2	463	71	6.5	22	656	100	6.6	31	2.95	2.88	2.90	h
<b>D.I.Khan Tehsil Total</b>													
D.I.Khan Tehsil Total	2,033.7	82,292	13,892	5.9	40	117,577	18,849	6.2	58	3.02	2.58	3.14	
<b>2. Kulachi</b>													
<b>Muddi</b>													
Muddi	43.9	2,813	433	6.5	64	3,932	541	7.3	90	2.83	1.87	2.84	m
Sigu Ganda Pur	4.3	823	119	6.9	191	1,167	167	7.0	271	2.95	2.88	2.97	h
<b>Kulachi Tehsil Total</b>													
Kulachi Tehsil Total	48.2	3,636	552	6.6	75	5,099	708	7.2	106	2.86	2.10	2.92	
<b>Administrative Area covering Study Area</b>													
Administrative Area covering Study Area	2,081.9	85,928	14,444	5.9	41	122,676	19,557	6.3	59	3.01	2.56	3.08	

Note: h (high density), m (medium density), and l (low density) of population to cultivated area. Projection for mouzas in study area is made on the basis of classification of high, medium and low density mouzas using the average growth rates in 11 selected mouzas classified by population density to cultivated area.

**Table E.3.3.4 Educational Level in D.I.Khan District**

Item	Both Sexes	Male	Female
<b>I. Literacy Ratio (10 years and over)</b>			
D.I.Khan District			
1981	18.4	27.2	8.0
(Rural)	(13.7)	(21.8)	(4.0)
NWFP			
1972	14.5	23.1	4.7
1981	16.7	25.9	6.5
1987/88	18.7	30.8	6.2
Pakistan			
1972	21.7	30.2	11.6
1981	26.2	35.0	16.0
1987/88	26.6	37.0	15.6
<b>II. Participation Rate to School (%)</b>			
(1) Primary Age Group (5 - 9)			
D.I.Khan District (1981)	7.8	10.0	5.3
NWFP (1990/91)	62.8	94.3	28.8
Pakistan (1990/91)	48.6	61.5	34.7
(2) Middle and High Age Group (10 - 14)			
D.I.Khan District (1981)	18.0	25.3	9.2
NWFP (1990/91)	20.4	31.5	7.2
Pakistan (1990/91)	22.7	30.1	13.9

Source: NWFP and Pakistan in 1972, 1981 and 1990/91 ; NWFP Development Statistics 1991.  
NWFP and Pakistan in 1987/88 ; Household Income and Expenditure Survey 1987-88  
D.I.Khan ; Population Census in 1981

**Table E.3.3.5 Labour Force by Major Industry**

Sector	NWFP (1989/90)		D.I.Khan (1989/90)	
	Thousand	(%)	Thousand	(%)
I. Agriculture	2,346	(62.3)	133.6	(56.4)
II. Industry	266	(7.0)	13.6	(5.8)
Mining & quarrying	9	(0.2)	0.2	(0.1)
Manufacturing	111	(2.9)	3.8	(1.6)
Construction	146	(3.9)	9.6	(4.1)
III. Services	1,158	(30.7)	89.3	(37.8)
Total	3,770	(100.0)	236.5	(100.0)

Source: Federal Bureau of Statistics, NWFP Development Statistics 1991

**Table E.3.3.6 Population by Age and Sex, D.I.Khan District in 1981**

Age	(Unit : '000)									
	D.I.Khan Tehsil			Kulachi Tehsil			D.I.Khan District			
	Total	Male	Female	Total	Male	Female	Total	Male	Female	
I. Figures (' 000)										
0 - 4	61.7	31.2	30.5	14.6	7.2	7.4	76.3	38.4	37.9	
5 - 9	67.0	34.7	32.3	16.6	8.7	7.9	83.6	43.4	40.2	
10 - 14	50.9	27.7	23.2	13.0	7.2	5.8	63.9	34.9	29.0	
15 - 19	36.4	19.7	16.7	8.5	4.8	3.7	44.9	24.5	20.4	
20 - 24	30.3	15.9	14.4	7.1	3.9	3.2	37.4	19.8	17.6	
25 - 29	27.9	14.9	13.0	6.6	3.5	3.1	34.5	18.4	16.1	
30 - 34	22.9	12.1	10.8	5.8	3.0	2.8	28.7	15.1	13.6	
35 - 39	19.4	10.0	9.4	5.4	2.7	2.7	24.8	12.7	12.1	
40 - 44	17.8	8.8	9.0	4.6	2.2	2.4	22.4	11.0	11.4	
45 - 49	14.3	7.7	6.6	3.9	2.1	1.8	18.2	9.8	8.4	
50 - 54	14.6	8.2	6.4	3.6	2.0	1.6	18.2	10.2	8.0	
55 - 59	7.7	4.2	3.5	2.2	1.2	1.0	9.9	5.4	4.5	
60 - 64	10.6	6.4	4.2	2.7	1.5	1.2	13.3	7.9	5.4	
65 - 69	4.7	2.8	1.9	1.3	0.8	0.5	6.0	3.6	2.4	
70 - 74	5.0	3.1	1.9	1.3	0.8	0.5	6.3	3.9	2.4	
75 -	5.0	3.1	1.9	1.0	0.7	0.3	6.0	3.8	2.2	
Total	396.2	210.5	185.7	98.2	52.3	45.9	494.4	262.8	231.6	
II. Distribution (%)										
0 - 4	15.6	7.9	7.7	14.9	7.3	7.6	15.4	7.8	7.6	
5 - 9	16.9	8.8	8.1	16.9	8.9	8.0	16.9	8.8	8.1	
10 - 14	12.8	7.0	5.8	13.3	7.3	6.0	12.9	7.1	5.8	
15 - 19	9.2	5.0	4.2	8.7	4.9	3.8	9.1	5.0	4.1	
20 - 24	7.6	4.0	3.6	7.2	4.0	3.2	7.6	4.0	3.6	
25 - 29	7.0	3.8	3.2	6.7	3.6	3.1	7.0	3.7	3.3	
30 - 34	5.8	3.1	2.7	5.9	3.1	2.8	5.8	3.1	2.7	
35 - 39	4.9	2.5	2.4	5.5	2.7	2.8	5.0	2.6	2.4	
40 - 44	4.5	2.2	2.3	4.7	2.2	2.5	4.5	2.2	2.3	
45 - 49	3.6	1.9	1.7	4.0	2.1	1.9	3.7	2.0	1.7	
50 - 54	3.7	2.1	1.6	3.7	2.0	1.7	3.7	2.1	1.6	
55 - 59	1.9	1.1	0.8	2.2	1.2	1.0	2.0	1.1	0.9	
60 - 64	2.7	1.6	1.1	2.7	1.5	1.2	2.7	1.6	1.1	
65 - 69	1.2	0.7	0.5	1.3	0.8	0.5	1.2	0.7	0.5	
70 - 74	1.3	0.8	0.5	1.3	0.8	0.5	1.3	0.8	0.5	
75 -	1.3	0.8	0.5	1.0	0.7	0.3	1.2	0.8	0.4	
Total	100.0	53.3	46.7	100.0	53.1	46.9	100.0	53.4	46.6	

Source : Population Census in D.I.Khan, 1981

**Table E.3.3.7 Future Demographic Forecast in the Study Area**

Year / Population Growth Rate	Population	Labor Force  /1	Household Number  /2	Labor Force per ha of CCA
Year 1993	83,500	26,300	13,340	0.23
Year 2000				
3.50%	106,200	33,500	16,860	0.29
3.01%	102,800	32,400	16,320	0.28
2.50%	99,300	31,300	15,760	0.27
Year 2005				
3.50%	126,200	39,800	20,030	0.34
3.01%	119,200	37,500	18,920	0.32
2.50%	112,300	35,400	17,830	0.31
Year 2010				
3.50%	149,900	47,200	23,790	0.41
3.01%	138,200	43,500	21,940	0.38
2.50%	127,100	40,000	20,170	0.35

Note :

/1 ; Crude Activity Rate/CAR (the percentage of persons in labor force to total population) in D.I.Khan was estimated at 31.5 on the basis of Labor Force Survey 1990-91, Federal Bureau of Statistics as follows ;

Refined Activity Rate/RAR ( the percentage of persons in labor force to population 10 years and above) for rural area in 1990-91

Male (73.62)

Female (14.78)

$$\text{CAR} = \frac{\text{RAC} * (\text{Male and female population 10 years and above separately})}{\text{Total population}}$$

/2 ; Family size of 6.3 is applied.



**Table E.3.4.1 Land Holding and Tenure Estimate in the Study Area**

**(I) AGRICULTURAL LAND HOLDING AND TENURE ESTIMATE IN THE STUDY AREA**

1. Residents' Farm Land Holding and Tenure					
Size of Land (ha)	Number of Household		Agricultural Land Area		Average Size of Agri. Land (ha)
	Resident (No)	Distribution (%)	Area (ha)	Distribution (%)	
Less than 1	5,600	56.0	1,120	2.3	0.20
1-3	1,730	17.3	3,235	6.5	1.87
3-5	860	8.6	3,345	6.7	3.89
5 & above	1,810	18.1	41,920	84.5	23.16
Total	10,000	100.0	49,620	100.0	4.98

Note : Agricultural land owner households are estimated at 10,000 or 75% of the total households (13,340).

2. Absentees' Farm Land Holding and Tenure					
Size of Land (ha)	Number of Household		Agricultural Land Area		Average Size of Agri. Land (ha)
	Absentee (No)	Distribution (%)	Area (ha)	Distribution (%)	
Less than 1	1,653	55.1	248	2.4	0.15
1-3	561	18.7	971	9.4	1.73
3-5	237	7.9	922	9.0	3.89
5 & above	549	18.3	8,136	79.2	14.82
Total	3,000	100.0	10,277	100.0	3.43

Note : Absentee land owners are estimated at 30% of the number of resident land owners (10,000).

3. All Households' Farm Land Holding and Tenure					
Size of Land (ha)	Number of Household		Agricultural Land Area		Average Size of Agri. Land (ha)
	All (No)	Distribution (%)	Area (ha)	Distribution (%)	
Less than 1	7,253	55.9	1,368	2.3	0.19
1-3	2,291	17.6	4,206	7.0	1.84
3-5	1,097	8.4	4,267	7.1	3.89
5 & above	2,359	18.1	50,056	83.6	21.22
Total	13,000	100.0	59,897	100.0	4.61

**(II) ALL LAND HOLDING AND TENURE ESTIMATE IN THE STUDY AREA**

1. Residents' All Land Holding and Tenure							
Size of Land (ha)	Number of Household		All Land Area		Average Size of Land (ha)	Average Size of Agri. Land (ha)	Balance (ha)
	Resident (No)	Distribution (%)	Area (ha)	Distribution (%)			
Less than 1	3,200	32.0	1,152	1.0	0.36	0.20	0.16
1-3	2,080	20.8	4,035	3.5	1.94	1.87	0.07
3-5	1,210	12.1	4,780	4.1	3.95	3.89	0.06
5 & above	3,510	35.1	106,072	91.4	30.22	23.16	7.06
Total	10,000	100.0	116,039	100.0	11.60	4.98	6.62

2. Absentees' All Land Holding and Tenure							
Size of Land (ha)	Number of Household		All Land Area		Average Size of Land (ha)	Average Size of Agri. Land (ha)	Balance (ha)
	Absentee (No)	Distribution (%)	Area (ha)	Distribution (%)			
Less than 1	723	24.1	304	1.2	0.42	0.15	0.27
1-3	708	23.6	1,289	5.0	1.82	1.73	0.09
3-5	399	13.3	1,564	6.1	3.92	3.89	0.03
5 & above	1,170	39.0	22,504	87.7	19.23	14.82	4.41
Total	3,000	100.0	25,661	100.0	8.55	3.43	5.12

3. All Households' Land Holding and Tenure							
Size of Land (ha)	Number of Household		All Land Area		Average Size of Agri. Land (ha)	Average Size of Agri. Land (ha)	Balance (ha)
	All (No)	Distribution (%)	Area (ha)	Distribution (%)			
Less than 1	3,923	30.2	1,456	1.0	0.37	0.19	0.18
1-3	2,788	21.4	5,324	3.8	1.91	1.84	0.07
3-5	1,609	12.4	6,344	4.5	3.94	3.89	0.05
5 & above	4,680	36.0	128,576	90.7	27.47	21.22	6.25
Total	13,000	100.0	141,700	100.0	10.90	4.61	6.29

**Table E.3.5.1 Cropped Area and Cropping Intensity in the Study Area**

Crops	Irrigated Area 940 ha			Roof Kobi Area 27,100 ha			Barani Area 78,600 ha			Total Area 106,640 ha		
	Harvested Area (ha)	Damage Area (ha)	Sown Area (ha)	Harvested Area (ha)	Damage Area (ha)	Sown Area (ha)	Harvested Area (ha)	Damage Area (ha)	Sown Area (ha)	Harvested Area (ha)	Damage Area (ha)	Sown Area (ha)
<b>A. KHARIF SEASON CROPS</b>												
Sorghum	5	5	10	380	930	1,310	390	820	1,210	775	1,755	2,530
			7.7%			53.9%			43.1%			47.1%
Millet	3	2	5	180	830	1,010	460	995	1,455	643	1,827	2,470
			3.8%			41.6%			51.8%			46.0%
Maize	5	5	10							5	5	10
			7.7%							2	3	5
Pulses (Mung beans)	2	3	5							20	10	30
			3.8%							25	35	60
Sugarcane	20	10	30							5	5	10
			23.1%							105	125	230
Cotton	20	25	45	5	10	15				15	10	25
			34.6%			0.6%				1.5%	3.7%	5.3%
Fodder	5	5	10							5	5	10
			7.7%							1.5%	3.5%	5.0%
Guara	5	5	10	35	40	75	65	80	145	105	125	230
			7.7%			3.1%			5.2%			4.3%
Vegetables, Fruits, others	5	5	10	10	10	20				15	10	25
			3.8%			0.8%				1.5%	3.7%	5.3%
<b>Total Area</b>	<b>70</b>	<b>60</b>	<b>130</b>	<b>610</b>	<b>1,820</b>	<b>2,430</b>	<b>915</b>	<b>1,895</b>	<b>2,810</b>	<b>1,595</b>	<b>3,775</b>	<b>5,370</b>
	7.4%	6.4%	13.8%	2.3%	6.7%	9.0%	1.2%	2.4%	3.6%	1.5%	3.5%	5.0%
<b>B. RABI SEASON CROPS</b>												
Wheat	290	310	600	1,890	2,770	4,660	1,410	1,870	3,280	3,590	4,950	8,540
			68.2%			56.3%			47.5%			53.2%
Barley	5	5	10	90	150	240	50	100	150	145	255	400
			1.1%			2.9%			2.2%			2.5%
Pulses (Gram)	70	90	160	790	1,180	1,970	830	1,460	2,290	1,690	2,730	4,420
			18.2%			23.8%			33.1%			27.5%
Oil Seeds/ Lentil	5	5	10	380	1,000	1,380	380	810	1,190	765	1,815	2,580
			1.1%			16.7%			17.2%			16.1%
Sugarcane	20	10	30							20	10	30
			3.4%							40	20	60
Fodder	40	20	60							20	10	30
			6.8%							20	10	30
Vegetables, Fruits, others	10		10	10	10	20				20	10	30
			1.1%			0.8%				20	10	30
<b>Total Area</b>	<b>440</b>	<b>440</b>	<b>880</b>	<b>3,160</b>	<b>5,110</b>	<b>8,270</b>	<b>2,670</b>	<b>4,240</b>	<b>6,910</b>	<b>6,270</b>	<b>9,790</b>	<b>16,060</b>
	46.8%	46.8%	93.6%	11.7%	18.9%	30.5%	3.4%	5.4%	8.8%	5.9%	9.2%	15.1%
<b>Total Sown Area (5 years average, 1987/88 to 1992/93)</b>												
Kharif Season Crops	70	60	130	610	1,820	2,430	915	1,895	2,810	1,595	3,775	5,370
Rabi Season Crops	440	440	880	3,160	5,110	8,270	2,670	4,240	6,910	6,270	9,790	16,060
<b>Total</b>	<b>510</b>	<b>500</b>	<b>1,010</b>	<b>3,770</b>	<b>6,930</b>	<b>10,700</b>	<b>3,585</b>	<b>6,135</b>	<b>9,720</b>	<b>7,865</b>	<b>13,565</b>	<b>21,430</b>
<b>Total Cultivated Area: 106,640 ha</b>												
<b>Cropping Intensity 54.3%</b>												

Source : Revenue Office D. I. Khan, August 1993

**Table E.3.6.1 Present Farm Inputs and Labor Requirement (1/2)**

Items	Unit per ha	Wheat		Sorghum		Millet		Guara		Maize		Mung			
		Barani	R.K. Irri.	Barani	R.K. Irri.	Barani	R.K. Irri.	Barani	R.K. Irri.	Barani	R.K. Irri.	Barani	R.K. Irri.		
<b>A. Farm Inputs</b>															
1. Seeds	(kg)	74.2	88.8	91.5	19.8	20.3	20.3	17.4	15.9	23.7	18.9	20.0	20.0	36.8	50.0
2. FYM/ Compost	(tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
3. Fertilizer															
- Urea (N : 46%)	(kg)	0	0	150	0	0	0	0	0	0	0	0	0	125	0
- TSP (P : 46%)	(kg)	0	0	125	0	0	0	0	0	0	0	0	0	0	0
- SOP (K : 50%)	(kg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4. Agro-chemicals															
- Insecticide	(kg)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
- Pesticide	(lit)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<b>B. Machinery and Animal Power Requirement</b>															
- Land Preparation	(hrs)	3.2	3.2	7.5	2.4	2.9	5.1	4.4	4.4	5.4	5.7	5.7	6.3	5.8	6.3
- Drill for sowing	(hrs)	3.0	3.0	3.0	0.0	0.0	0.0	0.0	0.0	0.0	2.0	2.0	2.5	0.0	2.5
- Threshing by tractor	(hrs)	2.0	2.4	5.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.0
<b>C. Labor</b>															
1. Land Preparation	(man-day)	2	2	2	2	2	2	2	2	2	4	5	5	2	2
2. Nursery/ sowing	(man-day)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3. Transplanting	(man-day)	0	0	0	0	0	0	0	0	0	0	0	0	0	0
/Sowing	(man-day)	2	2	2	2	2	2	2	2	2	4	4	4	2	2
4. Fertilizer Application	(man-day)	0	0	0	0	0	0	0	0	1	0	0	0	1	0
5. Weeding	(man-day)	0	1	2	0	0	0	0	0	0	2	2	2	0	2
6. Water Management	(man-day)	0	0	2	0	0	1	0	0	1	0	0	2	1	1
7. Harvesting	(man-day)	5	7	10	2	3	4	5	7	10	10	14	20	10	5
8. Threshing, others	(man-day)	2	2	4	1	2	2	1	1	2	5	5	7	2	3
<b>Total</b>		<b>11</b>	<b>14</b>	<b>22</b>	<b>7</b>	<b>9</b>	<b>11</b>	<b>10</b>	<b>12</b>	<b>18</b>	<b>25</b>	<b>30</b>	<b>40</b>	<b>18</b>	<b>15</b>

Source : Farm survey, 1993 by the JICA Team

Note : Barani ; Rainfed field, R.K. ; Rod Kohi, Irr. ; Irrigated field by well

**Table E.3.6.1 Present Farm Inputs and Labor Requirement (2/2)**

Items	Unit per ha	Pulses (gram)		Oilseeds/Lentil		Rice (Paddy)		Sugarcane		Cotton		R. Fodder		K. Fodde		R. Vege.		F. Vege.		
		Barani	R.K.	Irr.	Barani	R.K.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.	Irr.
<b>A. Farm Inputs</b>																				
1. Seeds	(kg)	46.3	43.2	50.0	10.8	8.5	8.7	46.3	7,950	40.0	15.4	19.6	7.0	51.0						
2. FYM/ Compost	(tons)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.0						
<b>3. Fertilizer</b>																				
- Urea (N : 46%)	(kg)	0	0	0	0	0	0	160	225	125	175	0	0	200						
- TSP (P : 46%)	(kg)	0	0	0	0	0	0	136	150	0	125	0	0	150						
- SOP (K : 50%)	(kg)	0	0	0	0	0	0	0	0	0	0	0	0	100						
<b>4. Agro-chemicals</b>																				
- Insecticide	(kg)	0	0	0	0	0	0	0	0	0	0	0	0	50						
- Pesticide	(lit)	0	0	0	0	0	0	1	1	2	0	0	0	2						
<b>B. Machinery and Animal Power Requirement</b>																				
- Land Preparation		5.7	5.7	6.3	2.5	5.0	5.3	7.5	4.9	7.0	6.1	6.1	5.0	10.0						
- Drill for sowing		2.2	2.2	2.5	0.0	0.0	0.0	0.0	5.3	0.0	0.0	0.0	0.0	0.0						
- Threshing by tractor		0.0	0.0	0.0	0.0	0.0	0.0	6.0	0.0	0.0	0.0	0.0	0.0	0.0						
<b>C. Labor</b>																				
1. Land Preparation	(man-day)	2	2	2	2	2	2	1	2	2	2	2	2	25						
2. Nursery/ sowing	(man-day)	0	0	0	0	0	0	4	0	0	0	0	0	5						
3. Transplanting	(man-day)	0	0	0	0	0	0	20	10	0	0	0	20	10						
/Sowing	(man-day)	2	2	2	2	2	2	0	0	2	2	2	0	0						
4. Fertilizer Application	(man-day)	0	0	0	0	0	0	4	2	4	2	2	0	10						
5. Weeding	(man-day)	1	1	2	0	0	0	2	8	2	0	0	0	10						
6. Water Management	(man-day)	0	0	1	0	0	1	4	4	2	1	1	6	20						
7. Harvesting	(man-day)	3	3	5	5	6	6	10	30	57	25	18	40	35						
8. Threshing, others	(man-day)	2	2	3	2	2	2	2	2	1	0	0	0	5						
Total	(man-day)	10	10	15	11	12	13	47	58	70	32	25	68	120						

Source : Farm survey, 1993 by the JICA Team

Note : Barani ; Rainfed field, R.K. ; Rod Kohi, Irr. ; Irrigated field by well

K. Fodder ; Khanif fodder (millet, sorghum), R. Fodder ; Rabi fodder (berseem, green)