

ANNEX-F

AGRICULTURAL ECONOMY

ANNEX - F

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ANNEX-F AGRICULTURAL ECONOMY

F.1 INTRODUCTION

This Annex reviews the agricultural economy of the Malir Basin Study and Project areas against the general background to the area outlined in ANNEX-A. The production of fodder, vegetable and fruit crops is the predominant agricultural activity of the area.

Chapter F.2, "The Present Situation", describes and analyses the present economic situation of agriculture in the area including the labour force, land holdings and land tenure, crop production, markets and prices, production costs and farm income. Chapter F.3, "Agricultural Support System", outlines the present situation of services and organizations which operate to support farmers engaged in crop production. Chapter F.4 identifies agricultural development arising from investment under the proposed Malir Basin Water Resource Development Project, an improved supply of water for irrigation and other uses. The investment would enable farmers in the area to intensify production and thereby obtain the maximum benefits from the assured long term supply of water resulting from infrastructure investment in dam(s) under the proposed project.

The Annex should be read in conjunction with ANNEX-E which provides detailed information on technical aspects of agriculture in the study area at present, and the technical potential for development.

F.2 THE PRESENT SITUATION

F.2.1 Population and Workforce

The study area comprises the central flood plain and adjoining parts of the Malir River Basin with a total area of 242.3 km². The population is estimated at 90,300 persons in 1989 of which about 40,600 persons or 45% are of working age (15 to 49 years). Males account for about 53% of total population and a similar proportion, about 21,500 members, of the potential adult workforce. According to census data, there are an estimated 16,200 households each containing 5.6 persons (see Table F.2.1) The population of the study area is discussed in detail in ANNEX-A.

F.2.2 Irrigable Land, Land Holdings and Tenure

F.2.2.1 Irrigable Land

Within the study area there are an estimated 6,140 ha of agricultural land which is scattered, in pockets, of greater or lesser size. The land had been developed 2,740 ha for irrigated upland/orchard field and 480 ha for rainfed upland field, and the remain of 2,920 ha of irrigable land has not been developed because of inadequate supplies of water.

F.2.2.2 Land Holdings

In 1979, the WAPDA study reviewed the land holding and land tenure situation in the study area for 1978 on the basis of records maintained, by the Karachi East District Revenue office, for the purpose of collecting land tax. It is reasonable to assume that registered land would comprise, mainly, land already developed for irrigation which is of relatively high value. The WAPDA study indicated that a total of about 5,660 ha of land were registered which was owned and/or operated by 831 farmers, giving an average holding of 6.8 ha.

The Karachi East District Revenue office has prepared an updated estimate for 1988, at the request of the Study Team. It indicates that over the past decade the area registered has increased to 6,140 ha, and that the number of farmers has decreased to about 700. Therefore average holding size has increased to 8.8 ha. The overall situation in 1978 and 1988 is summarized in the table below and shown in more detail in Table F.2.2. for 1978 and 1988:

	<u>Under 5 ha</u>		<u>5-20 ha</u>		<u>Over 20 ha</u>		<u>Total</u>	
	1978	1988	1978	1988	1978	1988	1978	1988
No. of Holdings	499	352	224	283	108	63	831	698
(%)	60	50	27	41	13	9	100	100
Area (ha)	1,360	847	1,982	2,836	2,323	2,457	5,665	6,140
(%)	24	14	35	46	41	40	100	100
Average Holding (ha)	2.7	2.4	8.9	10.0	21.5	39.0	6.8	8.8

Both the 1978 and 1988 estimates indicate that a high proportion of registered land, 41% and 40% in the respective years, is concentrated in large units of over 20 ha which are in the hands of a small number of farmers, 13% and 10% of the respective annual totals. In 1978 some 108 farmers in this group had an average holding of 21.5 ha, and in 1988, 63 farmers had holdings with an increase in average size to 39.0 ha. The estimates also indicate, on the other hand, that a high proportion of farmers, 60% in 1978 and 50% in 1988, operated units of under 5 ha, occupying only 24% and 14% of the registered area in the respective years. The average size of holding was 2.7 ha in 1978 and 2.4 ha in 1988. Data from 1988 indicate that almost 10% of farmers operated units with an average size of only 0.6 ha (see Tables F.2.3 and F.2.4). A middle group of farmers operated holdings in the 5 to 20 ha size range. These farmers increased in number from 224 in 1978 to 283 in 1988 and operated farms occupying 35% of registered land in the earlier period and 46% in 1988. The average holding of the group was 8.9 ha in 1978 and 10.0 ha in 1988.

The estimates indicate that the area of registered land under small operators remained about the same over the period (1,360 ha in 1978 and 847 ha in 1988 respectively) and that increased registration by the medium size and the larger farmers, increasing by 43% and 6% respectively, accounted for the entire increase in registered land.

The registration of land in the study area has increased despite the declining supply of water available for irrigation and the consequent decline in the area irrigated over the period 1978 - 1988. Increased registration is likely to be attributable, in part, to the increased value of land along the super-highway (connecting Karachi to the north of the country) which was constructed during the period and, in part, to increased value as a result of the expansion of peri-urban Karachi further into the Malir valley. It has also been suggested that it may reflect the acquisition of land by non-residents for poultry farming and other non-agricultural purposes.

There is no information on the proportion of registered land which is actually irrigated by size of holding, or even the proportion of land which is, at least potentially, irrigable. However, as noted above, it can reasonably be assumed that most land which is presently irrigated is registered and that, therefore, most farm operators in the study area fall into one or other of the categories described above.

F.2.2.3 Land Tenure

The 1979 WAPDA study presents a breakdown of the land tenure situation in the study area in 1978, also from Karachi East District Revenue office records. The Study Team has been unable to locate similar records to provide a similar breakdown for the late 1980's and, in the absence of recent data, it may be assumed that there has been little change in the overall situation over the decade. Present land tenure conditions are estimated based on the rate of the WAPDA study, 1978. Data for 1978 indicate that 53% of all farmers were tenants, whose farm land owned by other persons, on a share cropping basis. The tenants operated on about 38% of the total area of land, with an average farm size of 4.9 ha. Owners, directly farming their own land, accounted for 27% of all farmers and 36% of the

registered land area, with an average farm size of 8.9 ha. An intermediate category of owner-tenant (owning and farming part of the land and farming another part owned by other persons on a share-cropping basis) accounted for the remaining 20% of farmers and 26% of the registered land area. The average farm size of owner-tenants was 9.0 ha, similar to that of owner farmers.

Overall, therefore, 70% of all farmers are tenants operating a holding which is, on average, a little over half the size of that of owner farmers and owner-tenant farmers. Given that up to half the volume of production on tenant operated farms is paid to the owner the actual and potential return to the tenant farmer is likely to be relatively small. The question of economic size of unit is considered below. Whilst records show that larger farm units (63 of over 20 ha) are directly operated by their owners or owner tenants, a field survey during this study period suggests that some of the farms are likely, in practice, to be operated, at least in part, on a tenant/sharecropping basis.

F.2.2.4 Tenancy and Sharecropping

Under the existing tenancy system the land owner receives 50% to 60% of the gross output of the crop which is paid to him (generally in kind) by the tenant. The tenant receives 40% to 50% of the crop. The tenant and land owner each provide 50% of the cost of a range of production inputs, whilst the tenant meets all labour costs, and the land owner well operation and maintenance costs as follows:

Operation Item	Share of Cost	
	Land Owner	Tenant
Tractor plowing, levelling, etc	50	50
Seed	50	50
Fertilizers	50	50
Agro-chemicals	50	50
Electric power and well maintenance	100	-
Labour (family or hired)	50	50

F.2.3 Agricultural Production

F.2.3.1 General

The agriculture of the study area is largely concentrated on the production of high value vegetable, fruit and fodder crops, produced under relatively intensive conditions, to supply the Karachi city market. There is little production of staple grain food crops either for subsistence or sale. Traditional livestock production is largely confined to satisfying domestic requirements for milk and poultry products. In recent years a number of small and medium scale intensive poultry units have been established, often by persons from outside the area, to supply the Karachi market. Feed for these units is obtained from Karachi, or elsewhere outside the study area.

The cropped area has fallen over the last decade so that with only limited improvements in yields overall production in the study area has declined substantially. This is attributable to shortage of water as described ANNEX-G, but also to other constraints including inadequate supporting services for producers.

Open wells are the only source of water for irrigation in the study area. There are currently 516 production dug/tube wells in the study area as described in ANNEX-G. The underlying water table has been falling as a result of over-exploitation over the past two decades or more. The resultant shortage of water has led to the fall in cropped area, which is likely to continue to decline unless steps are taken to remedy the situation. Water supply is discussed in detail in ANNEXes-D and -G.

F.2.3.2 Cropped Area

The crop year runs from May to end April of the following year with two seasons. The Kharif (summer or monsoon season) runs from May to early September. During this season which is relatively hot, the area receives about 180 mm equivalent to about 80% of annual rainfall. During the rabi (winter season), from October to April, temperatures are relatively cool but there is negligible rainfall. The Kharif is the main crop season when, subject to water availability, the maximum area of irrigable land is cropped.

A lesser area is cropped in the winter season. In the Karachi "green belt", fruit crops are harvested during the summer season; vegetables are grown in both seasons with a preponderance of temperate type vegetables in the cooler winter season. The relatively warm climate of lower Sindh extends the season (at both ends) for a number of crops which affords producers an advantage over those to the north of the country.

The total sown area for Karachi District (which includes the study area) averaged about 16,000 ha over the 1986/87 and 1987/88 crop seasons, of which over 12,000 ha were grown under irrigation. About 95% of irrigation water supplies came from dug wells with the balance from canals and tubewells.

The WAPDA study estimated the cropped area in 1978 at some 5,960 ha of which 4,070 ha were in the summer season and 1,890 ha in the winter. Based on an estimated farm area of 5,660 ha in 1978, and allowing for an orchard area of 1,380 ha in both seasons, the cropping intensity was estimated at 1.5. Water constraints prevented the full utilization of the farm area for crops even in the summer season.

It indicates that the cropped area has fallen over the past decade from 5,960 ha in 1978 to some 3,730 ha in 1987/88 and 1988/89. Of the latter total, some 3,220 ha were cropped in the summer season and 510 ha in the winter, and some 1,200 ha are under permanent orchard fruit crops in both seasons. The crop rotation in 1978 and 1988 included fodder, vegetable and fruit crops. The cropped area and major crops grown in 1978 and 1988/89 are shown in the following table and are given in detail in Table F.2.5. Crops

grown in the study area are also grown, on a larger scale, elsewhere in Lower Sindh and many are grown in Upper Sindh and other Provinces to the north.

Unit: ha

Area/Crop	1978			1988		
	Summer	Winter	Total	Summer	Winter	Total
Farm Area			5,660			6,140
Cropped Area						
- Fodder	590	370	960	490	80	570
- Vegetable	1,920	1,340	3,260	1,520	425	1,945
- Fruit	1,380	-	1,380	1,200	-	1,200
- Misc	180	180	360	10	5	15
Total	4,070	1,890	5,960	3,220	510	3,730

Total cropped area fell by 37% over the period 1978 to 1988, with a fall of 21% in the summer season and 73% in the winter season.

The vegetable crop declined in relation to cropped area in both seasons as shown in the table below. Fruit crops showed only a small absolute decline in area, but increased as a proportion of cropped area. The increase in the importance of fruit crops is apparent rather than real. It is evident from the condition of fruit trees in the study area that large areas, particularly of mango, are senescent and unproductive and are receiving little or no irrigation. This is due to shortage of irrigation water as described in detail in ANNEX-G, and it is hardly possible to stop irrigation water supply to perennial crops.

Unit: %

	1978			1988		
	Summer	Winter	Total	Summer	Winter	Total
Cropped Area :	100	100	100	100	100	100
- Fodder	15	20	16	15	16	15
- Vegetable	47	71	55	47	83	52
- Fruit	34	-	23	37	-	32
- Misc	4	9	6	1	1	1

Although the total area of fodder has declined in line with the decline in cropped area, fodder had a slightly larger share of the cropped area in 1988 than in 1978 but with some switch towards the winter season crop (lucerne) and away from summer season (sorghum and maize). Comparative data for 1978 and 1988 are given for certain vegetable crops in Table F.2.5. Data are not available for fruit. Tomato, mainly a summer crop, was the most important vegetable crop in both 1978 and 1988, and an increase in its relative importance from 19% to 32% of the vegetable area in the summer season. The area under three other major vegetable crops (eggplant, sponge gourd and chillies) in 1978 amounted to 48% of the total vegetable area in the summer season, and in proportional terms to 16% of the summer season vegetable crops.

The winter season vegetable crop declined from 1,340 ha to 425 ha over the period. The major winter season crops in 1978 were spinach, radish, carrot, turnip and potatoes

which together accounted for 880 ha and for two-thirds of the area under vegetables. In 1988 potatoes were no longer grown (apparently due to high water demand and seed supply problems), whilst the share of spinach and the other root crops was 170 ha or 40% of the vegetable area.

The principal features of vegetable production over the decade are, therefore (a) an overall decline in area both absolutely and proportionately with the greatest decline in the winter season; (b) an increase in the area under the major crop, tomatoes, and a major increase in its relative importance ; and, probably, (c) the greater relative importance attached to a range of other important crops including in particular, gourds, melons, and cauliflower.

F.2.3.3 Crop Yields

There are three secondary sources of information on crop yields. Primary data on yields for fodder, vegetable and fruit crops in the study area based on actual measurement are not available. Area, production and yield estimates are prepared on an annual basis for Karachi District which includes the study area by the local office of the Government of Sindh's Agricultural Extension Department (DOAE) based on the estimates of field offices. The WAPDA study in 1979 estimated crop yields on the basis of a farm survey conducted during the same study.

A Crop Guide has been prepared by the DOAE for use by extension staff serving farmers in Karachi District. The Guide sets out a range of recommended practices for the most important vegetable and fruit crops grown in the study area and gives a range of yields which should be obtained. Although these practices are not in widespread use (on a package basis) in the study area, the Guide does provide a basis for assessing the credibility of other yield estimates in relation to maximum attainable yields. Therefore, attainable yields have been reviewed on the basis of the findings and recommendations of the Horticulture Research Institute (HRI), Mirpurkhas.

Broadly, it appears that yields in Karachi District averaged over the two years 1986/87 - 1987/88 (which are thought to be typical) have been generally significantly lower than comparable yields for the Province of Sindh as a whole. Yield estimates for both areas have been prepared by DOAE (it is assumed on a similar basis). Karachi District yields, and those for Sindh Province, are also generally substantially below attainable yields based on the Crop Guide and HRI estimates. The position is summarized for selected crops in the following table:

Unit : ton/ha			
Crop	Crop Guide	Sindh	Karachi District
<u>Vegetables</u>			
Tomato	5 - 10	5.0	3.3
Egg Plant	5 - 10	6.8	4.9
Sponge Gourd	10 - 15	6.4	3.1
Bottle Gourd	8 - 15	5.4	4.7
Cauliflower	13 - 18	5.8	13.3
Spinach	10 - 13	4.2	2.6
Carrot	10 - 13	9.9	5.4
Radish	18 - 20	7.8	4.0
Turnip	13 - 20	13.0	6.6
Peas	8 - 10	4.1	2.6
<u>Fruit</u>			
Guava	-	6.0	4.5
Mango	-	7.7	7.0
<u>Fodder</u>			
Maize	18 - 23	13.6	10.5
Sorghum	15 - 25	17.7	11.5
Lucerne	20 - 30	23.6	13.9

WAPDA'S yield estimates from the 1978 farm survey place study area yields consistently within or above the attainable yield range given in the Crop Guide. However, on the basis of available information on farming practices and input use, including that obtained from the present Study Team's 1988 Farm Survey, it is considered unlikely that average yields reach the levels stipulated in the Crop Guide or by the HRI, or, consequently, those collected by WAPDA for 1978.

Vegetable and fruit producers in Karachi District and the study area are in a relatively favoured position compared to producers in interior Sindh in relation to access to farm inputs which are essential to achieve good yields, provided that supplies are readily available on a timely basis in Karachi. Transport costs are relatively low because of proximity to the city and most producers are reported to deliver their own produce to the Karachi Fruit and Vegetable Market which would facilitate input procurement.

Karachi and study area producers also enjoy relatively favorable prices because of proximity to market, freshness of produce, the extended production season for certain crops, and low transport costs. They should be, therefore, in a relatively favorable situation in terms of margins, to meet the cost of inputs. Ample labour is apparently available in the District and the study area. It seems likely, therefore, that the low yields, found in Karachi District, and by extension in the study area, in relation to those of Sindh as a whole (where there is perennial and non perennial canal irrigation) may be largely attributable to inadequate irrigation due to shortage of water. This is compounded by lack of technical knowledge, and, on occasions shortage or inadequate quantity of inputs and institutional credit.

In the absence of specific and reliable information for the study area, it is assumed that average yields for fodder, vegetable and fruit crops in the study area are similar to the DOAE estimates for Karachi District given in detail in ANNEX-E.

F.2.3.4 Crop Production

The volume of crop production in the study area has been estimated on the basis of the estimates of cropped area and crop yields as set out above. The study area is estimated to produce some 6,900 tons of fodder from a cropped area of 570 ha, some 8,600 tons of vegetables from 1,960 ha, and 5,980 tons of fruit from 1,200 ha. Average yields are, therefore, for fodder 12.1 tons/ha, for vegetables 4.4 tons/ha, and for fruit 5 tons/ha. All Pakistan yields for fruit are 8.4 tons/ha according to the National Committee on Agriculture and 10 tons/ha for vegetables further indicating that study area yields are depressed. The volume and value of production at estimated farmgate prices is summarized in the following table and given in detail in Tables F.2.6 and F.2.7:

Crop	Cropped Area ha	Volume ton	Yield ton/ha	Value at Farmgate	
				Rs 10 ³	%
Fodder	570	6,910	12.1	2,120	4
Vegetables	1,960	8,610	4.4	24,080	50
Fruit	1,200	5,980	5.0	22,330	46
All	3,730	21,500	-	48,530	100

The total gross value of crop production at estimated farmgate prices is Rs. 48.5 million annually of which fodder contributes 4%, vegetables 50% and fruit 46%. Farmgate prices are discussed in the following Section F.2.4, together with crop production costs (Section F.2.5) and farm income from crop production (Section F.2.6).

F.2.4 Markets and Prices

F.2.4.1 General

Products from the study area are sold mainly through the Karachi Vegetable and Fruit Market which is the central wholesale market serving the greater Karachi area. Products enter this market from all major fruit and vegetable producing regions of Pakistan including Baluchistan, NWFP and Punjab as well as the interior of Sindh Province. Karachi is the country's largest market and only a small portion of its requirements are met by producers in Karachi District and adjoining areas.

F.2.4.2 Marketed Production

The total volume of production in the study area has been estimated for 1988 at 6,900 tons of fodder, 8,600 tons of fruit and 6,000 tons of vegetables. Virtually the whole of this production is transported to, and sold in the Karachi market. With some 102,500 tons of major vegetables and 27,300 tons of major fruit crops entering the market annually (which includes varieties produced in the study area only), production from the study area accounts for about 8% of the throughput of vegetables and around 22% of the

throughput of fruit. Details of supplies of major study areas fruit and vegetable crops entering the Karachi market, and similar crops from elsewhere in Pakistan, are given in Tables F.2.8 and F.2.9. Virtually all vegetables from the study area are sold through the central wholesale market. However, a significant proportion of fruit and fodder crops is sold to pre-harvest contractors, as standing crops, and it is probable that a proportion enters Karachi through channels other than the central wholesale market.

F.2.4.3 Market Share of Selected Vegetables and Fruit

Supplies of fruit arrive on the Karachi market from all areas of the country on a highly seasonal basis (see Table F.2.8 for monthly arrivals). The supply of most varieties of vegetable also fluctuates, although to a lesser extent, according to season. The study area producers enjoy a significant advantage in the production of certain crops which benefit from the relatively warm climate of southern Sindh, and from an extended crop season at both ends which makes it possible to market crops when they are out of season elsewhere in the country. At such times produce from the study area may reach final consumers in the north of the country.

F.2.4.4 Market Regulation

Karachi is a regulated market in terms of the Agricultural Product Markets Act. The original Act pre-dates Independence. The Board of Supply and Prices, under the Ministry of Industries, has overall responsibility for the implementation of the Act which is intended to provide an orderly market structure. Under the Act a Karachi Market Committee was established which is directly responsible for regulating the sale and purchase of, inter alia, fruit and vegetables. It is also responsible for providing amenities at the market to facilitate trade. The Committee also fixes commission rates and market fees on the sale of products and is responsible for licensing.

In addition to overall responsibility for regulating product markets including the control of Market Committees, the Board of Supply and Prices is also responsible for providing market intelligence, market research and the development of new markets. The Karachi Market Committee comprises members who are appointed by the Additional Commissioner, Karachi who is the senior GOS official responsible for the Karachi area. The Committee includes representation of growers, traders, consumers and officials of the GOS administration. The Additional Commissioner also exercises powers delegated to him by the Ministry of Industries (GOS) under the relevant Act to fix wholesale, middlemen and retail prices of a wide range of fruit and vegetables with the objective of controlling prices and preventing profiteering and hoarding.

The Market Committee has day-to-day responsibility for the management and orderly conduct of the market including the collection of market fees, the issue of licences to commission agents and middlemen and other market functionaries (sweepers, baggers, weighmen, etc.), and the collection of price information which is used for the purpose of

price fixing. The Committee employs a member of Market Inspectors (10 at present) who discharge these functions and are also responsible for the implementation of price control.

F.2.4.5 Marketing Chain

The marketing chain comprises growers, traders in the rural areas, pre-harvest contractors (fruit and fodder only), commission agents (who sometimes double as wholesalers), middlemen (who are in effect middlemen/wholesalers), and retailers. Because of the proximity of the study area to the Karachi market it is understood that most producers in the study area directly undertake the transport of their own product to the Karachi wholesale market, thereby bypassing local traders. Elsewhere in Pakistan, particularly where producers are far from markets, local traders act on behalf of commission agents and wholesalers in the towns and undertake local procurement, bulking and primary marketing of products.

Throughout Pakistan fruit crops are generally purchased from owners on a standing crop basis by pre-harvest contractors who are responsible for harvesting the crop and for all aspects of primary marketing. It is understood that some producers in the study area with substantial areas of fruit crops sell their standing crops in a similar manner to pre-harvest contractors. However, in the study area most producers pack and then transport their own products to the Karachi market, generally in the evening or very early in the morning. They usually locally hire transport, which is shared by several producers in the event of small individual consignments.

At the market the products pass into the hands of a commission agent. The commission agent is a key figure in the marketing system for fruit and vegetables. The agent trades in products on behalf of the producers on a commission basis. Producers generally sell regularly through the same commission agent. The commission agent frequently advances loans to producers for the purchase of farm inputs and other purposes, which are recovered by regular deductions from sales. The commission agent has a fixed place of business in the market from which he negotiates sales of vegetables, on behalf of producers, to middlemen/wholesalers in the market. In some cases, the commission agents also function as the wholesaler.

In the case of fruit, the commission agent conducts an auction. In either case, the middleman/wholesaler pays a fee to the Market Committee. It is reported that there is a considerable degree of price collusion between the commission agent and the wholesaler/middleman in both negotiated sales and at auction. The commission agent charges a fee which is generally about 10% of the price received. It is deducted from the price received and the balance is paid by the commission agent to the producer, after deduction of any loan repayments which fall due. It is reported that fees often exceed the fixed commission charge due to under weighing and other deductions.

The middleman/wholesaler works as an intermediary between the wholesale and retail markets. The middleman buys in relatively large quantities from a number of commission

agents and then breaks bulk, sorts and grades to meet the needs of retailers. The middleman also purchases and stores unripe products and holds unsold products for future sale. He may have access to cold storage for this purpose. It is understood that cold storage capacity has been increasing in recent years. The middleman is allowed a fixed mark-up of 10% over the base price (known as the "wholesale" price) which is established and published by the Additional Commissioner Karachi as described below.

Retailers generally come to the market, on a daily base or less frequently, to purchase their requirements from the middlemen/wholesalers. It is reported that middlemen with unsold surpluses of products, particularly of perishable items, will leave the markets to sell to retailers. There are many thousands of retailers in Karachi operating from established shop premises, from stalls in formal and informal markets, and itinerant retailers who sell products, generally fruit, from pushcarts which they rent. Products are frequently supplied to retailers, especially stall and pushcart vendors by the middlemen/wholesalers on credit.

A recent study for the Fruit and Vegetable Storage and Marketing Development Project by Hawaiian Agronomics Inc. has pointed to the strength of the regulated markets and of those engaged in the fruit and vegetable trade which it attributes to their flexibility. This flexibility should be borne in mind in reading the above schematic description of the marketing process.

F.2.4.6 Quality and Grading

The variety, quality, size and conditions of products entering the market are highly variable and there is no formal grading system. However, higher quality products undoubtedly command a markedly higher price which is reflected in informal grading undertaken by commission agents and middlemen/wholesalers as well as retailers. Wholesale prices are fixed, in fact, for first and second grades of produce. First grade is very wide and second grade encompasses products of only the lowest standard.

F.2.4.7 Spoilage

A large quantity of purchase is trucked by road to the Karachi market from the distant producing areas of Baluchistan, NWFP, Punjab and interior Sindh. It might be expected that this would result in relatively high spoilage rates. There is little the information available on the extent of spoilage although one authoritative estimate indicates that wastage amounts to only about 10% of marketed produce. study area producers should enjoy some competitive advantage in this respect due to the short distance from farm to final market.

F.2.4.8 Prices and Margins — Wholesale and Retail

Under the Price Control and Prevention of Profiteering and Hoarding Act, broad powers to control prices are delegated to provincial authorities which include the power to control the price of most fruit and vegetables. In Karachi, the Sindh Government has delegated this responsibility to the Additional Commissioner responsible for the

administration of Karachi District in which the main wholesale fruit and vegetable market is located. The Additional Commissioner posts maximum retail prices, thrice weekly, which are based on the average of prevailing wholesale prices (achieved by commission agents — see above). Prevailing wholesale (or commission agent) prices are established on the basis of price information collected in the market by the Market Inspectors. The mark-up from wholesale price to retail price is also officially established and has long been 30%. The middleman is entitled to one-third of this mark-up, or 10% over the wholesale price, whilst the retailer receives two thirds of the mark-up, or 20% over the wholesale price.

In the case, for example, of bananas the official mark-up operates as follows:

Unit: Rs./dozen			
Quality	Wholesale (1)	Middleman (2)	Retail (3)
Price			
1st Class	8.00	8.75	10.50
2nd Class	5.00	5.50	6.50
Mark-up			
1st Class	n.a	0.75 (10%)	1.75 (20%)
2nd Class	n.a	0.75 (10%)	1.00 (20%)

Remarks: (1) Payable to Commission Agent
(2) Charges to Retailer
(3) Charges to Consumer.

The control is in essence at the retail level. However, penalties for overcharging are only invoked in periods of severe shortage. Controls are enforced to only a very limited extent in part because of wide variation in the size and quality of products which lead to substantial variation in value, and, in part, because of lack of resources for and difficulty in enforcement. However, it is reported that "in the opinion of those that are familiar with marketing in Pakistan, this price control at the retail level tends to influence and stabilize prices further down the marketing chain". Of course, the wholesale price is, in principle, determined on the basis of the average of bargains struck between commission agents and middlemen and is, in principle, a market price. Details of actual average retail prices on the foregoing basis in Karachi (current prices) are given in Table F.2.10 for the period 1985 - 1989.

F.2.4.9 Price Movements

Prices (in current terms) have moved upward, over the period 1985-1989 with a rather sharp increase in 1988 (see Table F.2.10). The trend over the period is shown in Table F.2.11 (on the basis of a three year moving average). Prices in 1989 ranged from 14% to 52% higher (than in 1985) for individual commodities. The rate of price increases for vegetables in Karachi market appears to have been below that for vegetables in the country as a whole, based on the wholesale index for that commodity, but on average similar to the rate of increase in the overall consumer price index.

The rate of price increases for fruit in Karachi market was higher than the wholesale index for fruit in the country as a whole, and higher than the overall consumer price index. Consumer and wholesale, and fruit and vegetable price indices are summarized in Table F.2.12. The rate of increase in prices of fruit and vegetable is rather volatile from year to year but, broadly speaking prices have been at least constant in real terms over the past five years.

F.2.4.10 Farmgate Prices

As previously noted most producers in the study area transport their own vegetable products and, in some cases fruit to the Karachi wholesale market where it is entrusted to a commission agent. The producer receives from the commission agent the wholesale price obtained by negotiated sale or at auction less the authorized commission charge of 10%. There may be other minor deductions. The producer then meets his costs of transport and loading and unloading of products to arrive at the price received at farmgate.

It has been noted above that control on retail prices tends to influence and stabilize prices further down the marketing chain, and that posted wholesale prices, in principle at least, reflect prevailing market prices. Farmgate prices have been estimated for crops grown in the study area on the basis of posted retail prices, less deductions to meet posted middlemen margins, posted commission agent margins, and farmers' marketing costs (farmgate to market). Farmgate prices calculated on this basis are given in Tables F.2.13 and F.2.14, with details of farmers marketing costs. Farmgate prices are equivalent to about 63% of the average retail price of fruit and vegetables in Karachi.

A review of the fruit and vegetable sub-sector was prepared by the Hawaiian Agronomic (International) Inc. in 1985 as part of a feasibility study for the Fruit and Vegetables Storage and Marketing Project. The review included an examination of prices and margins including the earlier in-depth analyses of fruit and vegetable marketing by national and international specialists. Based on this examination the review indicated that "the grower's share of the consumer Rupee in Pakistan is between 40 to 55% for vegetables and between 25 to 40% for fruit, with some examples above these ranges, particularly of the less perishable vegetables, and rare occasions of margins below 25%". It noted the conclusion of the earlier study which reported that "the growers share in the retail price is the least for various fruit crops", and attributed this, in part, to the localization of production and, in part, to the need for specialist services, such as pre-harvest contractors.

A Study Team farm survey gave a wide range to prices received by the study area producers but indicated that they received around 46% of the average retail price of vegetables and around 39% of fruit in Karachi as shown in Table F.2.15. This is likely to understate prices received when allowance is made for the actual tendency on the part of farmers to under-report prices received.

It is considered that prices received by producers in the study area are likely to be higher than overall averages for the country as a whole as reported, for example, in the 1985

study. They may well approach the relative high share of 63% of the retail price noted above. This is because study area producers enjoy a comparative advantage in the production and marketing of their crop in relation to producers outside the Karachi area.

Proximity to Karachi city enables producers to directly market their products into the wholesale market thereby eliminating an intermediary trader margin; the distance to market is short and transport costs are consequently very low in relation to that incurred by producers elsewhere in Sindh or other more distant provinces; roads are relatively good, the distance is short and transport time is reduced so that products arrive within a few hours of picking in relatively good condition and frequent visits to the market by producers lead to better than average market intelligence. The latter should facilitate both the timely production and the timely marketing of crops.

In addition, producers in the study area (as elsewhere in southern Sindh) should benefit from the warm climate which permits production out of season or when better prices are obtainable. It is unlikely, of course, that all producers benefit all the time from these advantages but they are likely to lead to farmgate prices which are significantly higher than average.

F.2.4.11 Price Basis

Based on the foregoing, the financial farmgate prices for all vegetables have been taken, on a conservative basis, for the purpose of project preparation, at 50% of the Karachi average 1989 retail price. The financial farmgate price for fruit has been taken at 40% of the Karachi average 1989 retail price to allow for the cost incurred by pre-harvest contractors engaged by some producers in the study area. Present farmgate prices of fodder, vegetable and fruit crops in the study area are given in Table F.2.16.

The farmgate price of fodder crops and farm inputs are estimated during the field works in late 1989 and early 1990, and given in Table F.2.17. Prices have remained broadly constant in real terms over the past five years and all prices are taken at constant 1989 prices for the purpose of project preparation.

F.2.5 Crop Production Costs and Income

F.2.5.1 Crop Budgets

Crop budgets have been prepared for the twenty major crops grown in the study area. Details of all physical inputs (seed, fertilizer, agro-chemicals, farm machinery and labour) and their costs are given in Tables F.2.18 (1/6 - 6/6) and F.2.19 for each crop together with estimated yield, cost of production and gross margin. The budgets reflect the typical present practices of most study area farmers.

Of course, more progressive farmers operate at higher levels of technology and the more backward farmers at lower levels. However, most are using a range of improved

inputs but in the absence of comprehensive integrated crop packages with extension support and farmer training, yields remain relatively low for most farmers and for most crops. Average gross margins vary widely from crop to crop and between major crop groups as can be seen in the summary table below:

Crops	Gross Income (Rs/ha)	Total P. Cost (Rs/ha)	Gross Margin (Rs/ha)	Labour Input (man-day)	Income (Rs/man-day)
Fodder					
Sorghum	2,875	1,790	1,085	17.5	112
Lucerne	5,838	3,785	2,053	31.0	116
Maize	3,392	2,546	846	20.0	92
Average	<u>4,035</u>	<u>2,707</u>	<u>1,081</u>	<u>22.8</u>	<u>107</u>
Vegetable					
Tomato	11,418	7,471	3,947	72.0	105
Egg Plant	12,005	6,447	5,558	75.5	124
Chilli	7,660	5,759	1,901	68.0	78
Lady's Finger	7,705	4,893	2,812	57.5	99
Sponge Gourd	10,261	5,258	5,003	41.5	171
Bottle Gourd	13,536	5,841	7,695	43.0	229
Cauliflower	40,698	6,843	33,855	64.0	579
Spinach	4,498	4,273	225	35.0	56
Carrot	8,424	5,822	2,602	64.0	91
Radish	7,800	6,200	1,400	64.0	72
Turnip	14,652	6,400	8,252	65.0	177
Peas	9,568	5,754	3,814	60.0	114
Average	<u>12,352</u>	<u>5,913</u>	<u>6,439</u>	<u>59.1</u>	<u>158</u>
Fruit					
Mango	8,983	4,650	4,333	29.8	195
Guava	8,071	4,954	3,117	36.4	136
Chikoo	4,830	3,878	952	26.2	86
Coconut	5,940	4,531	1,409	27.9	101
Papaya	15,257	10,159	5,098	62.0	132
Average	<u>8,616</u>	<u>5,634</u>	<u>2,982</u>	<u>36.5</u>	<u>130</u>

- Remarks: (1) Detailed Crop Budgets see Tables F.2.18 and F.2.19
(2) Costs include costs of family and hired labour
Income per man-day is calculated;
(gross margin + labour cost) ÷ man-days per ha.
(3) Labour input includes harvesting, packing and loading.

As pointed out elsewhere, producers in the study area obtain relatively favorable prices for their output because of their proximity to the final market. This results in relatively attractive gross margins for the overall vegetable and fruit crops. The gross margin after taking account of all inputs, including family and hired labour, is estimated at Rs. 6,440 /ha for all vegetable crops (major and minor) and at Rs. 2,980 /ha for all fruit crops (major and minor). In the case of fodder the average gross margin is relatively small at Rs. 1,330 but fodder is grown largely for feeding to stock maintained by the farmer for his own use.

Farm overhead costs are relatively low (tractors are hired, wells are on electric pumps which require little maintenance or replacement, irrigation is by earth field channel, etc) so that the gross margins largely reflects profit. In the case of fruit crops, the situation is

difficult because the gross margin is required in part to finance the cost of investment in establishing the crop and bringing it into full bearing. The cost of credit, obtained after through market traders, must be taken into account. The effective interest rate equivalent is likely to be high.

F.2.5.2 Production Costs and Crop Income

Crop budget data have been used to estimate total production volume and costs in the study area from the base year (1988). The present annual volume of production and cost for each major crop group is estimated in Table F.2.20. The present situation is summarized in the table below:

Crops	Cropped Area (ha)	Annual Production (tons)	Gross Income (Rs 10 ³)	Total P. Cost (Rs 10 ³)	Crop Income (Rs 10 ³)
Fodder	570	6,890	2,253	1,485	768
Vegetable	1,960	8,700	24,493	12,306	12,187
Fruit	1,200	5,230	9,869	6,002	3,867
Total	3,730	20,820	36,615	19,793	16,822

Present crop incomes are estimated at Rs. 0.8 million for all fodder crops, Rs. 12.2 million for all vegetables, Rs. 3.8 million for all fruit and Rs. 16.8 million for total crop income in the study area.

F.2.6 Farm Income from Crop Production

Present costs of production, income, gross margin and returns per man-day for typical owner-operated and tenant operated farms in the study area are estimated based on the cost of production analyses for 1989/90.

As land tenure data are not available for 1988, tenure data for 1978 are applied to available land holding data for 1988 to determine typical farm sizes. Details of the calculations are given in Table F.2.2. Present average cropped area for farm is calculated at 52.4% for summer season crops and 8.3% for winter season crops. The average cropped areas are 7.3 ha for owner operated farm, 7 ha for owner cum tenant operated farm and 3.7 ha for tenant operated farm

The typical farms are assumed to operate the same cropping pattern as applied in the overall study area in 1988. Farmers typically grow two to three types of fodder crop, 10 main vegetable crops and 10 or more minor vegetable crops, and between 5-10 varieties of fruit.

Farm cost, income and gross margin estimates are based on composite crop groups which reflect the variety of crops grown through the use of weighted averages for crops within each major group, viz., fodder, vegetables and fruit (see Table F.2.20).

Costs, income and gross margin for each type of farm are given in Table F.2.21 for the typical owner-operated, owner cum tenant operated and tenant operated unit. They are summarized as follows:

Item	Unit	Owner Operated	Owner/Tenant Operated	Tenant Operated
Average Holding Size	ha	12.1	11.5	6.1
Cropped Area	ha	7.3	7.0	3.7
Crop Production	tons	40.9	38.8	20.6
Gross Income	Rs.	72,330	68,743	36,464
Production Cost	Rs.	39,284	26,794	14,267
Landlord's Share	Rs.	not applicable	17,186	18,232
Gross Margin	Rs.	33,046	24,763	3,965
Labour Income	Rs.	not applicable	4,100	8,700
Family Income	Rs.	33,046	28,838	12,665
Labour Requirement	man-day	not applicable	82	174
Man-day Equivalent	Rs./m-d	not applicable	not applicable	73

Remarks : Cost of labour income is estimated at Rs.50 per man-day.

The estimates indicate that the gross margin on the owner operated farm after meeting all production costs (including family and hired labour) amounts to Rs. 33,050 or Rs. 4,530 /ha. If the owner and his family work in the farm using only family labour then the family would receive additional income amounting to Rs. 17,200 annually. The total labour requirement is estimated at 344 adult male man-days annually. Costs include hired tractor for cultivation and land levelling operations, the operation and maintenance of wells, the maintenance of irrigation channels, and all annual inputs. Overhead costs to be deducted from the gross margin available are limited to the replacement of sprayers and hand tools and management costs.

In the case of the tenant farmer after meeting all production costs (including payment of all family or other labour) the gross margin is only Rs. 3,965. The small gross margin is in part attributable to the smaller farm size, but principally due to the payment of 50% of the gross value of the crop to the landlord/owner of the land. The family income of the tenant (assuming that all labour is supplied from within the family and excluding minor overhead costs) amounts to Rs. 12,670 annually. It is equivalent to 253 man-days of work at the prevailing agricultural wages rate for adult males of Rs. 50 per man-day in the study area. Actual man-day (adult male) required to operate the 3.7 ha unit at existing levels of productivity is estimated at 174 only.

F.2.7 Employment in Crop Production

Labour requirement in the study area is estimated the aggregate volume of on farm employment in crop production on the basis of present cropped area using crop budget data. Employment provided in crop production on 3,730 ha is estimated at some 168,400 adult male man-days in 1988 generating a total annual income of some Rs. 8.4 million (see Table F.2.22). Average labour requirement per ha is 45 man-days. They are summarized as follows:

Crops	<u>Summer Season</u>		<u>Winter Season</u>		<u>Annual Requirement</u>
	Area (ha)	Man-day	Area (ha)	Man-day	Man-day
Fodder Crops	490	10,925	80	1,600	12,525
Vegetables	1,530	95,640	430	21,110	116,750
Fruit	1,200	39,120	-	-	39,120
Total	<u>3,220</u>	<u>145,685</u>	<u>510</u>	<u>22,710</u>	<u>168,395</u>

F.3 AGRICULTURAL SUPPORT SYSTEM

F.3.1 Agricultural Extension

The Director of Agriculture (Extension) controls extension activities through two General Directors of Agriculture (DA), one in Hyderabad and one in Sukkan Division. At his headquarters, he is assisted by specialist staff officers, a ADA (Administration) and a ADA (Economics and Marketing).

The two divisional ADAs supervise Extra Assistant Directors of Agriculture (EADA) in each district, who are in charge of all agricultural extension activities. Each Divisional ADA has specialist staff officers for horticulture and plant protection. The district EADAs supervise about 200 Agricultural Officers (AO), who supervise about 700 Field Assistants (FA). Each EADA is assisted by an Assistant Plant Protection Officer (APPO) who acts as a district subject matter specialist in plant protection matters. In each district there is also an EADA (Economics and Marketing) who reports to the ADA (E&M) at Headquarters.

A Field Assistant (FA) is expected to contact over 1,000 farmers. Most FAs live on the farms of the larger landlords, to whom many eventually become obligated to provide various services. Each FA is supported by one or two trained laborers (beldar) who are recruited from the local farming community and usually live on their family farms or in the villages. The beldar's duties involve practical teaching and demonstration work under the supervision of the FAs. The FAs and the beldars are involved in the sale and application of pesticides, mainly for cotton and orchards. The FAs spend about two-thirds of their time in the cotton season (kharif) on pest control. In rabi, they mainly work on orchards and, to a limited extent, on Brassica oilseeds. This takes about one-third of their time. The FAs sell about 10-15% of the pesticides and 20-25% of the sprayers used in the Province, and complete various statistical returns for the EADAs. The Department of Agriculture also assigns up to 20% of the FAs in cotton growing areas to ginneries during the Rabi season to supervise the selection and ginning of batches of seed cotton from fields that have produced a good crop. Therefore, time available for advice to farmers on crop husbandry is limited and irregular.

Since the FAs are busy with other work, it is left to the AOs to advise farmers on crop husbandry. The AOs, who are graduates in agriculture, also work almost exclusively with the larger, more progressive farmers; the small farmers may learn of some innovations from neighbors, from the radio or from seeing the new techniques in demonstration plots on the large farmers' land. Field days, which would make demonstrations an effective teaching tool, are infrequent and poorly conducted.

Since May 1978, the Department of Agriculture has changed over its method of operation to conform the principles of the Training and Visits (T&V) System, for which it received technical assistance from the World Bank. There are now clear job descriptions for all staff levels. Day-by-day work schedules for FAs and AOs have been prepared and are being followed. However, the middle and lower levels of the service, especially the older

individuals, find it difficult not to count achievements as quantity of pesticides sold and crop acreages sprayed. More importantly, the FAs and the AOs are under some pressure from the larger farmers to maintain the exclusive services which they used to render before the adoption of the T&V System. This pressure extends even to the EADAs.

As illustrated in Fig. F.3.1, the organization of agricultural extension in Karachi area is assigned by one EADA under the supervision of Director of Agriculture Extension, Hyderabad. Under the ADA Karachi Office, there is one Agriculture Office located at Malir, and one APPO assists and advise 5 AOs and 9 FAs. In the study area, total number of AOs and FAs are 4 and 7, respectively, and covered 4 Union Councils, 32 Dehs and about 1,000 farmers, and illustrated on Fig. F.3.2.

F.3.2 Agricultural Research

Agricultural research is being conducted by 6 organizations, i.e. the Agricultural Research Institute, the Rice Research Institute, the Sindh Agricultural University Tando Jam, the Atomic Energy Agricultural Research Institute, Horticulture Research Institute Mirpurkhas and the Cotton Research Institute.

- (a) The Agricultural Research Institute (ARI): The institute is located in Tando Jam and is headed by a Director. It has 13 research sections which deal with all crops except rice; plant protection; soil fertility investigations and agricultural engineering investigations.
- (b) The Rice Research Institute (RRI): The institute is in Dokri and is also headed by a Director. It was built up to its present level only in 1977; it has departments for plant breeding, agronomy, pathology, entomology, engineering, etc. It also deals with the agronomy of the rabi crops that follow rice under the different climatic and water supply conditions of the Sindh. There are close and fruitful contacts with the International Rice Research Institute (IRRI) in the Philippines at the Director and department head level and also a satisfactory formalized exchange of information and flow of technical assistance.
- (c) The Sindh Agricultural University, Tando Jam: The University's principal function is agricultural education. Its faculty heads also engage in research work and conduct agro-economic investigations as part of their students' graduate studies.
- (d) The Atomic Energy Agricultural Research Institute. This institute is also in Tando Jam. Its main function is agricultural research in connection with nuclear physics.

- (e) The Horticulture Research Institute, Mirpurkhas : The institute is located in Mirpurkhas and is headed by Director. The institute carries out research, mostly on vegetables and fruit in its sub-stations located in various places of Sindh province. Vegetable and fruit specialists are the heads at different stations.

The government of Sindh Sanctuaries a Scheme "Creation of Vegetable Research Station" in January 1975 at Laundhi Farm. Karachi (project area), but due to non-availability of irrigation water and other technical problems, the said scheme was shifted to sub-station, Sindh Horticulture Research Institute, Mirpurkhas in December 1976.

The main objectives of Vegetable Research Station to maintain germ plasma of different kinds of vegetables, to evolve high yielding early maturing and discuss resistance varieties by introduction, selection and hybridization varieties of vegetables for commercial plantation, to ascertain the optimum agronomical operation for obtaining maximum yield. Personal contacts are kept with progressive growers in Mirpurkhas area by vegetable specialists on frequent basis resulted more awareness in the mind of growers and adaptation of high yielding varieties.

The site already established in project area could start functioning if the proposed dam(s) are constructed. The impact of research station would be highly significant on the farmers of vegetables in the project area if they provided with high yielding early maturing and disease resistance varieties.

- (f) The Cotton Research Institute: The institute, in Sakrand, functions under the auspices of the Pakistan Central Cotton control Committee (PCCC) but, because of its location, it deals exclusively with cotton-growing problems pertaining to the Sindh province. The institute is still being built up; its most significant contribution to date has been its operation of the Cotton Maximization Scheme (CMS). The CMS operates in one taluk in Hyderabad and Nawabshah districts. The scheme controls its own staff and maintains contacts with the regular extension service only at the FADA and AO level.

The six research organizations come under four separate authorities: ARI Tando Jam, Horticulture Research Institute and RRI Dokri under the Secretary for Agriculture, GOS; the Sindh Agricultural University Tando Jam under the Secretary for Education, GOS; the Cotton Research Institute under the PCCC, a Federal body; and the Atomic Agricultural Research Institute under the Pakistan Atomic Energy Authority, also a Federal organization. Apart from the first two, the interchange of ideas and contacts are entirely informal at the Provincial level; the only formal link is through the Pakistan Agricultural Research Council.

The institutes are reasonably well equipped, but their effectiveness suffers from a dearth of operating funds, insufficient adaptive field work and inadequate linkage with the

extension service. Their field stations are too few for effective testing of research findings in all the various agroclimatic zones of the province; shortage of operating funds makes it necessary to reduce the scope of the field stations' work drastically, frequently below that required for efficient operation. The outstations maintain only minimal contact with the extension service and, therefore, frequently it is the large farmers themselves who initiate the final adaptive trials on their own fields before a recommendation by a research station becomes available.

The research findings at different research stations are carried to farmers through Agricultural Extension Department of Sindh. The coordination between agricultural research institutes and agricultural extension is through Sindh Coordination Committee. The committee meets every month to review their performance, bring new ideas and problems of the growers. Future plans and policies are made in the meetings.

F.3.3 Sindh Seed Corporation

Sindh Seed Corporation is legally, operationally and financially an autonomous organization. The organization work as modern seed industry in the province involving variety release, multiplication processing, certification, storage and marketing of seeds for wheat, rice, and cotton. The corporation procures good quality pre-basic seeds of wheat and cotton from Agricultural Research Institute Tando Jam and of rice from Rice Research Institute, Dokri. The seeds are also produced at different government farms. The corporation selects progressive farmers for multiplication of seeds. To maintain the quality of the seed, supervisory staff is available to supervise. Corporation distributes seed through a network of agencies in town and rural areas and fix the wholesale and retail prices of improved seeds.

Corporation started function from March 1976 under the administrative control of Board of Directors being a Managing Director as Head of the Organization. During the year 1987-88, 5,714 kg of wheat seed was procured whereas 964 kg of paddy and 2,337 kg of cotton seed was gained.

Sindh Seed Corporation has not been involved in vegetables, fruit and fodder crops so far. Therefore the agencies of this corporation are not established in the project area. This is only the corporation guarantees high quality seed. Thus the organization should strengthen its scope to fodder, vegetables and fruit, and also establish its agencies in the study area.

F.3.4 Sindh Agriculture Supplies Organization

Fertilizer marketing in the province is done by the operators of the Daharki plant, Exxon Chemical (Pakistan) Ltd., the National Fertilizer Corporation (NFC) who are supplied by all the public sector plants in the country and the Sindh Agricultural Supply Organization (SASO) which handles only imported products. SASO operates some sales parts in the more remote areas with their own staff. In all SASO has established 13 bulk depot, 79 sub-bulk depot and 51 sales point respectively in Sindh province.

Karachi area has only one sub-bulk depot of SASO which is located in one of the major towns (Memon Goth) of the project area. This sales point serves for providing fertilizer in the project area. Reports are being made for non-availability of fertilizer during the months of cultivation of various crops in August and September.

F.3.5 Agricultural Credit

The Agricultural Development Bank of Pakistan (ADBP) has been continuing the "Supervised Credit Programme" since 1979. This programme is to extend credit to borrower farmers with technical guidance by Mobile Credit Officers of the ADBP.

There is one (1) branch office of ADBP in the project area. The office started operation in 1987 and two (2) mobile credit officers cover the whole project area. As of the end of 1989, some 230 borrowers, most of whom are poultry raisers, availed of the development credit with the amount of about 106 million Rupees. Only one case of production loan for procurement of fertilizer, seeds, etc. was recorded. It seems that credit from the ADBP is not so popular for small farmers so far.

F.4 FUTURE AGRICULTURAL PROSPECTS

F.4.1 General Description

The objectives of the project is to re-charge the phreatic aquifer and maintain a stable supply of water for irrigation, livestock and domestic purposes in the project area. The project would include the design and construction of a dam on the Mol river to store seasonal run-off during the monsoon a proportion of which currently drains to the sea. The stored water would be released so as to increase the re-charge to the aquifer which underlies the area. The operation and maintenance of the dam would be the responsibility of the GOS Department of Irrigation and Power. The project would also support the establishment and operation of an adaptive research and demonstration farm which would develop methods designed to lay the basis for the intensification of crop production.

The direct operational benefits of the project are summarized as follows:

- a) the continuing decline in the cropped area would be arrested and additional land, under command from existing wells, would be cropped,
- b) production of existing crops would be rapidly increased pro rata to area by existing farmers using the technologies which are already available to them, and
- c) incremental production would find a ready market in Karachi at prices which are profitable to producers.

The project offers substantial other benefits to the population of the area. The population is relatively large and density is relatively high for what is a predominantly rural area. There is considerable infrastructure in the area (roads, power supplies, schools, houses, etc). Without the project, there would be a continuing depletion of water supplies resulting in a reduction in agricultural and related employment.

The direct beneficiaries of the project would be the farm families numbering around 700, in the project area who operate small, medium and larger holdings and several thousand other households who would benefit from a secure long term supply of water for household and other purposes. The project would generate additional income and employment and augment the supply of fruit and vegetables to the nearby Karachi market. The project area covers some 13,900 ha and its boundary has been determined by reference to the underlying aquifer which is the source of irrigation water. For the purpose of project preparation it is assumed that all farms are under command from wells supply sources in the project area.

However, in order to maximize long term benefits from the incremental supply of water it will be necessary to:

- a) establish a mechanism to control the volume of water withdrawn, and

- b) develop supporting services to assist farmers to increase crop yields from their existing low average levels.

F.4.2 Crop Production

F.4.2.1 General

This section considers the prospects for crop production without the proposed investment in water resource development and the prospects with the proposed investment under the project. It then considers incremental production arising from implementation of the project. The details are described in ANNEX-E.

F.4.2.2 Future Cropped Area

The WAPDA study in 1979 estimated that the irrigated area, cropped area, and crop production in the project area would decline by 70% over a period of 50 years in the absence of investment to develop the water resources. The decline would occur steadily over the period as a result of the continued depletion of the aquifer as a result of over-pumping by farmers.

It would be possible to decrease the rate of pumping and stabilize the aquifer at its present level, and even improve it without investment, provided that agreement to do so could be reached by all farmers in the project area, and that farmers would implement the agreement. This seems unlikely to occur without the project and the Study Team concurs with the view taken in the WAPDA study that cropped area is in long term decline.

In 1978 more water was available than in 1988, and some 5,960 ha was cropped of which 960 ha. or 16% was cropped with fodder, 3,260 ha or 55% with vegetables and 1380 ha. or 23% with orchard crops and 360 ha with other crops. At that time the summer and winter cropped area ratio was approximately 2:1. For the purposes of project preparation the Study Team has reviewed a range of possible changes in the cropping pattern. It has concluded that a conservative scenario is one which takes account of an apparent long term decline in the priority accorded to fruit crops, (especially mangoes) which is probably attributable to high water demand, which maintains the production of fodder crops at its 1988 level with the increased area allocated to vegetables.

In the case of fodder, which also has a high water demand, some change is anticipated in the type of fodder grown and the growing period. The readily available data do not permit a reasonable level of accuracy in projecting the medium and longer term profitability of the very wide range of crops grown in the project area. This combined with the tendency of producers to continue with established crops and cropping patterns in the absence of secure and dramatic changes in relative profitability of different crops suggests the likely continuation of past patterns. It is also assumed that the proportions of each type of major fodder, vegetable and fruit type will remain broadly as in 1988.

The rate of depletion of the aquifer in recent years has been re-assessed (see ANNEX-D). It is now estimated that without investment under the project the cropped area will decline from some 2,960 ha in 1988 to some 2,730 ha in future. Assuming that yields can be maintained at current levels, and that there are no compensatory changes in the cropping pattern, production of fodder, fruit and vegetables would fall by a similar percentage to the fall in cropped area. This is the base case for the purpose of project preparation. The projected cropped area are summarized in the following table and given in Table F.4.1.

Cropped Area	WAPDA Study in 1978	JICA Study	
		1988	1996
Summer Season	<u>4,070</u>	<u>2,600</u>	<u>2,400</u>
- Fodder	530	170	150
- Vegetables	1,920	1,250	1,250
- Fruit	1,380	1,180	1,000
Winter Season	<u>1,880</u>	<u>360</u>	<u>330</u>
- Fodder	370	50	40
- Vegetables	1,510	310	290
Total	<u>5,960</u>	<u>2,960</u>	<u>2,730</u>

F.4.2.3 Crop Production Without and With Project

Controlled re-charge of the aquifer using the stored water would commence in 1995 and continue in 1996. It is considered that the cropped area will continue to decline during this period, as a result of continued over-pumping, from 2,960 ha in 1988 to 2,730 ha in future. It is estimated that controlled recharge will enable the cropped area to be increased after completion of the project and that at the full development stage, the water supply will be sufficient to permit a sustainable level of cropped area of 6,500 ha (4,350 ha irrigated) with a cropping intensity of 1.5. The cropped area with project and the increase compared to without project situation are given in Table F.4.1.

The project would make a contribution to the intensification of crop production in the project area through the establishment of an research, training and demonstration farm to provide for adaptive research including the testing of crop packages, alternative technologies, including irrigation techniques and management practices to meet the needs of farmers in the area. The farm would also serve to some extent as a focus for extension and demonstration activities in the project area.

Fruit and vegetable crop yields achieved by producers in the project area are significantly lower than those generally achieved by progressive farmers in the Hyderabad Division of southern Sindh as stated in ANNEX-E. The restoration of a reliable and properly managed supply of water under the proposed project would create the conditions for the development of more intensive fruit and vegetable production system in the Project area. With the provision of on-farm investment and the strengthening of supporting services, it

should be possible for the relatively small number of project area producers to achieve yield levels similar to those now being obtained in Hyderabad Division. The details are described in ANNEX-E.

The incremental cropped area and crop production with and without project are given in Table F.4.2. Incremental crop production at full development would amount to some 2,056 tons of fodder, 39,690 tons of vegetables, 2,498 tons of fruit and 44,244 tons of total crops, as summarized below:

Items	Without Project	With Project	Increment
Cropped Area (ha) :			
- Fodder	190	200	10
- Vegetables	1,540	5,300	3,760
- Fruit	1,000	1,000	-
Total	<u>2,730</u>	<u>6,500</u>	<u>3,770</u>
Crop Production (tons) :			
- Fodder	2,340	4,400	2,060
- Vegetables	6,960	46,646	39,686
- Fruit	4,760	7,256	2,496
Total	<u>14,060</u>	<u>58,302</u>	<u>44,242</u>

F.4.3 Markets and Prices

There is a ready market for incremental fodder, fruit and vegetable production from the project area which will result from the implementation of the proposed project. As discussed in Section F.2.4, and on the basis of past performance, retail and farmgate prices of vegetables and fruit are likely to remain constant in real terms for the foreseeable future and this assumption has been adopted for the purpose of project preparation.

Karachi market price data are not available on a reliable basis for fodder crops. It is assumed that the prevailing 1989/90 farmgate price of fodder in the project area will be maintained in real terms. Farmgate prices are given in Table F.4.3.

F.4.4 Irrigation Benefits

F.4.4.1 Crop Budgets

The project would provide for the construction of a dam to recharge the aquifer underlying the central flood plain thereby supplying the water resources required for additional sustainable cropping. It is possible, of course, that there would be some increment in overall average yields, in line with the general experience in Sindh agriculture over the past two decades, resulting from a generalized (rather than project specific) adoption of improved methods of farming with a commensurate increase in all farm inputs.

Crop budgets under without and with project condition are estimated for 18 major crops grown in the project area, and given in Table F.4.4. The present agricultural condition would not change significantly unless a proposed project could be implemented. The production costs under without project condition is estimated on the basis of these under the present condition. The production costs would increase under with project condition. This anticipated increase is primarily attributable to increase of expenses for fertilizers, agro-chemicals and labours due to the proposed farming practices with reference to the Crop Guide by the DOAE.

F.4.4.2 Net Irrigation Benefits

Crop budget data have been used to estimate total volume of production costs and income in the project area at the full development stage. The annual increase in the cropped area under with project is shown in Table F.4.1 for the three major crop groups (Fodder, Vegetables, Fruit). The full development stage will be attained after 5 years of build-up period from the completion of construction work. It is projected to increase from 2,730 ha in 1996 to 6,500 ha as a consequence of the increased supply of irrigation water. The cropped area under without project is projected to continue same area of 2,730 ha so that the incremental cropped area resulting from the project would amount to 3,770 ha at full development stage.

The annual volume of production, costs and income without project and with project at full development stage are shown in Tables F.4.5, F.4.6 and F.4.7, and summarized in the table below.

Items	Without Project	With Project	Increment
Cropped Area (ha):			
Fodder	190	200	10
Vegetable	1,540	5,300	3,760
Fruit	1,000	1,000	-
Total	2,730	6,500	3,770
Crop Income (10³ Rs.):			
Fodder	889	1,668	779
Vegetable	19,495	138,675	119,180
Fruit	13,269	20,788	7,519
Total	33,653	161,131	127,478
Total Costs (10³ Rs.):			
Fodder	607	914	307
Vegetable	9,685	43,057	33,372
Fruit	4,918	5,893	975
Total	15,211	49,864	34,653
Net Crop Income (10³ Rs.):			
Fodder	282	755	473
Vegetable	9,810	95,618	85,808
Fruit	8,351	14,894	6,543
Total	18,442	111,267	92,825

Total income from crop production (in constant 1989 prices) is projected to increase from Rs. 18.4 million under without project to Rs. 111.3 million under with project at full development. Incremental annual income from crop production is projected to be Rs. 92.8 million annually at the full development stage.

The incremental cost and income streams are at constant 1989 financial costs and prices. When converted to economic costs and prices, and discounted, they provide a measure of the project costs and benefits at farmgate. Overall project economic costs and benefits, including the costs of dam construction and operation, are considered in ANNEX-I.

F.4.5 Farm Budget Analysis

Crop production, crop income, production cost and gross margin for typical owner-operated and tenant operated farms in the project area are estimated without and with the project condition, and given in Table F.4.8. As a result of the average cropped area without and with project, the average owner/owner-tenant operated farm would increase from 6.7 ha. to 16.5 ha., and the average tenant operated farm from 3.4 ha. to 8.3 ha.

Farm cost, income and gross margin estimates are based on composite crop group estimates derived as previously described. Costs, income and gross margin for the typical owner operated farm are summarized as follows:

Items	Unit	Owner Operated Farm		
		Without Project	With Project	Increment
Average Holding Size	ha	12.1	12.1	-
Cropped Area	ha	6.7	16.5	9.8
Crop Production	tons	34.6	148.2	113.6
Gross Income	10 ³ Rs.	82.9	412.1	329.2
Production Cost	10 ³ Rs.	37.0	126.2	89.2
Gross Margin	10 ³ Rs.	45.9	285.9	240.0
Labour Income	10 ³ Rs.	16.7	57.3	40.6
Family Income	10 ³ Rs.	62.6	343.2	280.6
Labour Requirement	man-day	334	1,146	813
Man-day Equivalent	Rs./m-d	137	196	59

The estimates indicate that the gross margin on the typical owner-operated unit after meeting all production costs (including family and hired labour) would increase from Rs. 46 x 10³ without project to Rs. 286 x 10³ with project mainly as a result of the increase in cropped area and unit yield. The incremental gross margin is Rs. 240 x 10³. If the owner and his family work the farm using only family labour, then the family would receive additional income amounting to Rs. 17 x 10³ (without project) and Rs. 57 x 10³ (with project) annually. The total labour requirements are estimated at 334 (without project) and 1,146 (with project) adult male man-day annually, respectively.

Costs, income and gross margin for the typical tenant operated farm are summarized as follows:

Items	Unit	Tenant Operated Farm		
		Without Project	With Project	Increment
Average Holding Size	ha	6.1	6.1	-
Cropped Area	ha	3.4	8.3	4.9
Crop Production	tons	17.5	74.4	57.3
Gross Income	10 ³ Rs.	42.0	208.0	166.0
Production Cost	10 ³ Rs.	13.6	46.3	32.7
Landlord's Share	10 ³ Rs.	21.0	104.0	83.0
Gross Margin	10 ³ Rs.	7.4	57.7	50.3
Labour Income	10 ³ Rs.	8.5	28.9	20.4
Family Income	10 ³ Rs.	15.9	86.6	70.7
Labour Requirement	man-day	169	579	410
Man-day Equivalent	Rs./m-d	94	150	56

In the case of the tenant farmer after meeting all production costs (including payment of family or other labour) the farm gross margin are only some Rs. 7.4 x 10³ (without project) and Rs. 57.7 x 10³ (with project). Annual incremental income is Rs. 50.3 x 10³. The family income of the tenant (assuming that all labour is supplied from within the family) would increase from Rs. 15.9 x 10³ annually (without project) to Rs. 86.6 x 10³ (with project). The income with project would be equivalent to 150 Rs./man-day of work, compared to 94 Rs./man-day without project.

F.4.6 Employment in Crop Production

Incremental farm employment that is the aggregate and incremental labour requirement in crop production is estimated on the basis of cropped area using crop budget data. The results are given in Table F.4.9, and summarized as follows:

Crops	Without Project		With Project		Increment Man-day
	Area (ha)	Man-day	Area (ha)	Man-day	
Fodder	190	4,900	200	8,600	3,700
Vegetables	1,540	93,288	5,300	395,316	302,028
Fruit	1,000	37,385	1,000	46,390	9,005
Total	2,730	135,573	6,500	450,306	314,733

On-farm employment provided in crop production would increase from some 136 x 10³ man-days without project to some 450 x 10³ with project at full development. Total annual labour income would increase from Rs. 6.8 million to Rs. 22.5 million over the same period. Incremental annual employment with project at full development would amount to some 315 x 10³ man-day compared to without project situation at the time and incremental annual labour income to Rs. 15.7 million. Total and incremental employment and labour income does not include related off farm employment in the project area or elsewhere, or the harvesting of the fruit crop.

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TABLES

Table F.2.1 POPULATION DENSITY AND HOUSEHOLD SIZE IN THE STUDY AREA, 1989

Name of Deh and Union Concl	Total Area (Km2)	Total Population	Population Density (persons/Km2)	No of Households	Household Size
DARSANO CAHANNO					
1) Bail	9.7 *	138	14	33	4.2
2) Kathore	24.6 *	2,703	110	575	4.7
3) Amilano	11.5	1,248	109	290	4.3
4) Khadeji	4.5 *	52	12	11	4.6
5) Chuhar	29.8	4,735	159	877	5.4
6) Koter0	25.7	3,753	146	682	5.5
Sub-total	<u>105.8</u>	<u>12,629</u>	<u>119</u>	<u>2,468</u>	<u>5.1</u>
KANKAR					
1) Bazar	22.0	2,722	124	534	5.1
2) Darsano Channo	24.4	8,186	335	1,462	5.6
3) Kharkharo	32.1	4,853	151	851	5.7
4) Malh	15.9	24,393	1,534	4,435	5.5
Sub-total	<u>94.4</u>	<u>40,154</u>	<u>425</u>	<u>7,282</u>	<u>5.5</u>
LANDHI					
1) Kharkhar	9.9	3,493	353	647	5.4
2) Sanhro	10.1	5,666	561	944	6.0
3) Landhi	10.2	11,439	1,121	1,875	6.1
4) Khanto	5.3 *	5,600	1,057	949	5.9
Sub-total	<u>35.5</u>	<u>26,198</u>	<u>738</u>	<u>4,415</u>	<u>5.9</u>
THANO					
1) Thano	6.6	11,391	1,726	2,109	5.4
Sub-total	<u>6.6</u>	<u>11,391</u>	<u>1,726</u>	<u>2,109</u>	<u>5.4</u>
Total	242.3	90,372	373	16,274	5.6

Source : 1981 Census Report, Karachi Division, May 1984

Population Census Organization Statistics Division, Government of Pakistan

Remarks : (*) ; These area are estimated in the study area only.

Table F.2.2 SIZE OF HOLDING, NUMBER OF FARMERS AND TENURE

Description	Holding Size						Total	
	Under 5 ha		5 - 20 ha		Over 20 ha		1978	1989
	1978	1989	1978	1989	1978	1989		
A. Number of Farmers								
Owner	115	81	56	71	56	33	227	185
(%)	(13.8)	(11.6)	(6.7)	(10.2)	(6.7)	(4.7)	(27.3)	(26.5)
Owner/ Tenant	70	49	60	76	34	20	164	145
(%)	(8.4)	(7.0)	(7.2)	(10.9)	(4.1)	(2.9)	(19.7)	(20.8)
Tenant	314	222	108	136	18	10	440	368
(%)	(37.8)	(31.8)	(13.0)	(19.5)	(2.2)	(1.4)	(52.9)	(52.7)
Total	<u>499</u>	<u>352</u>	<u>224</u>	<u>283</u>	<u>108</u>	<u>63</u>	<u>831</u>	<u>698</u>
	(60.0)	(50.4)	(27.0)	(40.5)	(13.0)	(9.0)	(100)	(100)
B. Farm Area (ha)								
Owner	258	161	555	794	1,208	1,277	2,021	2,232
(%)	(4.6)	(2.6)	(9.8)	(12.9)	(21.3)	(20.8)	(35.7)	(36.4)
Owner/ Tenant	218	136	535	766	720	762	1,473	1,664
(%)	(3.8)	(2.2)	(9.4)	(12.5)	(12.7)	(12.4)	(26.0)	(27.1)
Tenant	884	550	892	1,276	395	418	2,171	2,244
(%)	(15.6)	(9.0)	(15.7)	(20.8)	(7.0)	(6.8)	(38.3)	(36.5)
Total	<u>1,360</u>	<u>847</u>	<u>1,982</u>	<u>2,836</u>	<u>2,323</u>	<u>2,457</u>	<u>5,665</u>	<u>6,140</u>
	(24.0)	(13.8)	(35.0)	(46.2)	(41.0)	(40.0)	(100)	(100)
C. Average Size of Farm (ha/farmer)								
Owner	2.24	1.99	9.91	11.18	21.57	38.70	8.90	12.06
Owner/ Tenant	3.11	2.78	8.92	10.08	21.18	38.10	8.98	11.48
Tenant	2.82	2.48	8.26	9.38	21.94	41.80	4.93	6.10
Average	<u>2.73</u>	<u>2.41</u>	<u>8.85</u>	<u>10.02</u>	<u>21.51</u>	<u>39.00</u>	<u>6.82</u>	<u>8.80</u>

Source : WAPDA report, 1979 and Karach East District Revenue office
(see Table F.2.4)

Remarks : Owner ; Owner operates the land himself.
Owner cum tenant ; The farmer owned the land and the remaining part is
owned by others, but cultivated on a share-cropping basis.
Tenant ; Land is not owned but farmed on a share-cropping basis.

Table F.2.3 SIZE OF HOLDING AND NUMBER OF FARMERS IN THE ADMINISTRATIVE AREA

(a) Number of Farmers by Size of Holding										Unit : Nos.
Name of Deh and Union Council	Holding Size (ha)									Total
	Under 1	1 - 5	5 - 10	10 - 20	Over 20					
DARSANO CAHANNO										
1) Bail		3 (0.3%)	1 (0.1%)	3 (0.3%)	1 (0.1%)					8
2) Kathore	2 (0.2%)	21 (2.1%)	18 (1.8%)	20 (2.0%)	14 (1.4%)					75
3) Amilano		9 (0.9%)	9 (0.9%)	3 (0.3%)	4 (0.4%)					25
4) Khadeji		10 (1.0%)	14 (1.4%)	3 (0.3%)	2 (0.2%)					29
5) Chuhar	2 (0.2%)	11 (1.1%)	7 (0.7%)	5 (0.5%)	5 (0.5%)					30
6) Koteri	1 (0.1%)	4 (0.4%)	13 (1.3%)	16 (1.6%)	1 (0.1%)					35
Sub-total	5 (0.5%)	58 (5.7%)	62 (6.1%)	50 (4.9%)	27 (2.6%)					202
KANKAR										
1) Bazar	4 (0.4%)	18 (1.8%)	13 (1.3%)	12 (1.2%)	4 (0.4%)					51
2) Darsano Channo	12 (1.2%)	41 (4.0%)	22 (2.1%)	7 (0.7%)	7 (0.7%)					89
3) Kharkharo	22 (2.1%)	17 (1.7%)	29 (2.8%)	15 (1.5%)	17 (1.7%)					100
4) Malh	17 (1.7%)	61 (6.0%)	30 (2.9%)	18 (1.8%)	4 (0.4%)					130
Sub-total	55 (5.4%)	137 (13.4%)	94 (9.2%)	52 (5.1%)	32 (3.1%)					370
LANDHI										
1) Kharkhar		12 (1.2%)	17 (1.7%)	22 (2.1%)	5 (0.5%)					56
2) Sanhro	13 (1.3%)	44 (4.3%)	17 (1.7%)	11 (1.1%)	9 (0.9%)					94
3) Landhi	14 (1.4%)	63 (6.2%)	17 (1.7%)	14 (1.4%)	15 (1.5%)					123
4) Khanto		47 (4.6%)	9 (0.9%)	5 (0.5%)						61
Sub-total	27 (2.6%)	166 (16.2%)	60 (5.9%)	52 (5.1%)	29 (2.8%)					334
THANO										
1) Thano	11 (1.1%)	67 (6.5%)	21 (2.1%)	13 (1.3%)	6 (0.6%)					118
Sub-total	11 (1.1%)	67 (6.5%)	21 (2.1%)	13 (1.3%)	6 (0.6%)					118
Total	98 (9.6%)	428 (41.8%)	237 (23.1%)	167 (16.3%)	94 (9.2%)					1,024
(b) Area of Farm by Holding Size										Unit : ha
Name of Deh and Union Council	Holding Size (ha)									Total
	Under 1	1 - 5	5 - 10	10 - 20	Over 20					
DARSANO CAHANNO										
1) Bail		10.5 (0.1%)	9.1 (0.1%)	41.8 (0.5%)	21.6 (0.2%)					83.0
2) Kathore	0.8 (0.0%)	68.9 (0.8%)	133.7 (1.5%)	271.5 (3.0%)	538.9 (6.0%)					1,013.8
3) Amilano		23.2 (0.3%)	67 (0.7%)	40.3 (0.4%)	112.2 (1.2%)					242.7
4) Khadeji		39.5 (0.4%)	98.7 (1.1%)	48.2 (0.5%)	48.6 (0.5%)					235.0
5) Chuhar	1.2 (0.0%)	29.9 (0.3%)	45.4 (0.5%)	65.5 (0.7%)	307.7 (3.4%)					449.7
6) Koteri	0.2 (0.0%)	16.3 (0.2%)	95.8 (1.1%)	207.5 (2.3%)	28.7 (0.3%)					348.5
Sub-total	2.2 (0.0%)	188.3 (2.1%)	449.7 (5.0%)	674.8 (7.5%)	1057.7 (11.7%)					2372.7
KANKAR										
1) Bazar	0.4 (0.0%)	43.3 (0.5%)	95.2 (1.1%)	180.2 (2.0%)	126.1 (1.4%)					445.2
2) Darsano Channo	5.0 (0.1%)	116.4 (1.3%)	157.5 (1.7%)	105.4 (1.2%)	247.5 (2.7%)					631.8
3) Kharkharo	18.1 (0.2%)	50.9 (0.6%)	218.2 (2.4%)	206.3 (2.3%)	707.5 (7.8%)					1,201.0
4) Malh	10.0 (0.1%)	164.7 (1.8%)	197.8 (2.2%)	257.4 (2.9%)	246.1 (2.7%)					876.0
Sub-total	33.5 (0.4%)	375.3 (4.2%)	668.7 (7.4%)	749.3 (8.3%)	1,327.2 (14.7%)					3,154.0
LANDHI										
1) Kharkhar		33.0 (0.4%)	121.5 (1.3%)	263.6 (2.9%)	210.1 (2.3%)					628.2
2) Sanhro	6.0 (0.1%)	108.9 (1.2%)	109.1 (1.2%)	143.5 (1.6%)	252.6 (2.8%)					620.1
3) Landhi	5.5 (0.1%)	177.7 (2.0%)	117.3 (1.3%)	179.3 (2.0%)	785.2 (8.7%)					1,265.0
4) Khanto		157.2 (1.7%)	60.2 (0.7%)	64.7 (0.7%)						282.1
Sub-total	11.5 (1.1%)	476.8 (5.3%)	408.1 (4.5%)	651.1 (7.2%)	1,247.9 (13.8%)					2,795.4
THANO										
1) Thano	7.0 (0.1%)	198.8 (2.2%)	156.3 (1.7%)	177.4 (2.0%)	154.4 (1.7%)					693.9
Sub-total	7.0 (0.1%)	198.8 (2.2%)	156.3 (1.7%)	177.4 (2.0%)	154.4 (1.7%)					693.9
Total	54 (0.6%)	1,239 (13.7%)	1,683 (18.7%)	2,253 (25.0%)	3,787 (42.0%)					9,016

Source : Karachi East District Revenue Office, 1987/88 - 1988/89 crop season.

Table F.2.4 SIZE OF HOLDING AND NUMBER OF FARMERS IN THE STUDY AREA

(a) Number of Farmers by Size of Holding							Unit : Nos.
Name of Deh and Union Council	Holding Size (ha)						Total
	Under 5		5 - 20		Over 20		
DARSANO CAHANNO							
1) Bail	2	(0.3%)	3	(0.4%)			5
2) Kathore	19	(2.7%)	32	(4.6%)	12	(1.7%)	63
3) Amilano	9	(1.3%)	12	(1.7%)	4	(0.6%)	25
4) Khadeji	1	(0.1%)	1	(0.1%)			2
5) Chuhar	11	(1.6%)	10	(1.4%)	4	(0.6%)	25
6) Koteru	4	(0.6%)	22	(3.2%)	1	(0.1%)	27
Sub-total	46	(6.6%)	80	(11.5%)	21	(3.0%)	147
KANKAR							
1) Bazar	22	(3.2%)	25	(3.6%)	4	(0.6%)	51
2) Darsano Channo	53	(7.6%)	29	(4.2%)	7	(1.0%)	89
3) Kharkharo	21	(3.0%)	25	(3.6%)	9	(1.3%)	55
4) Malh	74	(10.6%)	46	(6.6%)	4	(0.6%)	124
Sub-total	170	(24.4%)	125	(17.9%)	24	(3.4%)	319
LANDHI							
1) Kharkhar	7	(1.0%)	24	(3.4%)	3	(0.4%)	34
2) Sanhro	45	(6.4%)	22	(3.2%)	7	(1.0%)	74
3) Landhi	28	(4.0%)	11	(1.6%)	5	(0.7%)	44
4) Khanto	20	(2.9%)	6	(0.9%)			26
Sub-total	100	(14.3%)	63	(9.0%)	15	(2.1%)	178
THANO							
1) Thano	36	(5.2%)	15	(2.1%)	3	(0.4%)	54
Sub-total	36	(5.2%)	15	(2.1%)	3	(0.4%)	54
Total	352	(50.4%)	283	(40.5%)	63	(9.0%)	698

(b) Area of Farm by Holding Size							Unit : ha
Name of Deh and Union Council	Holding Size (ha)						Total
	Under 5		5 - 20		Over 20		
DARSANO CAHANNO							
1) Bail	8	(0.1%)	12	(0.2%)			20
2) Kathore	59	(1.0%)	342	(5.6%)	454	(7.4%)	855
3) Amilano	26	(0.4%)	119	(1.9%)	125	(2.0%)	270
4) Khadeji	3	(0.0%)	11	(0.2%)			15
5) Chuhar	23	(0.4%)	83	(1.4%)	229	(3.7%)	335
6) Koteru	12	(0.2%)	209	(3.4%)	20	(0.3%)	240
Sub-total	131	(2.1%)	776	(12.6%)	828	(13.5%)	1,735
KANKAR							
1) Bazar	83	(1.4%)	526	(8.6%)	241	(3.9%)	850
2) Darsano Channo	144	(2.3%)	312	(5.1%)	294	(4.8%)	750
3) Kharkharo	23	(0.4%)	139	(2.3%)	233	(3.8%)	395
4) Malh	130	(2.1%)	341	(5.6%)	184	(3.0%)	655
Sub-total	380	(6.2%)	1,318	(21.5%)	952	(15.5%)	2,650
LANDHI							
1) Kharkhar	20	(0.3%)	233	(3.8%)	127	(2.1%)	380
2) Sanhro	90	(1.5%)	198	(3.2%)	197	(3.2%)	485
3) Landhi	66	(1.1%)	106	(1.7%)	283	(4.6%)	455
4) Khanto	67	(1.1%)	53	(0.9%)			120
Sub-total	243	(3.9%)	590	(9.6%)	607	(9.9%)	1,440
THANO							
1) Thano	93	(1.5%)	152	(2.5%)	70	(1.1%)	315
Sub-total	93	(1.5%)	152	(2.5%)	70	(1.1%)	315
Total	847	(13.8%)	2,836	(46.2%)	2,457	(40.0%)	6,140

Source : Karachi East District Revenue Office, 1987/88 - 1988/89 crop season
This table is estimated based on Table F2.3.

Table F.2.5 CROPPED AREA AND CROPPING INTENSITY 1978 AND 1988

Crops	Unit : ha					
	1978 (1)			1988 (2)		
	Summer	Winter	Total	Summer	Winter	Total
A. Fodder Crops						
Sorghum				210		210
Lucern				150		150
Maize, others				130	80	210
All Fodder	<u>590</u> *	<u>370</u> *	<u>960</u>	<u>490</u>	<u>80</u>	<u>570</u>
	(14%)	(20%)	(16%)	(15%)	(16%)	(15%)
B. Vegetables						
Tomato	370		370	480		480
Eggplant	330		330	110	50	160
Chilli	280		280	10	40	50
Sponge Gourd	320		320	130	70	200
Bottle Gourd				100	50	150
Bitter Gourd				30	5	35
Cucumber				20		20
Melon				40		40
Cauliflower				120		120
Spinach		280	280	60	60	120
Carrot *		480 *	480	100	50	150
Radish *				60	45	105
Turnip *				50	15	65
Peas				100	5	105
Potato		120	120			
Others	620	460	1,080	110	35	145
All Vegetables	<u>1,920</u>	<u>1,340</u>	<u>3,260</u>	<u>1,520</u>	<u>425</u>	<u>1,945</u>
	(47%)	(71%)	(55%)	(47%)	(83%)	(52%)
C. Fruit						
Guava				280		280
Mango				570		570
Chikoo				80		80
Coconut				90		90
Papaya				50		50
Dates Palm				40		40
Others				90		90
All Fruit	<u>1,380</u> *		<u>1,380</u>	<u>1,200</u>		<u>1,200</u>
	(34%)		(23%)	(37%)		(32%)
D. Other Crops						
Miscellaneous	<u>180</u> *	<u>180</u> *	<u>360</u>	<u>10</u>	<u>5</u>	<u>15</u>
	(4%)	(9%)	(6%)	(0.3%)	(1%)	(0.4%)
Total	4,070	1,890	5,960	3,220	510	3,730
Command Area :		5,660 ha			6,140 ha	
Cropping Intensity :		1.46			1.16	

Sources : (1) WAPDA study, 1979

(2) 2 years average, 1987/88 - 1988/89

Remarks : Command area include fallow field because of water constraint.

(*) ; Data are not available for each crop.

Table F.2.6 CROPPED AREA, YIELD AND PRODUCTION IN THE STUDY AREA

Crops	Summer Season			Winter Season			Annual Production (tons)
	Area (ha)	Unit Yield (t/ha)	Production (tons)	Area (ha)	Unit Yield (t/ha)	Production (tons)	
A. Fodder Crops							
Sorghum	210	11.5	2,415				2,415
Lucerne	150	13.9	2,085				2,085
Maize	50	10.6	530	50	10.6	530	1,060
Others	80	12.3	981	30	12.3	369	1,350
All Fodder	<u>490</u>	(12.3) *	<u>6,011</u>	<u>80</u>	(11.2) *	<u>899</u>	<u>6,910</u>
B. Vegetables							
Tomato	480	3.3	1,584				1,584
Eggplant	110	4.9	539	50	4.9	245	784
Chilli	10	1.0	10	40	1.0	40	50
Sponge Gourd	130	3.1	403	70	3.1	217	620
Bottle Gourd	100	4.7	470	50	4.7	235	705
Bitter Gourd	30	4.0	120	5	4.0	20	140
Cucumber	20	2.0	40				40
Water Melon	30	3.0	90				90
Musk Melon	10	2.9	29				29
Cauliflower	120	13.3	1,596				1,596
Spinach	60	2.6	156	60	2.6	156	312
Carrot	100	5.4	540	50	5.4	270	810
Radish	60	4.0	240	45	4.0	180	420
Turnip	50	6.6	330	15	6.6	99	429
Peas	100	2.6	260	5	2.6	13	273
Others	120	4.5	545	40	4.5	180	725
All Vegetables	<u>1,530</u>	(4.5) *	<u>6,952</u>	<u>430</u>	(3.8) *	<u>1,655</u>	<u>8,607</u>
C. Fruit							
Guava	280	3.8	1,064				1,064
Mango	570	6.1	3,477				3,477
Chikoo	80	2.3	184				184
Coconut Palm	90	2.7	243				243
Papaya	50	7.3	365				365
Others	130	5.0	648				648
All Fruit	<u>1,200</u>	(5.0) *	<u>5,981</u>				<u>5,981</u>
Total	<u>3,220</u>		<u>18,945</u>	<u>510</u>		<u>2,554</u>	<u>21,499</u>

Sources : East Karachi Revenue Office, Malir
Agricultural Statistics of Sindh, 1989

Remarks : Annual crop production in the study area is estimated on 2 years average,
1987/88 and 1988/89
(*); Weighted average of unit yield for fodder, vegetable and fruit crops.

Table F.2.7 CROP PRODUCTION VALUE IN THE STUDY AREA

Crops	Summer Season			Winter Season			Annual Value (Rs,000)
	Volume (tons)	Unit Price (Rs/kg)	Value (Rs,000)	Volume (tons)	Unit Price (Rs/kg)	Value (Rs,000)	
A. Fodder Crops							
Sorghum	2,415	0.25 *	604				604
Lucerne	2,085	0.32 *	667				667
Maize	530	0.42 *	223	530	0.42 *	223	445
Others	981	0.30 *	291	369	0.30 *	111	402
All Fodder	<u>6,011</u>	(0.30) **	<u>1,785</u>	<u>899</u>	(0.37) **	<u>333</u>	<u>2,118</u>
B. Vegetables							
Tomato	1,584	3.46	5,481				5,481
Eggplant	539	2.45	1,321	245	2.45	600	1,921
Chilli	10	7.66	77	40	7.66	306	383
Sponge Gourd	403	3.31	1,334	217	3.31	718	2,052
Bottle Gourd	470	2.88	1,354	235	2.88	677	2,030
Bitter Gourd	120	2.54 *	305	20	2.54 *	51	356
Cucumber	40	2.25 *	90				90
Water Melon	90	1.67	150				150
Musk Melon	29	2.61	76				76
Cauliflower	1,596	3.06	4,884				4,884
Spinach	156	1.73	270	156	1.73	270	540
Carrot	540	1.56	842	270	1.56	421	1,264
Radish	240	1.95	468	180	1.95	351	819
Turnip	330	2.22	733	99	2.22	220	952
Peas	260	3.68	957	13	3.68	48	1,005
Others	546	2.86	1,561	180	2.86	515	2,076
All Vegetables	<u>6,953</u>	(2.86) **	<u>19,901</u>	<u>1,655</u>	(2.52) **	<u>4,177</u>	<u>24,078</u>
C. Fruit							
Guava	1,064	3.54	3,767				3,767
Mango	3,477	4.01	13,943				13,943
Chikoo	184	0.53	98				98
Coconut	243	5.50	1,337				1,337
Papaya	365	2.09	763				763
Others	648	3.73	2,420				2,420
All Fruit	<u>5,981</u>	(3.73) *	<u>22,326</u>				<u>22,326</u>
Total	18,945		44,012	2,554		4,510	48,522

Sources : Estimation by the JICA Study team

Remarks : Cropping area, unit yield and production ; see Table F.2.6

Farmgate price see Table F.2.16

(*) ; Estimated by Farm Economy Survey November, 1989

(**) ; Weighted average of unit prices for fodder, vegetable and fruit crops

Table F.2.8 MONTHLY ARRIVALS OF VEGETABLE AND FRUIT AT KARACHI MARKET

Crops	Year	Month												Total
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Unit : Tons														
A. Vegetables														
Tomato	1987	1,820	1,950	2,080	2,340	1,820	1,170	1,560	1,560					14,300
	1988	2,340	2,132	2,340	2,470	2,340	2,210	1,872	1,560	1,560	1,820	390	2,028	23,062
	1989	2,028	2,860	2,366	1,248	1,560	1,040	260	1,508	1,430	1,664	1,248		17,212
	Average	2,063	2,314	2,262	2,019	1,907	1,473	1,231	1,543	1,492	1,742	819	2,028	18,191
Eggplant	1987	182	130	234	208	208	104	104	156					1,326
	1988	208	1,248	156	130	1,820	156	1,378	234	351	312	156	455	6,604
	1989	494	312	312	65	260	78	78	156	182	130	117		2,184
	Average	295	563	234	134	763	113	520	182	267	221	137	455	3,371
Chilli	1987	104	130	182	234	182	156	104	130					1,222
	1988	130	156	104	130	156	130	91	104	130	117	520	143	1,911
	1989	117	104	312	299	182	26	26	130	130	130	2,340		3,796
	Average	117	130	192	221	173	104	74	121	130	124	1,430	143	2,310
Bottle Gourd	1987	78	91	156	260	390	130	130	104					1,339
	1988	78	0	78	1,820	364	1,820	208	260	546	468	104	520	6,266
	1989	520	78	333	286	260	156	208	312	208	260	312		2,933
	Average	225	56	182	782	338	702	182	225	377	364	208	520	3,513
Bitter Gourd	1987	0	0	0	52	156	156	130	130					624
	1988	8	78	21	78	156	156	260	130	182	143	26	42	1,279
	1989	26	26	8	91	390	286	156	208	52	26	26		1,295
	Average	11	35	10	74	234	192	182	156	117	85	26	42	1,066
Cauliflower	1987	416	416	182	260	0	0	0	26					1,300
	1988	312	286	26	0	0	0	0	0	351	780	130	598	2,483
	1989	728	624	322	0	0	0	0	10	312	416	624		3,037
	Average	485	442	177	87	0	0	0	12	332	598	377	598	2,273
Spinach	1987	520	780	494	468	468	468	520	468					4,186
	1988	624	754	468	546	468	624	468	260	364	403	156	650	5,785
	1989	728	884	429	273	208	104	78	130	182	247	208		3,471
	Average	624	806	464	422	381	322	355	286	273	325	182	650	4,481
Carrot	1987	546	650	520	0	104	26	26	39					1,911
	1988	546	754	624	39	52	26	26	26	78	39	0	572	2,782
	1989	910	1,040	338	78	0	3	3	5	26	39	31		2,473
	Average	667	815	494	32	52	18	18	23	52	32	16	572	2,389
Radish	1987	624	468	468	208	104	0	5	26					1,903
	1988	546	455	416	260	0	13	8	78	390	650	52	1,027	3,895
	1989	988	936	494	208	26	3	0	36	52	91	130		2,964
	Average	719	620	459	225	43	5	4	47	221	371	91	1,027	2,921
Turnip	1987	312	312	208	104	39	26	65	52					1,118
	1988	416	273	260	78	52	65	5	26	26	364	0	169	1,734
	1989	260	520	403	78	7	10	3	13	52	65	156		1,567
	Average	329	368	290	87	33	34	24	30	39	215	78	169	1,473
Peas	1987	416	650	416	260	52	0	5	0					1,799
	1988	468	884	104	52	26	104	0	0	0	0	0	910	2,548
	1989	780	936	780	78	4	8	3	3	0	0	0		2,591
	Average	555	823	433	130	27	37	3	1	0	0	0	910	2,313
Others	1987	2,311	2,587	5,772	7,644	11,350	5,798	5,226	4,992					45,680
	1988	7,987	5,642	6,448	7,592	5,824	3,952	4,758	4,290	5,538	5,226	2,704	4,656	64,617
	1989	3,770	3,549	5,197	5,928	9,490	6,942	3,172	5,509	4,706	7,618	8,411		64,292
	Average	4,689	3,926	5,806	7,055	8,888	5,564	4,385	4,930	5,122	6,422	5,558	4,656	58,196
All Vegetables		(10,780)	(10,898)	(11,017)	(11,288)	(12,839)	(8,648)	(6,978)	(7,557)	(8,424)	(10,504)	(8,921)	(11,710)	(102,496)
B. Fruit														
Guava	1987	780	364	156	0	0	0	0	0					1,300
	1988	728	650	520	26	0	0	0	21	16	13	130	0	2,103
	1989	728	286	86	161	0	0	0	0	8	39	117		1,425
	Average	745	433	254	62	0	0	0	7	12	26	124	0	1,609
Mango	1987	0	0	0	0	0	5,760	2,340	416					9,516
	1988	0	0	0	0	1,820	2,600	2,860	364	0	0	0	0	7,644
	1989	0	0	0	0	2,340	8,710	2,340	910	520	0	0		14,820
	Average	0	0	0	0	1,387	6,023	2,513	563	260	0	0	0	10,660
Chikoo	1987	16	143	16	39	78	31	13	0					336
	1988	52	260	104	52	78	52	39	26	0	0	0	0	663
	1989	0	0	127	90	120	73	39	31	8	5	0		493
	Average	23	134	82	60	92	52	30	19	4	3	0	0	497
Papaya	1987	12	78	169	21	234	21	16	31					582
	1988	78	260	182	208	182	130	0	130	104	10	0	16	1,300
	1989	16	10	52	78	104	91	8	52	52	47	13		523
	Average	35	116	134	102	173	81	8	71	78	22	7	16	802
Others	1987	3,900	4,342	5,330	3,016	1,780	650	962	936					8,840
	1988	7,020	7,280	5,590	2,132	1,430	1,430	1,482	1,092	1,300	2,184	494	4,524	14,092
	1989	5,798	5,152	5,796	9,438	1,848	2,241	2,119	3,513	2,210	4,225	3,120		18,356
	Average	5,573	5,591	5,572	4,862	1,686	1,440	1,521	1,847	1,755	2,205	1,807	4,524	13,763
All Fruit		(6,376)	(6,275)	(6,043)	(5,087)	(3,338)	(7,596)	(4,073)	(2,507)	(2,109)	(3,262)	(1,937)	(4,540)	(27,331)

Source : Bureau of Supply and Prices, Ministry Industries, GOS

Remarks : Data are not available from September to December 1987 and December 1989.

Table F.2.9 VOLUME OF VEGETABLE AND FRUIT ENTERING
KARACHI MARKET FROM THE STUDY AREA

Crops	Unit : Tons		
	All Sources (1)	Study Area (2)	%
A. Vegetables			
Tomato	18,200	1,580	8.7
Eggplant	3,370	780	23.1
Chilli	2,310	50	2.2
Bottle Gourd	3,510	705	20.1
Bitter Gourd	1,070	140	13.1
Cauliflower	2,270	1,600	70.5
Spinach	4,480	310	6.9
Carrot	2,390	810	33.9
Radish	2,920	420	14.4
Turnip	1,470	430	29.3
Peas	2,310	270	11.7
Others	58,200	1,515	2.6
All Vegetables	<u>102,500</u>	<u>8,610</u>	8.4
B. Fruit			
Guava	1,610	1,060	65.8
Mango	10,660	3,480	32.6
Chikoo	500	185	37.0
Papaya	800	365	45.6
Others	13,760	890	6.5
All Fruit	<u>27,330</u>	<u>5,980</u>	21.9

Remarks : (1) Bureau of Supply and Prices, 1987-89 average ; see Table F.2.8
(2) 2 years average, 1987-88 by JICA Study team ; see Table F.2.6

Table F.2.10 RETAIL PRICES OF VEGETABLE AND FRUIT IN KARACHI MARKET

Crops	Average Retail Prices (Jan. 1985 - Oct. 1989)					Unit : Rs/kg		
						5 Years		
	1985	1986	1987	1988	1989	Average	Max.	Min.
A. Vegetables								
Tomato	6.08	5.90	6.75	7.89	6.10	6.60	14.31	2.00
Eggplant	4.23	4.47	5.11	5.27	4.29	4.68	6.50	4.73
Chilli	12.69	12.75	13.39	15.85	16.70	14.18	26.00	3.50
Lady's Finger	5.19	6.68	6.77	6.65	6.66	6.39	9.44	3.86
Sponge Gourd	5.67	6.39	6.38	7.07	6.39	6.40	8.79	4.40
Bottle Gourd	4.42	5.02	6.42	5.56	5.28	5.30	7.10	3.40
Bitter Gourd	7.48	8.88	9.41	10.26	9.58	6.10	13.00	5.50
Water Melon	2.19	2.43	2.91	3.31	3.77	2.95	6.96	1.63
Musk Melon	3.97	5.25	4.50	5.29	5.84	4.98	8.62	3.60
Cauliflower	4.97	4.95	5.92	5.78	6.62	5.59	9.22	3.55
Spinach	2.67	2.90	3.25	3.85	3.25	3.17	5.92	2.43
Carrot	3.33	3.40	2.65	3.80	3.01	3.46	7.05	1.90
Radish	3.05	3.55	4.04	3.93	3.70	3.64	6.00	2.61
Turnip	3.84	4.48	4.56	4.76	4.00	4.51	6.94	2.65
Peas	6.76	6.16	6.95	7.64	7.45	7.08	12.77	3.55
B. Fruit								
Guava	7.31	7.15	8.01	8.66	9.87	8.28	16.61	4.90
Mango (kalmi)	10.48	12.20	16.56	14.09	12.99	13.34	20.00	9.10
Mango (desi)	7.63	7.63	9.86	10.37	9.85	9.19	14.21	5.90
Banana	5.31	5.73	6.26	7.23	8.02	6.44	11.77	4.00

Sources : Monthly Bulletin of Statistics, FBS , Sept. 1988 - Oct. 1989
Pakistan Statistical Year Book, FBS, 1988 & 1989

Table F.2.11

**AVERAGE RETAIL PRICES OF VEGETABLE AND FRUIT
IN KARACHI MARKET**

Unit : Rs/kg

Crops	Actual 1985	Moving Average (1)			Increase (2)
		1987	1988	1989	
A. Vegetables					
Tomato	6.08	6.24	6.85	6.91	13.7%
Eggplant	4.23	4.60	4.95	4.89	15.6%
Chilli	12.69	12.94	14.00	15.31	20.6%
Lady's Finger	5.19	6.21	6.70	6.69	28.9%
Sponge Gourd	5.67	6.15	6.61	6.61	16.6%
Bottle Gourd	4.42	5.29	5.67	5.75	30.1%
Bitter Gourd	7.48	8.59	9.52	9.75	30.3%
Water Melon	2.19	2.51	2.88	3.33	52.1%
Musk Melon	3.97	4.57	5.01	5.21	31.2%
Cauliflower	4.97	5.28	5.55	6.11	22.9%
Spinach	2.67	2.94	3.33	3.45	29.2%
Carrot	3.33	3.13	3.28	3.11	-6.6%
Radish	3.05	3.55	3.84	3.89	27.5%
Turnip	3.84	4.29	4.60	4.44	15.6%
Peas	6.76	6.62	6.92	7.35	8.7%
B. Fruit					
Guava	7.31	7.49	7.94	8.85	21.1%
Mango (kalmi)	10.48	13.08	14.28	14.55	38.8%
Mango (desi)	7.63	8.37	9.29	10.03	31.5%
Banana	5.31	5.77	6.41	7.17	35.0%

Remarks : (1) 3 years moving average 1985-1989
(2) 1989 over 1985

Source : JICA Study team, see Table F.2.10

Table F.2.12 CONSUMER AND WHOLESALE PRICE INDEX, PAKISTAN

Year	Consumer Price	General Items	Wholesale Prices		
			Food	Vegetables	Fruit
A. 1980/81	100	100	100	100	100
B. 1984/85	131.8	130.9	135.4	145.1	132.3
1985/86	137.6	137.0	140.2	100.9	125.8
1986/87	142.5	143.8	146.7	138.1	124.6
1987/88	151.5	158.2	160.2	195.2	134.0
1988/89 (Oct.)	167.2	173.5	175.8	223.8	167.9
C. Increase (%)					
1984/85 to 1988/89	26.9	32.5	29.8	54.2	26.9
1984/85 to 1985/86	8.1	9.9	8.3	(4.8)	(5.8)
1987/88 to 1988/89	17.3	20.7	19.8	62.1	34.8

Source : Monthly Bulletin of Statistics, FBS, November 1989

Table F.2.13 MARKETING COST FOR FARMGATE TO KARACHI MARKET

Items	Unit	Quantity
A. Transport Cost		
Truck Capacity	tons	7.5
Distance (farm to market)	km	25
Transport cost per truck	Rs/load	1,500
Average loading capacity	Maund	200
Unit cost	Rs/mds	7.50
	Rs/kg	<u>0.20</u>
	Rs/t/km	8.00
B. Loading and Unloading Cost		
Unit cost	Rs/load	150
	Rs/mds	0.75
	Rs/kg	<u>0.02</u>
C. Octori Tax		
Tax per truck	Rs/load	400 - 600
Unit cost	Rs/mds	2.50
	Rs/kg	<u>0.07</u>
D. Total Cost		
Cost per truck	Rs/load	2,050 - 2,250
Cost per maund	Rs/mds	10.75
Cost per kg	Rs/kg	<u>0.29</u>

Source : Farm Economy Survey by the JICA team, November 1989 and March 1990

Remarks : Actual costs quoted vary from 950 to 2,000 Rs/load.

Produce other than fodder in crates or boxes.

Average load capacity of truck, 200 mds or approximately 7.5 tons.

Quoted load sizes ; carrot, onion, potato, turnip 9 tons,

cauliflower 6 tons, tomato and similar crops 7 tons

Table F.2.14 RETAIL, MIDDLEMEN AND WHOLESALE MARGINS

Items	Unit : Rs/kg					
	Average Retail Price (1)	Middlemen Price (2)	Wholesale Price (3)	Marketing Cost (4)	Farmgate Price	Rate %
A. Vegetables						
Tomato	6.91	5.85	5.32	0.82	4.49	65
Eggplant	4.89	4.14	3.76	0.67	3.10	63
Chilli	15.31	12.95	11.78	1.47	10.31	67
Lady's Finger	6.69	5.66	5.15	0.80	4.34	65
Sponge Gourd	6.61	5.59	5.08	0.80	4.29	65
Bottle Gourd	5.75	4.87	4.42	0.73	3.69	64
Bitter Gourd	9.75	8.25	7.50	1.04	6.46	66
Water Melon	3.33	2.82	2.56	0.55	2.02	61
Musk Melon	5.21	4.41	4.01	0.69	3.32	64
Cauliflower	6.11	5.17	4.70	0.76	3.94	64
Spinach	3.45	2.92	2.65	0.56	2.10	61
Carrot	3.11	2.63	2.39	0.53	1.86	60
Radish	3.89	3.29	2.99	0.59	2.40	62
Turnip	4.44	3.76	3.42	0.63	2.78	63
Peas	7.35	6.22	5.65	0.86	4.80	65
B. Fruit						
Guava	8.85	7.49	6.81	0.97	5.84	66
Mango (kalmi)	14.55	12.31	11.19	1.41	9.78	67
Mango (desi)	10.03	8.49	7.72	1.06	6.65	66
Banana	7.17	6.07	5.52	0.84	4.67	65

- Remarks :
- (1) Price is 130% of wholesale price, see Table F.2.11.
 - (2) Price is 110% of wholesale price.
 - (3) Price is estimated the Karachi Committee by market survey of deals struck by Wholesaler/ Commission Agency.
 - (4) Agent's commission is 10% of wholesale price.
Transport and handling cost is 0.29 Rs/kg (see Table F.2.13).
Cost, also, includes 50 Rs per 20 Mds of market fee paid by wholesaler to the Market Committee.

Table F.2.15 ESTIMATION OF MARKET PRICE RATE OF THE SELECTED CROPS

Crops	Unit : Rs/kg								
	Retail Price	Middleman		Wholesale			Farm-gate		
		(a)	Price (b)	Rate (b)/(a)	Price (c)	Rate (c)/b)	Rate (c)/(a)	Price (d)	Rate (d)/c)
1) Tomato									
1st class (long)	3.50	2.75	0.79	2.50	0.91	0.71			
2nd class (long)	2.00	1.65	0.83	1.50	0.91	0.75			
1st class (circular)	5.00	4.00	0.80	3.50	0.88	0.70			
2nd class (circular)	3.50	2.75	0.79	2.50	0.91	0.71	2.00	0.80	0.57
Others	3.50	2.75	0.79	2.50	0.91	0.71	1.00	0.40	0.29
Average	3.50	2.78	0.79	2.50	0.90	0.71	1.50	0.60	0.43
2) Eggplant									
1st class (long)	2.75	2.25	0.82	2.00	0.89	0.73			
2nd class (long)	1.75	1.37	0.78	1.25	0.91	0.71			
1st class (circular)	4.25	3.25	0.76	3.00	0.92	0.71	2.00	0.67	0.47
2nd class (circular)	2.75	2.25	0.82	2.00	0.89	0.73	1.64	0.82	0.60
Average	2.88	2.28	0.79	2.06	0.90	0.72	1.82	0.88	0.63
3) Chilli									
1st class	7.00	5.50	0.79	5.00	0.91	0.71	4.55	0.91	0.65
2nd class	5.50	4.50	0.82	4.00	0.89	0.73	1.50	0.38	0.27
Average	6.25	5.00	0.80	4.50	0.90	0.72	3.03	0.67	0.48
4) Lady's Finger									
1st class	9.75	7.75	0.79	7.00	0.90	0.72	4.00	0.57	0.41
2nd class	7.00	5.50	0.79	5.00	0.91	0.71	2.50	0.50	0.36
Average	8.38	6.63	0.79	6.00	0.91	0.72	3.25	0.54	0.39
5) Sponge Gourd									
1st class	7.00	5.50	0.79	5.00	0.91	0.71	2.50	0.50	0.36
2nd class	5.50	4.50	0.82	4.00	0.89	0.73	2.00	0.50	0.36
Average	6.25	5.00	0.80	4.50	0.90	0.72	2.25	0.50	0.36
6) Bottle Gourd									
1st class	4.50	3.50	0.78	3.25	0.93	0.72	3.00	0.92	0.67
2nd class	3.50	2.75	0.79	2.50	0.91	0.71	1.50	0.60	0.43
Average	4.00	3.13	0.78	2.88	0.92	0.72	2.25	0.78	0.56
7) Bitter (Circular) Gourd									
1st class	2.75	2.25	0.82	2.00	0.89	0.73	1.30	0.65	0.47
2nd class	2.00	1.65	0.83	1.50	0.91	0.75	0.70	0.47	0.35
Average	2.38	1.95	0.82	1.75	0.90	0.74	1.00	0.57	0.42
8) Cucumber									
1st class	6.25	5.00	0.80	4.50	0.90	0.72	3.50	0.78	0.56
2nd class	5.00	4.00	0.80	3.50	0.88	0.70	2.00	0.57	0.40
Average	5.63	4.50	0.80	4.00	0.89	0.71	2.75	0.69	0.49
9) Water Melon									
1st class	4.00	3.25	0.81	3.00	0.92	0.75	2.00	0.67	0.50
2nd class	2.00	1.65	0.83	1.50	0.91	0.75	1.00	0.67	0.50
Average	3.00	2.45	0.82	2.25	0.92	0.75	1.50	0.67	0.50
10) Musk Melon									
1st class	6.50	5.50	0.85	5.00	0.91	0.77	2.35	0.47	0.36
2nd class	4.50	4.00	0.89	3.50	0.88	0.78	2.35	0.67	0.52
Average	5.50	4.75	0.86	4.25	0.89	0.77	2.35	0.55	0.43
11) Cauliflower									
1st class	6.25	5.00	0.80	4.50	0.90	0.72	2.45	0.54	0.39
2nd class	4.25	3.25	0.76	3.00	0.92	0.71	2.00	0.67	0.47
Average	5.25	4.13	0.79	3.75	0.91	0.71	2.23	0.59	0.42
12) Spinach									
Average	3.15	2.50	0.79	2.25	0.90	0.71	1.50	0.67	0.48
13) Cluster Bean									
1st class	6.25	5.00	0.80	4.50	0.90	0.72			
2nd class	5.00	4.00	0.80	3.50	0.88	0.70	2.09	0.60	0.42
Average	5.63	4.50	0.80	4.00	0.89	0.71	2.09	0.52	0.37
14) Onion									
1st class	2.50	2.00	0.80	1.75	0.88	0.70			
2nd class	1.75	1.37	0.78	1.25	0.91	0.71	1.18	0.94	0.67
Average	2.13	1.69	0.79	1.50	0.89	0.71	1.18	0.79	0.56
15) Banana (Rs/per dozen)									
1st class	9.00	7.75	0.86	7.00	0.90	0.78			
2nd class	5.25	4.50	0.86	4.00	0.89	0.76	3.00	0.75	0.57
Average	7.13	6.13	0.86	5.50	0.90	0.77	3.00	0.55	0.42
16) Papaya									
Average	5.75	5.00	0.87	4.50	0.90	0.78	2.09	0.46	0.36
Total Average Rate			0.81		0.90	0.73		0.63	0.46

Source : Market price is estimated by the Karachi Vegetable & Fruit Market Office on 11 th November 1989.

Table F.2.16 ESTIMATED FARMGATE PRICES OF MAJOR CROPS
IN THE STUDY AREA

			Unit : Rs/kg
Crops	Retail Price (1)	Farmgate Price (2)	
A. Fodder (3)			
Sorghum	Non	0.25	
Maize	Non	0.32	
Lucern	Non	0.42	
B. Vegetables			
Tomato	6.91	3.46	
Eggplant	4.89	2.45	
Chilli	15.31	7.66	
Lady's Finger	6.69	3.35	
Sponge Gourd	6.61	3.31	
Bottle Gourd	5.75	2.88	
Bitter Gourd	9.75	4.88	
Water Melon	3.33	1.67	
Musk Melon	5.21	2.61	
Cauliflower	6.11	3.06	
Spinach	3.45	1.73	
Carrot	3.11	1.56	
Radish	3.89	1.95	
Turnip	4.44	2.22	
Peas	7.35	3.68	
C. Fruit			
Guava	8.85	3.54	
Mango (kalmi)	14.55	5.82	
Mango (desi)	10.03	4.01	
Banana	7.17	2.87	
Chikoo (3)	Non	3.50	
Coconut (3)	Non	5.50	
Papaya (3)	Non	2.09	

- Remarks :
- (1) See Table F.2.11
 - (2) Estimation of farmgate price is 50% of retail price for vegetable, and 40% of retail price for fruit.
 - (3) Farmgate prices for fodder, chikoo, coconut, papaya are estimated in the study area 1988/89 by the JICA Study team.

Table F.2.17 FARMGATE PRICES OF FARM INPUTS IN THE STUDY AREA

Items	Farmgate Prices	Items	Farmgate Prices
A. Seeds			
Vegetables		Fodder Crops	
Tomato	625 Rs/kg	Sorghum	3 Rs/kg
Eggplant	100 Rs/kg	Maize	3 Rs/kg
Chilli	200 Rs/kg	Lucern	3 Rs/kg
Lady's Finger	10 Rs/kg		
Sponge Gourd	200 Rs/kg	Fruits	
Bottle Gourd	200 Rs/kg	Guava	12 Rs/tree
Cauliflower	300 Rs/kg	Mango	20 Rs/tree
Spinach	70 Rs/kg	Chikoo	20 Rs/tree
Carrot	120 Rs/kg	Coconut	40 Rs/tree
Radish	120 Rs/kg	Papaya	3 Rs/tree
Turnip	400 Rs/kg		
Peas	25 Rs/kg		
B. Fertilizers			
Urea	3.0 Rs/kg	S.O.P.	1.7 Rs/kg
D.A.P.	4.1 Rs/kg	FYM	60 Rs/ton
C. Agro-chemicals			
Insecticides	200 Rs/litre	(Methyle Parathion, Roger, Azodrin 40, etc.)	
Fungicides	250 Rs/litre	(Benlate, Diathian, etc.)	
Herbicides	210 Rs/litre	(Stam 330E, Saturn, etc.)	
D. Machinery Cost (Tractor)		E. Well O/M Cost	
Plowing	70 Rs/hour	Electric cost	0.071 Rs/m ³
Leveling	70 Rs/hour	Maintenance cost	0.011 Rs/m ³
F. Labour Cost			
- male	50 Rs/man-day		
- female	20 Rs/man-day		

Remarks : Present farmgate prices of farm inputs are estimated based on the farm economy survey by JICA team in November 1989 and March 1990.

Table F.2.18 PRESENT CROP BUDGETS PER HA (1/6)

Tomato					Eggplant				
Items	Unit	Quantity	Unit Price	Amount	Items	Unit	Quantity	Unit Price	Amount
		(a)	(b) (Rs)	(a x b) (Rs)			(a)	(b) (Rs)	(a x b) (Rs)
Unit Yield	kg	3,300	3.46	11,418 (c)	Unit Yield	kg	4,900	2.45	12,005 (c)
Farm Inputs					Farm Inputs				
1) Seeds	kg	1.5	625	938	1) Seeds	kg	1.5	100	150
2) Fertilizers					2) Fertilizers				
- Urea	kg	75	3.0	225	- Urea	kg	75	3.0	225
- D.A.P.	kg	125	4.1	513	- D.A.P.	kg			
- Farmyard Manure	ton	5	60	300	- Farmyard Manure	ton	7.5	60	450
3) Insecticides					3) Insecticides				
- Novacron	lit	1	200	200	- Novacron	lit	1	200	200
4) Fungicides					4) Fungicides				
- Benlate	lit					lit			
Machinery Requirement					Machinery Requirement				
1) Tractor					1) Tractor				
- Plowing/harrowing	hour	5	70	350	- Plowing/harrowing	hour	5	70	350
- Levering/ridging		5	70	350	- Levering/ridging		5	70	350
2) Well operation	month	4		640	2) Well operation	month	4		640
Labor Requirement					Labor Requirement				
1) Land preparation	man-day	10.0	50	500	1) Land preparation	man-day	10.0	50	500
2) Nursery work		3.5	50	175	2) Nursery work		5.5	50	275
3) Transplanting		10.0	50	500	3) Sowing, transplanting		10.0	50	500
4) Fertilizer application		2.0	50	100	4) Fertilizer application		3.5	50	175
5) Insecticide application		1.5	50	75	5) Insecticide application		1.5	50	75
6) Fungicide application					6) Fungicide application				
7) Weeding		15.0	50	750	7) Weeding		15.0	50	750
8) Water management		5.0	50	250	8) Water management		5.0	50	250
9) Harvesting		15.0	50	750	9) Harvesting		15.0	50	750
10) Packing, others		10.0	50	500	10) Packing, others		10.0	50	500
	(sub-total)	(72.0)				(sub-total)	(75.5)		
Miscellaneous					Miscellaneous				
(5 % of above production cost)		5%		356	(5 % of above production cost)		5%		307
Total Production Cost				7,471 (d)	Total Production Cost				6,447 (d)
Net Return per Ha				3,947	Net Return per Ha				5,558
(c - d)					(c - d)				

Chilli					Lady's Finger				
Items	Unit	Quantity	Unit Price	Amount	Items	Unit	Quantity	Unit Price	Amount
		(a)	(b) (Rs)	(a x b) (Rs)			(a)	(b) (Rs)	(a x b) (Rs)
Unit Yield	kg	1,000	7.66	7,660 (c)	Unit Yield	kg	2,300	3.35	7,705 (c)
Farm Inputs					Farm Inputs				
1) Seeds	kg	2.5	200	500	1) Seeds	kg	20.0	10	200
2) Fertilizers					2) Fertilizers				
- Urea	kg	75	3.0	225	- Urea	kg	75	3.0	225
- D.A.P.	kg				- D.A.P.	kg			
- Farmyard Manure	ton	5	60	300	- Farmyard Manure	ton	5	60	300
3) Insecticides					3) Insecticides				
	lit					lit			
4) Fungicides					4) Fungicides				
Machinery Requirement					Machinery Requirement				
1) Tractor					1) Tractor				
- Plowing/harrowing	hour	4	70	280	- Plowing/harrowing	hour	4	70	280
- Levering/ridging		2	70	140	- Levering/ridging		2	70	140
2) Well operation	month	4		640	2) Well operation	month	4		640
Labor Requirement					Labor Requirement				
1) Land preparation	man-day	10.0	50	500	1) Land preparation	man-day	10.0	50	500
2) Nursery work		5.5	50	275	2) Nursery work				
3) Transplanting		10.0	50	500	3) Sowing		5.0	50	250
4) Fertilizer application		2.5	50	125	4) Fertilizer application		2.5	50	125
5) Insecticide application					5) Insecticide application				
6) Fungicide application					6) Fungicide application				
7) Weeding		15.0	50	750	7) Weeding		10.0	50	500
8) Water management		5.0	50	250	8) Water management		5.0	50	250
9) Harvesting		15.0	50	750	9) Harvesting		20.0	50	1,000
10) Packing, others		5.0	50	250	10) Packing, others		5.0	50	250
	(sub-total)	(68.0)				(sub-total)	(57.5)		
Miscellaneous					Miscellaneous				
(5 % of above production cost)		5%		274	(5 % of above production cost)		5%		233
Total Production Cost				5,752 (d)	Total Production Cost				4,823 (d)
Net Return per Ha				1,901	Net Return per Ha				2,812
(c - d)					(c - d)				

Table F.2.18 PRESENT CROP BUDGETS PER HA (2/6)

Sponge Gourd					Bottle Gourd				
Items	Unit	Quantity	Unit Price	Amount	Items	Unit	Quantity	Unit Price	Amount
		(a)	(b) (Rs)	(a x b) (Rs)			(a)	(b) (Rs)	(a x b) (Rs)
Unit Yield	kg	3,100	3.31	10,261 (c)	Unit Yield	kg	4,700	2.88	13,536 (c)
Farm Inputs					Farm Inputs				
1) Seeds	kg	5	200	1,000	1) Seeds	kg	7	200	1,400
2) Fertilizers					2) Fertilizers				
- Urea	kg	75	3.0	225	- Urea	kg	75	3.0	225
- D.A.P.	kg	75	4.1	308	- D.A.P.	kg	75	4.1	308
- Farmyard Manure	ton	3	60	180	- Farmyard Manure	ton	2	60	120
3) Insecticides					3) Insecticides				
- Novacron	lit	1	200	200	- Novacron	lit	1	200	200
4) Fungicides					4) Fungicides				
Machinery Requirement					Machinery Requirement				
1) Tractor					1) Tractor				
- Plowing/harrowing	hour	4	70	280	- Plowing/harrowing	hour	4	70	280
- Levering/ridging		2	70	140	- Levering/ridging		4	70	280
2) Well operation	month	3		600	2) Well operation	month	3		600
Labor Requirement					Labor Requirement				
1) Land preparation	man-day	10.0	50	500	1) Land preparation	man-day	10.0	50	500
2) Nursery work					2) Nursery work				
3) Sowing		2.5	50	125	3) Sowing		2.5	50	125
4) Fertilizer application		2.0	50	100	4) Fertilizer application		3.5	50	175
5) Insecticide application		2.0	50	100	5) Insecticide application		2.0	50	100
6) Fungicide application					6) Fungicide application				
7) Weeding		5.0	50	250	7) Weeding		5.0	50	250
8) Water management		5.0	50	250	8) Water management		5.0	50	250
9) Harvesting		10.0	50	500	9) Harvesting		10.0	50	500
10) Packing, others		5.0	50	250	10) Packing, others		5.0	50	250
	(sub-total)	(41.5)				(sub-total)	(43.0)		
Miscellaneous					Miscellaneous				
(5 % of above production cost)		5%		250	(5 % of above production cost)		5%		278
Total Production Cost				5,258 (d)	Total Production Cost				5,841 (d)
Net Return per Ha				5,003	Net Return per Ha				7,695
(c - d)					(c - d)				

Cauliflower					Spinach				
Items	Unit	Quantity	Unit Price	Amount	Items	Unit	Quantity	Unit Price	Amount
		(a)	(b) (Rs)	(a x b) (Rs)			(a)	(b) (Rs)	(a x b) (Rs)
Unit Yield	kg	13,300	3.06	40,628 (c)	Unit Yield	kg	2,600	1.73	4,498 (c)
Farm Inputs					Farm Inputs				
1) Seeds	kg	1.5	300	450	1) Seeds	kg	12.5	70	875
2) Fertilizers					2) Fertilizers				
- Urea	kg	125	3.0	375	- Urea	kg	75	3.0	225
- D.A.P.	kg	125	4.1	513	- D.A.P.	kg			
- Farmyard Manure	ton	7.5	60	450	- Farmyard Manure	ton	3	60	180
3) Insecticides					3) Insecticides				
- Dieldrin	lit	2	200	400	-	lit	1	200	200
4) Fungicides					4) Fungicides				
Machinery Requirement					Machinery Requirement				
1) Tractor					1) Tractor				
- Plowing/harrowing	hour	5	70	350	- Plowing/harrowing	hour	4	70	280
- Levering/ridging		2	70	140	- Levering/ridging		2	70	140
2) Well operation	month	3		640	2) Well operation	month	3		420
Labor Requirement					Labor Requirement				
1) Land preparation	man-day	10.0	50	500	1) Land preparation	man-day	4.0	50	200
2) Nursery work		5.5	50	275	2) Nursery work				
3) Transplanting		10.0	50	500	3) Sowing		2.0	50	100
4) Fertilizer application		3.5	50	175	4) Fertilizer application		3.0	50	150
5) Insecticide application		2.0	50	100	5) Insecticide application		1.5	50	75
6) Fungicide application					6) Fungicide application				
7) Weeding		15.0	50	750	7) Weeding		7.5	50	375
8) Water management		5.0	50	250	8) Water management		5.0	50	250
9) Harvesting		8.0	50	400	9) Harvesting		8.0	50	400
10) Packing, others		5.0	50	250	10) Packing, others		4.0	50	200
	(sub-total)	(64.0)				(sub-total)	(35.0)		
Miscellaneous					Miscellaneous				
(5 % of above production cost)		5%		326	(5 % of above production cost)		5%		204
Total Production Cost				6,843 (d)	Total Production Cost				4,274 (d)
Net Return per Ha				33,855	Net Return per Ha				225
(c - d)					(c - d)				

Table F.2.18 PRESENT CROP BUDGETS PER HA (3/6)

Items	Unit	Carrot		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	5,400	1.56	8,424 (c)
Farm Inputs				
1) Seeds	kg	4.5	120	540
2) Fertilizers				
- Urea	kg	75	3.0	225
- D.A.P.	kg			
- Farmyard Manure	ton	3	60	180
3) Insecticides				
- Azodrin 40 WSC	lit	0.5	200	100
4) Fungicides				
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	5	70	350
- Levering/ridging		5	70	350
2) Well operation	month	3		600
Labor Requirement				
1) Land preparation	man-day	15.0	50	750
2) Nursery work				
3) Sowing		5.0	50	250
4) Fertilizer application		2.5	50	125
5) Insecticide application		1.5	50	75
6) Fungicide application				
7) Weeding		10.0	50	500
8) Water management		5.0	50	250
9) Harvesting		15.0	50	750
10) Packing, others		10.0	50	500
	(sub-total)	(64.0)		
Miscellaneous				
(5 % of above production cost)		5%		277
Total Production Cost				5,822 (d)
Net Return per Ha (c - d)				2,602

Items	Unit	Turnip		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	6,600	2.22	14,652 (c)
Farm Inputs				
1) Seeds	kg	2.5	400	1,000
2) Fertilizers				
- Urea	kg	75	3.0	225
- D.A.P.	kg			
- Farmyard Manure	ton	3	60	180
3) Insecticides				
-	lit	0.5	200	100
4) Fungicides				
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	5	70	350
- Levering/ridging		5	70	350
2) Well operation	month	3		640
Labor Requirement				
1) Land preparation	man-day	15.0	50	750
2) Nursery work				
3) Sowing		5.0	50	250
4) Fertilizer application		3.5	50	175
5) Insecticide application		1.5	50	75
6) Fungicide application				
7) Weeding		10.0	50	500
8) Water management		5.0	50	250
9) Harvesting		15.0	50	750
10) Packing, others		10.0	50	500
	(sub-total)	(65.0)		
Miscellaneous				
(5 % of above production cost)		5%		305
Total Production Cost				6,400 (d)
Net Return per Ha (c - d)				8,252

Items	Unit	Raddish		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	4,000	1.95	7,800 (c)
Farm Inputs				
1) Seeds	kg	7.5	120	900
2) Fertilizers				
- Urea	kg	75	3.0	225
- D.A.P.	kg			
- Farmyard Manure	ton	3	60	180
3) Insecticides				
- Novacron	lit	0.5	200	100
4) Fungicides				
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	5	70	350
- Levering/ridging		5	70	350
2) Well operation	month	3		600
Labor Requirement				
1) Land preparation	man-day	15.0	50	750
2) Nursery work				
3) Sowing		5.0	50	250
4) Fertilizer application		2.5	50	125
5) Insecticide application		1.5	50	75
6) Fungicide application				
7) Weeding		10.0	50	500
8) Water management		5.0	50	250
9) Harvesting		15.0	50	750
10) Packing, others		10.0	50	500
	(sub-total)	(64.0)		
Miscellaneous				
(5 % of above production cost)		5%		295
Total Production Cost				6,200 (d)
Net Return per Ha (c - d)				1,600

Items	Unit	Peas		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	2,600	3.68	9,568 (c)
Farm Inputs				
1) Seeds	kg	30	25	750
2) Fertilizers				
- Urea	kg			
- D.A.P.	kg			
- Farmyard Manure	ton	5	60	300
3) Insecticides				
-	lit			
4) Fungicides				
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	5	70	350
- Levering/ridging		5	70	350
2) Well operation	month	3		730
Labor Requirement				
1) Land preparation	man-day	10.0	50	500
2) Nursery work				
3) Sowing		3.0	50	150
4) Fertilizer application		2.0	50	100
5) Insecticide application				
6) Fungicide application				
7) Weeding		10.0	50	500
8) Water management		5.0	50	250
9) Harvesting		20.0	50	1,000
10) Packing, others		10.0	50	500
	(sub-total)	(60.0)		
Miscellaneous				
(5 % of above production cost)		5%		274
Total Production Cost				5,754 (d)
Net Return per Ha (c - d)				3,814

Table F.2.18 PRESENT CROP BUDGETS PER HA (4/6)

Items	Unit	Sorghum		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	11,500	0.25	2,875 (c)
Farm Inputs				
1) Seeds	kg	50	3	150
2) Fertilizers				
- Urea	kg	75	3	225
- D.A.P.	kg			
- Farmyard Manure	ton			
3) Insecticides	lit			
4) Fungicides				
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	4	70	280
- Levering/ridging		2.5	70	175
2) Well operation	month			
Labor Requirement				
1) Land preparation	man-day			
2) Nursery work				
3) Sowing		2.5	50	125
4) Fertilizer application		1.0	50	50
5) Insecticide application				
6) Fungicide application				
7) Weeding				
8) Water management				
9) Harvesting		10.0	50	500
10) Packing, others		4.0	50	200
(sub-total)		(17.5)		
Miscellaneous (5 % of above production cost)				85
Total Production Cost				1,790 (d)
Net Return per Ha (c - d)				1,085

Items	Unit	Maize		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	10,600	0.32	3,392 (c)
Farm Inputs				
1) Seeds	kg	80	3	240
2) Fertilizers				
- Urea	kg	75	3	225
- D.A.P.	kg			
- Farmyard Manure	ton			
3) Insecticides	lit			
4) Fungicides				
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	4	70	280
- Levering/ridging		2	70	140
2) Well operation	month	2		540
Labor Requirement				
1) Land preparation	man-day			
2) Nursery work				
3) Sowing		2.5	50	125
4) Fertilizer application		1.0	50	50
5) Insecticide application				
6) Fungicide application				
7) Weeding				
8) Water management		2.5	50	125
9) Harvesting		10.0	50	500
10) Packing, others		4.0	50	200
(sub-total)		(20.0)		
Miscellaneous (5 % of above production cost)				121
Total Production Cost				2,546 (d)
Net Return per Ha (c - d)				846

Items	Unit	Lucerne		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	13,900	0.42	5,838 (c)
Farm Inputs				
1) Seeds	kg	25	3	75
2) Fertilizers				
- Urea	kg	75	3.0	225
- D.A.P.	kg			
- Farmyard Manure	ton	3	60	180
3) Insecticides	lit			
4) Fungicides	lit			
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	4	70	280
- Levering/ridging		2.5	70	175
2) Well operation	month	10		1,120
Labor Requirement				
1) Land preparation	man-day	2.5	50	125
2) Nursery work				
3) Sowing		2.5	50	125
4) Fertilizer application		1.0	50	50
5) Insecticide application				
6) Fungicide application				
7) Weeding				
8) Water management		5.0	50	250
9) Harvesting		15.0	50	750
10) Packing, others		5.0	50	250
(sub-total)		(31.0)		
Miscellaneous (5 % of above production cost)				180
Total Production Cost				3,785 (d)
Net Return per Ha (c - d)				2,053

Items	Unit	Papaya		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	7,300	2.09	15,257 (c)
Farm Inputs				
1) Seeds	seedling	1,100	3	3,300
2) Fertilizers				
- Urea	kg	75	3.0	225
- D.A.P.	kg			
- Farmyard Manure	ton	5	60	300
3) Insecticides				
- Novacron	lit	1	200	200
4) Fungicides	lit			
Machinery Requirement				
1) Tractor				
- Plowing/harrowing	hour	5	70	350
- Levering/ridging		5	70	350
2) Well operation	month	12		1,850
Labor Requirement				
1) Land preparation	man-day	2.0	50	100
2) Digging (1,100 pits)		10.0	50	500
3) Planting		10.0	50	500
4) Fertilizer application		3.5	50	175
5) Insecticide application		1.5	50	75
6) Fungicide application				
7) Weeding		10.0	50	500
8) Water management		10.0	50	500
9) Harvesting		10.0	50	500
10) Packing, loading		5.0	50	250
(sub-total)		(62.0)		
Miscellaneous (5 % of above production cost)				484
Total Production Cost				10,152 (d)
Net Return per Ha (c - d)				5,098

Table F.2.18 PRESENT CROP BUDGETS PER HA (5/6)

- Mango -														
Items	Unit	Year										Total (a)	Unit Price (b)	Amount (Rs) (c)
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th			
Unit Yield	kg	0	0	0	0	1,020	2,040	3,060	4,080	6,100	6,100	22,400	4.01	89,824 (c)
Farm Inputs														
1) Seeds	seedling	85										85	20	1,700
2) Fertilizers														
- Urea	kg			50	50	125	125	125	250	250	250	1,225	3	3,675
- Farmyard Manure	ton	6				6					6	18	60	1,080
3) Agro-chemicals														
- Novacron	lit	1	1	1	1	2	2	2	3	3	3	19	200	3,800
Machinery Requirement														
1) Tractor														
- Plowing	hour	5										5	70	350
- Levelling	hour	4										4	70	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500
Labor Requirement														
1) Land preparation	man-day	10										10	50	500
2) Digging (85 pits)	man-day	20										20	50	1,000
3) Planting	man-day	10										10	50	500
4) Fertilizer application	man-day	5		1	1	5	2	2	4	4	5	29	50	1,450
5) Spraying	man-day	1	1	1	1	2	2	2	3	3	3	19	50	950
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000
8) Harvesting	man-day					5	5	8	8	10	10	46	50	2,300
9) Packing/ loading	man-day					3	3	4	4	5	5	24	50	1,200
(sub-total)		(57)	(12)	(13)	(13)	(31)	(28)	(32)	(35)	(38)	(39)	(298)		
Miscellaneous (5 % of above production cost)														
		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,214
Total Production Cost		7,970	2,783	2,993	2,993	4,762	4,226	4,436	5,198	5,355	5,786			46,492 (d)
Net Return per Ha (c - d)		-7,970	-2,783	-2,993	-2,993	-672	3,954	7,834	11,163	19,106	18,676			43,325

- Guava -														
Items	Unit	Year										Total (a)	Unit Price (b)	Amount (Rs) (c)
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th			
Unit Yield	kg	0	0	760	1,520	2,280	3,040	3,800	3,800	3,800	3,800	22,800	3.54	80,712 (c)
Farm Inputs														
1) Seeds	seedling	85										85	12	1,020
2) Fertilizers														
- Urea	kg			50	50	125	125	125	125	125	125	850	3	2,550
- Farmyard Manure	ton	6				6					6	18	60	1,080
3) Agro-chemicals														
	lit	2	2	2	2	3	3	3	3	3	3	26	200	5,200
Machinery Requirement														
1) Tractor														
- Plowing	hour	5										5	70	350
- Levelling	hour	4										4	70	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500
Labor Requirement														
1) Land preparation	man-day	10										10	50	500
2) Digging (85 pits)	man-day	20										20	50	1,000
3) Planting	man-day	10										10	50	500
4) Fertilizer application	man-day	5		1	1	5	2	2	2	2	5	25	50	1,250
5) Spraying	man-day	2	2	2	2	3	3	3	3	3	3	26	50	1,300
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000
8) Harvesting	man-day			5	5	10	10	15	20	20	20	105	50	5,250
9) Packing/ loading	man-day			2	2	3	3	4	4	5	5	28	50	1,400
(sub-total)		(58)	(13)	(21)	(21)	(37)	(34)	(40)	(45)	(46)	(49)	(364)		
Miscellaneous (5 % of above production cost)														
		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,359
Total Production Cost		7,518	3,045	3,623	3,623	5,287	4,751	5,066	5,329	5,381	5,917			49,539 (d)
Net Return per Ha (c - d)		-7,518	-3,045	-932	1,758	2,784	6,010	8,386	8,123	8,071	7,535			31,173

Table F.2.18 PRESENT CROP BUDGETS PER HA (6/6)

- Chikoo -														
Items	Unit	Year										Total (a)	Unit Price (b)	Amount (Rs) (c)
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th			
Unit Yield	kg	0	0	460	920	1,380	1,840	2,300	2,300	2,300	2,300	13,800	3.50	48,300 (c)
Farm Inputs														
1) Seeds	seedling	85										85	20	1,700
2) Fertilizers														
- Urea	kg			50	50	50	50	125	125	125	125	700	3	2,100
- Farmyard Manure	ton	5				5					5	15	60	900
3) Agro-chemicals	lit													
Machinery Requirement														
1) Tractor														
- Plowing	hour	5										5	70	350
- Levelling	hour	4										4	70	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500
Labor Requirement														
1) Land preparation	man-day	10										10	50	500
2) Digging (85 pits)	man-day	20										20	50	1,000
3) Planting	man-day	10										10	50	500
4) Fertilizer application	man-day	5		1	1	5	1	2	2	2	5	24	50	1,200
5) Spraying	man-day													
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000
8) Harvesting	man-day			2	2	3	3	5	5	10	10	40	50	2,000
9) Packing/ loading	man-day			1	1	2	2	2	2	4	4	18	50	900
(sub-total)		(56)	(11)	(15)	(15)	(26)	(22)	(25)	(25)	(32)	(35)	(262)		
Miscellaneous (5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			1,847
Total Production Cost		7,644	2,520	2,888	2,888	3,780	3,255	3,649	3,649	4,016	4,489			38,777 (d)
Net Return per Ha (c - d)		-7,644	-2,520	-1,278	333	1,050	3,185	4,401	4,401	4,034	3,561			2,524

- Coconut -														
Items	Unit	Year										Total (a)	Unit Price (b)	Amount (Rs) (c)
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th			
Unit Yield	kg	0	0	0	0	540	1,080	1,620	2,160	2,700	2,700	10,800	5.50	59,400 (c)
Farm Inputs														
1) Seeds	seedling	170										170	40	6,800
2) Fertilizers														
- Urea	kg			50	50	125	125	125	125	125	125	850	3	2,550
- Farmyard Manure	ton	4				4					4	12	60	720
3) Agro-chemicals	lit													
Machinery Requirement														
1) Tractor														
- Plowing	hour	5										5	70	350
- Levelling	hour	4										4	70	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500
Labor Requirement														
1) Land preparation	man-day	20										20	50	1,000
2) Digging (170 pits)	man-day	30										30	50	1,500
3) Planting	man-day	10										10	50	500
4) Fertilizer application	man-day	5		1	1	5	2	2	2	2	5	25	50	1,250
5) Spraying	man-day													
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000
8) Harvesting	man-day					5	5	5	5	10	10	40	50	2,000
9) Packing/ loading	man-day					1	1	2	2	4	4	14	50	700
(sub-total)		(76)	(11)	(12)	(12)	(27)	(24)	(25)	(25)	(32)	(35)	(279)		
Miscellaneous (5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,158
Total Production Cost		13,986	2,520	2,730	2,730	4,006	3,596	3,649	3,649	4,016	4,426			45,308 (d)
Net Return per Ha (c - d)		-13,986	-2,520	-2,730	-2,730	-1,036	2,344	5,261	8,231	10,834	10,424			14,093

Table F.2.19 CROP BUDGETS AND GROSS MARGIN PER HA

Crops	Income (1)			Production Cost (1)			Gross Margin (Rs)	
	Unit Yield (t/ha)	Unit Price (Rs/kg)	Gross Income (Rs)	Farm Inputs (Rs)	Machinery (Rs)	Labour (Rs)		Total Cost (Rs)
A. Fodder Crops								
Sorghum	11.5	0.25	2,875	460	455	875	1,790	1,085
Lucern	13.9	0.42	5,838	660	1,575	1,550	3,785	2,053
Maize	10.6	0.32	3,392	586	960	1,000	2,546	846
Average	<u>12.0</u>	<u>0.34</u>	<u>4,035</u>	<u>569</u>	<u>997</u>	<u>1,142</u>	<u>2,707</u>	<u>1,328</u>
B. Vegetables								
Tomato	3.3	3.46	11,418	2,531	1,340	3,600	7,471	3,947
Eggplant	4.9	2.45	12,005	1,332	1,340	3,775	6,447	5,558
Chilli	1.0	7.66	7,660	1,299	1,060	3,400	5,759	1,901
Lady's Finger	2.3	3.35	7,705	958	1,060	2,875	4,893	2,812
Sponge Gourd	3.1	3.31	10,261	2,023	1,160	2,075	5,258	5,003
Bottle Gourd	4.7	2.88	13,536	2,531	1,160	2,150	5,841	7,695
Cauliflower	13.3	3.06	40,698	2,513	1,130	3,200	6,843	33,855
Spinach	2.6	1.73	4,498	1,683	840	1,750	4,273	225
Carrot	5.4	1.56	8,424	1,322	1,300	3,200	5,822	2,602
Raddish	4.0	1.95	7,800	1,700	1,300	3,200	6,200	1,600
Turnip	6.6	2.22	14,652	1,810	1,340	3,250	6,400	8,252
Peas	2.6	3.68	9,568	1,324	1,430	3,000	5,754	3,814
Average	<u>4.5</u>	<u>2.76</u>	<u>12,352</u>	<u>1,752</u>	<u>1,205</u>	<u>2,956</u>	<u>5,913</u>	<u>6,439</u>
C. Fruit								
Mango (2)	(6.1)	(4.01)	8,983	1,247	1,913	1,490	4,650	4,333
Guava (2)	(3.8)	(3.54)	8,071	1,221	1,913	1,820	4,954	3,117
Chikoo (2)	(2.3)	(3.50)	4,830	655	1,913	1,310	3,878	952
Coconut (2)	(2.7)	(5.50)	5,940	1,223	1,913	1,395	4,531	1,409
Papaya	7.3	2.09	15,257	4,509	2,550	3,100	10,159	5,098
Average	<u>4.4</u>	<u>1.94</u>	<u>8,616</u>	<u>1,771</u>	<u>2,040</u>	<u>1,823</u>	<u>5,634</u>	<u>2,982</u>

Remarks : (1) ; Detail crop budgets, see Tables F.2.18 (1/6 - 6/6).

(2) ; Gross income and production cost are estimated on annual average of 10 years growing period.

Table F.2.20 GROSS AND NET CROP INCOME IN THE STUDY AREA

Crops	Cropped Area (ha)	Gross Crop Income				Production Cost		Net Crop Income	
		Unit Yield (t/ha)	Pro-duction (tons)	Unit Price (Rs/kg)	Gross Income (Rs 000)	Unit Cost (Rs/ha)	Total Cost (Rs 000)	Total Income (Rs 000)	per Ha (Rs/ha)
A. Fodder Crops									
Sorghum	210	11.50	2,415	0.25	603.8	1,790	375.9	227.9	1,085
Lucern	150	13.90	2,085	0.42	875.7	3,785	567.8	307.9	2,053
Maize	100	10.60	1,060	0.32	339.2	2,546	254.6	84.6	846
Others	110	12.09 *	1,330	0.33 *	434.9	2,605 *	286.5	148.4	1,349
All Fodder	570	(12.09)	6,890	(0.33)	2,253.5	(2,605)	1,484.8	768.8	(1,349)
B. Vegetables									
Tomato	480	3.30	1,584	3.46	5,480.6	7,471	3,586.1	1,894.6	3,947
Eggplant	160	4.90	784	2.45	1,920.8	6,447	1,031.5	889.3	5,558
Chilli	50	1.00	50	7.66	383.0	5,759	288.0	95.1	1,901
Lady's Finger	5	2.30	12	3.35	38.5	4,893	24.5	14.1	2,812
Sponge Gourd	200	3.10	620	3.31	2,052.2	5,258	1,051.6	1,000.6	5,003
Bottle Gourd	150	4.70	705	2.88	2,030.4	5,841	876.2	1,154.3	7,695
Cauliflower	120	13.30	1,596	3.06	4,883.8	6,843	821.2	4,062.6	33,855
Spinach	120	2.60	312	1.73	539.8	4,273	512.8	27.0	225
Carrot	150	5.40	810	1.56	1,263.6	5,822	873.3	390.3	2,602
Raddish	105	4.00	420	1.95	819.0	6,200	651.0	168.0	1,600
Tunip	65	6.60	429	2.22	952.4	6,400	416.0	536.4	8,252
Peas	105	2.60	273	3.68	1,004.6	5,754	604.2	400.5	3,814
Others	250	4.44 *	1,110	2.81 *	3,124.1	6,278 *	1,569.6	1,554.5	6,218
All Vegetables	1,960	(4.44)	8,705	(2.81)	24,492.8	(6,278)	12,305.8	12,187.0	(6,218)
C. Fruit									
Mango	280	6.10	1,708	(8,983)	2,515.2	4,650	1,302.0	1,213.2	4,333
Guava	570	3.80	2,166	(8,071)	4,600.5	4,954	2,823.8	1,776.7	3,117
Chikoo	80	2.30	184	(4,830)	386.4	3,878	310.2	76.2	952
Coconut	90	2.70	243	(5,940)	534.6	4,531	407.8	126.8	1,409
Papaya	50	7.30	365	2.09	762.9	10,159	508.0	254.9	5,098
Others	130	4.36 *	567	1.89 *	1,069.1	5,002 *	650.2	418.9	3,222
All Fruit	1,200	(4.36)	5,233	(1.89)	9,868.7	(5,002)	6,002.0	3,866.7	(3,222)
Total	3,730		20,827		36,615.0		19,792.5	16,822.5	4,510

- Remarks : (1) ; Detail crop budgets see Table F.2.18 (1/6 - 6/6).
(2) ; Gross income and unit cost for mango, guava, chikoo and coconut are annual average of 10 years growing period (see Table F.2.19).
(3) ; All fodder, vegetable, fruit crops and others(*) are weighted average of unit yield, unit prices and unit costs.

Table F.2.21 PRESENT FARM GROSS MARGIN

Description		Owner Farm	Owner cum Tenant	Tenant Farm
A. Holding Size (ha)				
Agriculture land (6,140 ha)		2,232	1,664	2,244
No. of farms (698)		185	145	368
Average holding size		<u>12.1</u>	<u>11.5</u>	<u>6.1</u>
B. Cropped Area (ha)				
Summer season (3,220 ha)	52.4%	6.3	6.0	3.2
Winter season (510 ha)	8.3%	1.0	1.0	0.5
		<u>7.3</u>	<u>7.0</u>	<u>3.7</u>
C. Cropped Pattern (ha)				
Fodder	15%	1.1	1.0	0.6
Vegetable	53%	3.9	3.7	2.0
Fruit	32%	2.4	2.2	1.2
Total		<u>7.3</u>	<u>7.0</u>	<u>3.7</u>
D. Crop Production (tons)				
Fodder	12.09 t/ha	13.3	12.7	6.7
Vegetable	4.44 t/ha	17.3	16.4	8.7
Fruit	4.36 t/ha	10.2	9.7	5.2
Total		<u>40.9</u>	<u>38.8</u>	<u>20.6</u>
E. Gross Income (Rs)				
Fodder	0.33 Rs/kg	4,395	4,178	2,216
Vegetable	2.81 Rs/kg	48,567	46,159	24,484
Fruit	1.89 Rs/kg	19,367	18,407	9,764
Total		<u>72,330</u>	<u>68,743</u>	<u>36,464</u>
F. Production Cost (Rs)				
		<u>39,284</u>	<u>26,794</u>	<u>14,267</u>
Labour cost (50 Rs/man-day)				
Fodder (23md/ha)	1,150 Rp/ha	25 1,250	24 1,200	13 650
Vegetable (59 md/ha)	2,950 Rs/ha	234 11,700	222 11,100	118 5,900
Fruit (36 md/ha)	1,800 Rs/ha	85 4,250	80 4,000	43 2,150
Total		<u>344 17,200</u>	<u>326 16,300</u>	<u>174 8,700</u>
Other cost				
Fodder	1,455 Rs/ha	1,603	75% 762	50% 404
Vegetable	3,328 Rs/ha	12,955	75% 6,156	50% 3,265
Fruit	3,202 Rs/ha	7,526	75% 3,576	50% 1,897
Total		<u>22,084</u>	<u>10,494</u>	<u>5,567</u>
G. Gross Margin				
Gross income		100% 72,330	75% 51,557	50% 18,232
Production cost		39,284	26,794	14,267
Gross margin		<u>33,046</u>	<u>24,763</u>	<u>3,965</u>

Remarks : A ; Average farm size, see in Table F.2.2.
 B ; Cropped area of fodder, vegetable and fruit is estimated in Table F.2.5.
 D, C, F ; see Tables F.2.18, F.2.19 and F.2.20

Table F.2.22 LABOUR REQUIREMENT IN THE STUDY AREA

Crops	Summer Season			Winter Season			Annual Requirement (man-day)
	Area (ha)	Labour (man-day/ha)	Total (man-day)	Area (ha)	Labour (man-day/ha)	Total (man-day)	
A. Fodder Crops							
Sorghum	210	17.5	3,675				3,675
Lucern	150	31.0	4,650				4,650
Maize, others	130	20.0	2,600	80	20.0	1,600	4,200
All Fodder	<u>490</u>	(22.3) *	<u>10,925</u>	<u>80</u>	(20.0) *	<u>1,600</u>	<u>12,525</u>
B. Vegetables							
Tomato	480	72.0	34,560				34,560
Eggplant	110	75.5	8,305	50	75.5	3,775	12,080
Chilli	10	68.0	680	40	68.0	2,720	3,400
Sponge Gourd	130	41.5	5,395	70	41.5	2,905	8,300
Bottle Gourd	100	43.0	4,300	50	43.0	2,150	6,450
Cauliflower	120	64.0	7,680				7,680
Spinach	60	35.0	2,100	60	35.0	2,100	4,200
Carrot	100	64.0	6,400	50	64.0	3,200	9,600
Radish	60	64.0	3,840	45	64.0	2,880	6,720
Turnip	50	65.0	3,250	15	65.0	975	4,225
Peas	100	60.0	6,000	5	60.0	300	6,300
Others	210	62.5	13,127	45	62.5	108	13,234
All Vegetables	<u>1,530</u>	(62.5) *	<u>95,637</u>	<u>430</u>	(49.1) *	<u>21,113</u>	<u>116,749</u>
C. Fruit							
Guava	280	36.4	10,192				10,192
Mango	570	29.8	16,986				16,986
Chikoo	80	26.2	2,096				2,096
Coconut	90	27.9	2,511				2,511
Papaya	50	62.0	3,100				3,100
Others	130	32.6	4,238				4,238
All Fruit	<u>1,200</u>	(32.6) *	<u>39,123</u>				<u>39,123</u>
Total	<u>3,220</u>	(45.2) *	<u>145,685</u>	<u>510</u>	(44.5) *	<u>22,713</u>	<u>168,397</u>

Remark : (*) ; Weighted average for all fodder, vegetables and fruit.

Table F.4.1 INCREMENTAL CROPPED AREA UNDER WITHOUT AND WITH PROJECT

Crops / Project Year (1)	1988 Actual	1989 -3	1990 -2	1991 -1	1992 1	1993 2	1994 3	1995 4	1996 5
A. Total Cropped Area (ha)									
With project	2,960	2,940	2,910	2,880	2,850	2,920	2,790	2,760	2,730
Without project	2,960	2,940	2,910	2,880	2,850	2,920	2,790	2,760	2,730
Incremental	-	-	-	-	-	-	-	-	-
B. Cropped Area by Crop (ha)									
- Without Project -									
Fodder 7.4%	220	215	210	205	200	195	190	190	190
Vegetables 52.7%	1,560	1,555	1,550	1,545	1,540	1,540	1,540	1,540	1,540
Fruit (2) 39.9%	1,180	1,155	1,130	1,105	1,080	1,055	1,030	1,005	1,000
- With Project -									
Fodder	220	215	210	205	200	195	190	190	190
Vegetables	1,560	1,555	1,550	1,545	1,540	1,540	1,540	1,540	1,540
Fruit	1,180	1,155	1,130	1,105	1,080	1,055	1,030	1,005	1,000
C. Increment									
Fodder	-	-	-	-	-	-	-	-	-
Vegetables	-	-	-	-	-	-	-	-	-
Fruit	-	-	-	-	-	-	-	-	-

Crops / Project Year (1)	1997 6	1998 7	1999 8	2000 9	2001 10	2002 - 11 - 50
A. Total Cropped Area (ha)						
With project	3,480	4,235	4,990	5,740	6,500	6,500
Without project	2,730	2,730	2,730	2,730	2,730	2,730
Incremental	750	1,505	2,260	3,010	3,770	3,770
B. Cropped Area by Crop (ha)						
- Without Project -						
Fodder	190	190	190	190	190	190
Vegetables	1,540	1,540	1,540	1,540	1,540	1,540
Fruit	1,000	1,000	1,000	1,000	1,000	1,000
- With Project -						
Fodder (3)	190	195	200	200	200	200
Vegetables	2,290	3,040	3,790	4,540	5,300	5,300
Fruit	1,000	1,000	1,000	1,000	1,000	1,000
C. Increment						
Fodder		5	10	10	10	10
Vegetables	750	1,500	2,250	3,000	3,760	3,760
Fruit						

Remarks : (1) PY 1 ; Dam Construction, PY 5 ; Trial dam operation, PY 6 ; Nomal dam operation
PY 6 - 10 ; Recharge to full development level

(2) Fruit crops, especially mango, will continue to decline due to shorage of water.

(3) Fodder crops change and production is maintained at 1988/89 level reduced area

Table F.4.2 CROP PRODUCTION WITHOUT AND WITH PROJECT

Crops	Without Project			With Project			Incremental Production (tons)
	Cropped Area (ha)	Unit Yield (t/ha)	Production (tons)	Cropped Area (ha)	Unit Yield (t/ha)	Production (tons)	
A. Fodder Crops							
Lucerne	100	13.9	1,390	100	26.0	2,600	1,210
Maize, others	90	10.6	954	100	18.0	1,800	846
All Fodder	<u>190</u>	(12.3) *	<u>2,344</u>	<u>200</u>	(22.0) *	<u>4,400</u>	<u>2,056</u>
B. Vegetables							
Tomato	400	3.3	1,320	1,000	7.0	7,000	5,680
Eggplant	140	4.9	686	500	9.0	4,500	3,814
Chilli	20	1.0	20	350	2.5	875	855
Sponge Gourd	160	3.1	496	1,000	11.0	11,000	10,504
Bottle Gourd	120	4.7	564	400	8.0	3,200	2,636
Cauliflower	100	13.3	1,330	300	16.0	4,800	3,470
Spinach	110	2.6	286	300	6.0	1,800	1,514
Carrot	120	5.4	648	200	11.0	2,200	1,552
Radish	70	4.0	280	150	13.0	1,950	1,670
Turnip	50	6.6	330	150	15.0	2,250	1,920
Peas	80	2.6	208	200	5.0	1,000	792
Others	170	4.5	788	750	8.1	6,071	5,283
All Vegetables	<u>1,540</u>	(4.5) *	<u>6,956</u>	<u>5,300</u>	(8.8) *	<u>46,646</u>	<u>39,690</u>
C. Fruit							
Guava	280	3.8	1,064	280	7.0	1,960	896
Mango	390	6.1	2,379	390	9.0	3,510	1,131
Chikoo	80	2.3	184	80	3.0	240	56
Coconut	90	2.7	243	90	4.0	360	117
Papaya	50	7.3	365	50	8.5	425	60
Others	110	4.8	523	110	6.9	761	238
All Fruit	<u>1,000</u>	(4.8) *	<u>4,758</u>	<u>1,000</u>	(7.3) *	<u>7,256</u>	<u>2,498</u>
Total	2,730		14,058	6,500		58,302	44,244

Remarks : (*) ; weighted average of unit yield

Table F.4.3 FINANCIAL PRICES OF FARM INPUTS

Items	Financial Prices (Market Price, 1989)
A. Seeds	
Maize	3 Rs/kg
Lucern	3 Rs/kg
Tomato	625 Rs/kg
Eggplant	100 Rs/kg
Chilli	200 Rs/kg
Sponge Gourd	200 Rs/kg
Bottle Gourd	200 Rs/kg
Cauliflower	300 Rs/kg
Spinach	70 Rs/kg
Carrot	120 Rs/kg
Radish	120 Rs/kg
Turnip	400 Rs/kg
Peas	25 Rs/kg
Guava	12 Rs/tree
Mango	20 Rs/tree
Chikoo	20 Rs/tree
Coconut	40 Rs/tree
Papaya	3 Rs/tree
B. Fertilizers	
Urea	3.0 Rs/kg
D.A.P.	4.1 Rs/kg
FYM	60 Rs/ton
C. Agro-chemicals	
Insecticides	200 Rs/litre
Fungucides	250 Rs/litre
D. Machinery Cost (Tractor)	
Plowing/ harrowing	70 Rs/hour
Levelling/ ridging	70 Rs/hour
E. Well O/M Cost	
Electric cost	0.071 Rs/m ³
Maintenance cost	0.011 Rs/m ³
F. Labour Cost	
- Male	50 Rs/man-day

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (1/11)

- Tomato -									
Items	Unit	Without Project			Unit	With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	
Unit Yield	kg	3,300	3.46	11,418 (c)	kg	7,000	3.46	24,220 (c)	
Farm Inputs									
1) Seeds	kg	1.5	625	938	kg	1.5	625	938	
2) Fertilizers									
- Urea	kg	75	3.0	225	kg	125	3.0	375	
- D.A.P.	kg	125	4.1	513	kg	125	4.1	513	
- Farmyard Manure	ton	5	60	300	ton	10	60	600	
3) Insecticides	lit	1	200	200	lit	2	200	400	
4) Fungicides	lit				lit	1	250	250	
Machinery Requirement									
1) Tractor									
- Plowing/ harrowing	hour	5	70	350	hour	5	70	350	
- Levelling/ ridging		5	70	350		5	70	350	
2) Well operation	month	4		640	month	4		640	
Labour Requirement									
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500	
2) Nursery work		3.5	50	175		5.5	50	275	
3) Transplanting		10.0	50	500		10.0	50	500	
4) Fertilizer application		2.0	50	100		5.0	50	250	
5) Insecticide application		1.5	50	75		4.0	50	200	
6) Fungicide application						2.0	50	100	
7) Weeding		15.0	50	750		15.0	50	750	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		15.0	50	750		20.0	50	1,000	
10) Packing, others		10.0	50	500		15.0	50	750	
	(sub-total)	(72.0)			(sub-total)	(91.5)			
Miscellaneous									
(5 % of above production cost)		5%		356		5%		450	
Total Production Cost				2,471 (d)	Total Production Cost				9,440 (d)
Net Return per Ha				3,947	Net Return per Ha				14,781
(c - d)					(c - d)				
- Eggplant -									
Items	Unit	Without Project			Unit	With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	
Unit Yield	kg	4,900	2.45	12,005 (c)	kg	9,000	2.45	22,050 (c)	
Farm Inputs									
1) Seeds	kg	1.5	100	150	kg	1.5	100	150	
2) Fertilizers									
- Urea	kg	75	3.0	225	kg	125	3.0	375	
- D.A.P.	kg				kg	125	4.1	513	
- Farmyard Manure	ton	7.5	60	450	ton	15	60	900	
3) Insecticides	lit	1	200	200	lit	2	200	400	
4) Fungicides	lit				lit	1	250	250	
Machinery Requirement									
1) Tractor									
- Plowing/ harrowing	hour	5	70	350	hour	5	70	350	
- Levelling/ ridging		5	70	350		5	70	350	
2) Well operation	month	4		640	month	4		640	
Labour Requirement									
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500	
2) Nursery work		5.5	50	275		5.5	50	275	
3) Transplanting		10.0	50	500		10.0	50	500	
4) Fertilizer application		3.5	50	175		7.0	50	350	
5) Insecticide application		1.5	50	75		4.0	50	200	
6) Fungicide application						2.0	50	100	
7) Weeding		15.0	50	750		15.0	50	750	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		15.0	50	750		20.0	50	1,000	
10) Packing, others		10.0	50	500		15.0	50	750	
	(sub-total)	(75.5)			(sub-total)	(93.5)			
Miscellaneous									
(5 % of above production cost)		5%		307		5%		430	
Total Production Cost				6,447 (d)	Total Production Cost				9,033 (d)
Net Return per Ha				5,558	Net Return per Ha				13,017
(c - d)					(c - d)				

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (2/11)

- Chilli -								
Items	Unit	Without Project			Unit	With Project		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	1,000	7.66	7,660 (c)	kg	2,500	7.66	19,150 (c)
Farm Inputs								
1) Seeds	kg	2.5	200	500	kg	2.5	200	500
2) Fertilizers								
- Urea	kg	75	3.0	225	kg	75	3.0	225
- D.A.P.	kg				kg	125	4.1	513
- Farmyard Manure	ton	5	60	300	ton	10	60	600
3) Insecticides	lit				lit	2	200	400
4) Fungicides	lit				lit	1	250	250
Machinery Requirement								
1) Tractor								
- Plowing/ harrowing	hour	4	70	280	hour	5	70	350
- Levelling/ ridging		2	70	140		5	70	350
2) Well operation	month	4		640	month	4		640
Labour Requirement								
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500
2) Nursery work		5.5	50	275		5.5	50	275
3) Transplanting		10.0	50	500		10.0	50	500
4) Fertilizer application		2.5	50	125		5.0	50	250
5) Insecticide application						4.0	50	200
6) Fungicide application						2.0	50	100
7) Weeding		10.0	50	500		10.0	50	500
8) Water management		5.0	50	250		5.0	50	250
9) Harvesting		20.0	50	1,000		25.0	50	1,250
10) Packing, others		5.0	50	250		10.0	50	500
	(sub-total)	(68.0)			(sub-total)	(86.5)		
Miscellaneous (5 % of above production cost)		5%		274		5%		408
Total Production Cost				5,752 (d)				8,560 (d)
Net Return per Ha (c - d)				1,901				10,590

- Turmp -								
Items	Unit	Without Project			Unit	With Project		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	6,600	2.22	14,652 (c)	kg	15,000	2.22	33,300 (c)
Farm Inputs								
1) Seeds	kg	2.5	400	1,000	kg	2.5	400	1,000
2) Fertilizers								
- Urea	kg	75	3.0	225	kg	125	3.0	375
- D.A.P.	kg				kg	125	4.1	513
- Farmyard Manure	ton	3	60	180	ton	10	60	600
3) Insecticides	lit	0.5	200	100	lit	2	200	400
4) Fungicides	lit				lit	1	250	250
Machinery Requirement								
1) Tractor								
- Plowing/ harrowing	hour	5	70	350	hour	5	70	350
- Levelling/ ridging		5	70	350		5	70	350
2) Well operation	month	3		640	month	3		640
Labour Requirement								
1) Land preparation	man-day	15.0	50	750	man-day	15.0	50	750
2) Nursery work								
3) Sowing		5.0	50	250		5.0	50	250
4) Fertilizer application		3.5	50	175		5.0	50	250
5) Insecticide application		1.5	50	75		4.0	50	200
6) Fungicide application						2.0	50	100
7) Weeding		10.0	50	500		10.0	50	500
8) Water management		5.0	50	250		5.0	50	250
9) Harvesting		15.0	50	750		20.0	50	1,000
10) Packing, others		10.0	50	500		15.0	50	750
	(sub-total)	(65.0)			(sub-total)	(81.0)		
Miscellaneous (5 % of above production cost)		5%		305		5%		426
Total Production Cost				6,400 (d)				8,954 (d)
Net Return per Ha (c - d)				8,252				24,346

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (3/11)

- Sponge Gourd -								
Items	Unit	Without Project			Unit	With Project		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	3,100	3.31	10,261 (c)	kg	11,000	3.31	36,410 (c)
Farm Inputs								
1) Seeds	kg	5.0	200	1,000	kg	5.0	200	1,000
2) Fertilizers								
- Urea	kg	75	3.0	225	kg	125	3.0	375
- D.A.P.	kg	75	4.1	308	kg	125	4.1	513
- Farmyard Manure	ton	3	60	180	ton	5	60	300
3) Insecticides	lit	1	200	200	lit	2	200	400
4) Fungicides	lit				lit			
Machinery Requirement								
1) Tractor								
- Plowing/ harrowing	hour	4	70	280	hour	4	70	280
- Levelling/ ridging		2	70	140		4	70	280
2) Well operation	month	3		600	month	3		600
Labour Requirement								
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500
2) Nursery work								
3) Sowing		2.5	50	125		2.5	50	125
4) Fertilizer application		2.0	50	100		5.0	50	250
5) Insecticide application		2.0	50	100		4.0	50	200
6) Fungicide application								
7) Weeding		5.0	50	250		5.0	50	250
8) Water management		5.0	50	250		5.0	50	250
9) Harvesting		10.0	50	500		15.0	50	750
10) Packing, others		5.0	50	250		7.5	50	375
	(sub-total)	(41.5)			(sub-total)	(54.0)		
Miscellaneous								
(5% of above production cost)		5%		250		5%		322
Total Production Cost				5,258 (d)				6,770 (d)
Net Return per Ha (c - d)				5,003				29,640

- Bottle Gourd -								
Items	Unit	Without Project			Unit	With Project		
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)
Unit Yield	kg	4,700	2.88	13,536 (c)	kg	8,000	2.88	23,040 (c)
Farm Inputs								
1) Seeds	kg	7.0	200	1,400	kg	7.0	200	1,400
2) Fertilizers								
- Urea	kg	75	3.0	225	kg	125	3.0	375
- D.A.P.	kg	75	4.1	308	kg	125	4.1	513
- Farmyard Manure	ton	2	60	120	ton	5	60	300
3) Insecticides	lit	1.0	200	200	lit	2	200	400
4) Fungicides	lit				lit			
Machinery Requirement								
1) Tractor								
- Plowing/ harrowing	hour	4	70	280	hour	4	70	280
- Levelling/ ridging		4	70	280		4	70	280
2) Well operation	month	3		600	month	3		600
Labour Requirement								
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500
2) Nursery work								
3) Sowing		2.5	50	125		2.5	50	125
4) Fertilizer application		3.5	50	175		5.0	50	250
5) Insecticide application		2.0	50	100		4.0	50	200
6) Fungicide application								
7) Weeding		5.0	50	250		5.0	50	250
8) Water management		5.0	50	250		5.0	50	250
9) Harvesting		10.0	50	500		15.0	50	750
10) Packing, others		5.0	50	250		7.5	50	375
	(sub-total)	(43.0)			(sub-total)	(54.0)		
Miscellaneous								
(5% of above production cost)		5%		278		5%		342
Total Production Cost				5,841 (d)				7,190 (d)
Net Return per Ha (c - d)				7,695				15,850

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (4/11)

- Cauliflower -									
Items	Unit	Without Project			Unit	With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	
Unit Yield	kg	13,300	3.06	40,698 (c)	kg	16,000	3.06	48,960 (c)	
Farm Inputs									
1) Seeds	kg	1.5	300	450	kg	1.5	300	450	
2) Fertilizers									
- Urea	kg	125	3.0	375	kg	150	3.0	450	
- D.A.P.	kg	125	4.1	513	kg	125	4.1	513	
- Farmyard Manure	ton	7.5	60	450	ton	15	60	900	
3) Insecticides	lit	2	200	400	lit	2	200	400	
4) Fungicides	lit				lit	1	250	250	
Machinery Requirement									
1) Tractor									
- Plowing/ harrowing	hour	5	70	350	hour	5	70	350	
- Levelling/ ridging		2	70	140		2	70	140	
2) Well operation	month	3		640	month	3		640	
Labour Requirement									
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500	
2) Nursery work		5.5	50	275		5.5	50	275	
3) Transplanting		10.0	50	500		10.0	50	500	
4) Fertilizer application		3.5	50	175		7.0	50	350	
5) Insecticide application		2.0	50	100		4.0	50	200	
6) Fungicide application						2.0	50	100	
7) Weeding		15.0	50	750		15.0	50	750	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		8.0	50	400		15.0	50	750	
10) Packing, others		5.0	50	250		10.0	50	500	
	(sub-total)	(64.0)			(sub-total)	(83.5)			
Miscellaneous (5% of above production cost)		5%		326		5%		413	
Total Production Cost				6,843 (d)				8,681 (d)	
Net Return per Ha (c - d)				33,855				40,279	

- Spinach -									
Items	Unit	Without Project			Unit	With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	
Unit Yield	kg	2,600	1.73	4,498 (c)	kg	6,000	1.73	10,380 (c)	
Farm Inputs									
1) Seeds	kg	12.5	70	875	kg	12.5	70	875	
2) Fertilizers									
- Urea	kg	75	3.0	225	kg	125	3.0	375	
- D.A.P.	kg				kg	125	4.1	513	
- Farmyard Manure	ton	3	60	180	ton	10	60	600	
3) Insecticides	lit	1	200	200	lit	1	200	200	
4) Fungicides	lit				lit				
Machinery Requirement									
1) Tractor									
- Plowing/ harrowing	hour	4	70	280	hour	4	70	280	
- Levelling/ ridging		2	70	140		2	70	140	
2) Well operation	month	3		420	month	3		420	
Labour Requirement									
1) Land preparation	man-day	4.0	50	200	man-day	5.0	50	250	
2) Nursery work									
3) Sowing		2.0	50	100		2.0	50	100	
4) Fertilizer application		3.0	50	150		5.0	50	250	
5) Insecticide application		1.5	50	75		2.0	50	100	
6) Fungicide application							50	50	
7) Weeding		7.5	50	375		10.0	50	500	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		8.0	50	400		12.5	50	625	
10) Packing, others		4.0	50	200		7.5	50	375	
	(sub-total)	(35.0)			(sub-total)	(49.0)			
Miscellaneous (5% of above production cost)		5%		204		5%		293	
Total Production Cost				4,274 (d)				6,145 (d)	
Net Return per Ha (c - d)				225				4,235	

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (5/11)

- Carrot -									
Items	Unit	Without Project			With Project				
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	Unit	Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	
Unit Yield	kg	5,400	1.56	8,424 (c)	kg	11,000	1.56	17,160 (c)	
Farm Inputs									
1) Seeds	kg	4.5	120	540	kg	4.5	120	540	
2) Fertilizers									
- Urea	kg	75	3.0	225	kg	125	3.0	375	
- D.A.P.	kg				kg	125	4.1	513	
- Farmyard Manure	ton	3	60	180	ton	15	60	900	
3) Insecticides	lit	0.5	200	100	lit	2	200	400	
4) Fungicides	lit				lit	1	250	250	
Machinery Requirement									
1) Tractor									
- Plowing/harrowing	hour	5	70	350	hour	5	70	350	
- Levelling/ridging		5	70	350		5	70	350	
2) Well operation	month	3		600	month	3		600	
Labour Requirement									
1) Land preparation	man-day	15.0	50	750	man-day	15.0	50	750	
2) Nursery work									
3) Sowing		5.0	50	250		5.0	50	250	
4) Fertilizer application		2.5	50	125		5.0	50	250	
5) Insecticide application		1.5	50	75		4.0	50	200	
6) Fungicide application						2.0	50	100	
7) Weeding		10.0	50	500		10.0	50	500	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		15.0	50	750		20.0	50	1,000	
10) Packing, others		10.0	50	500		15.0	50	750	
	(sub-total)	(64.0)			(sub-total)	(81.0)			
Miscellaneous									
(5 % of above production cost)		5%		277		5%		416	
Total Production Cost				5,822 (d)	8,744 (d)				
Net Return per Ha (c - d)				2,602	8,416				
- Radish -									
Items	Unit	Without Project			With Project				
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	Unit	Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	
Unit Yield	kg	4,000	1.95	7,800 (c)	kg	13,000	1.95	25,350 (c)	
Farm Inputs									
1) Seeds	kg	7.5	120	900	kg	7.5	120	900	
2) Fertilizers									
- Urea	kg	75	3.0	225	kg	125	3.0	375	
- D.A.P.	kg				kg	125	4.1	513	
- Farmyard Manure	ton	3	60	180	ton	10	60	600	
3) Insecticides	lit	0.5	200	100	lit	2	200	400	
4) Fungicides	lit				lit	1	250	250	
Machinery Requirement									
1) Tractor									
- Plowing/harrowing	hour	5	70	350	hour	5	70	350	
- Levelling/ridging		5	70	350		5	70	350	
2) Well operation	month	3		600	month	3		600	
Labour Requirement									
1) Land preparation	man-day	15.0	50	750	man-day	15.0	50	750	
2) Nursery work									
3) Sowing		5.0	50	250		5.0	50	250	
4) Fertilizer application		2.5	50	125		5.0	50	250	
5) Insecticide application		1.5	50	75		4.0	50	200	
6) Fungicide application						2.0	50	100	
7) Weeding		10.0	50	500		10.0	50	500	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		15.0	50	750		20.0	50	1,000	
10) Packing, others		10.0	50	500		15.0	50	750	
	(sub-total)	(64.0)			(sub-total)	(81.0)			
Miscellaneous									
(5 % of above production cost)		5%		295		5%		419	
Total Production Cost				6,200 (d)	8,807 (d)				
Net Return per Ha (c - d)				1,600	16,543				

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (6/11)

- Peas -									
Items	Unit	Without Project			Unit	With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	
Unit Yield	kg	2,600	3.68	9,568 (c)	kg	5,000	3.68	18,400 (c)	
Farm Inputs									
1) Seeds	kg	30	25	750	kg	30	25	750	
2) Fertilizers									
- Urea	kg				kg	75	3.0	225	
- D.A.P.	kg				kg	125	4.1	513	
- Farmyard Manure	ton	5	60	300	ton	5	60	300	
3) Insecticides	lit				lit	1	200	200	
4) Fungicides	lit				lit				
Machinery Requirement									
1) Tractor									
- Plowing/harrowing	hour	5	70	350	hour	5	70	350	
- Levelling/ridging	hour	5	70	350	hour	5	70	350	
2) Well operation	month	3		730	month	3		730	
Labour Requirement									
1) Land preparation	man-day	10.0	50	500	man-day	10.0	50	500	
2) Nursery work									
3) Sowing		3.0	50	150		3.0	50	150	
4) Fertilizer application		2.0	50	100		5.0	50	250	
5) Insecticide application						2.0	50	100	
6) Fungicide application									
7) Weeding		10.0	50	500		10.0	50	500	
8) Water management		5.0	50	250		5.0	50	250	
9) Harvesting		20.0	50	1,000		25.0	50	1,250	
10) Packing, others		10.0	50	500		15.0	50	750	
	(sub-total)	(60.0)			(sub-total)	(75.0)			
Miscellaneous (5 % of above production cost)		5%		274		5%		358	
Total Production Cost				5,754 (d)				7,526 (d)	
Net Return per Ha (c - d)				3,814				10,874	

- Papaya -										
Items	Unit	Without Project				Unit	With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	6 years		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs)	6 years
Unit Yield	kg	7,300	2.09	15,257 (c)	64,842	kg	8,500	2.09	17,765 (c)	75,501
Farm Inputs										
1) Seeds	Seedling	1,100	3	3,300	3,300	Seedling	1,100	3	3,300	3,300
2) Fertilizers										
- Urea	kg	75	3.0	225	1,350	kg	125	3.0	375	2,250
- D.A.P.	kg					kg				
- Farmyard Manure	ton	5	60	300	300	ton	10	60	600	600
3) Insecticides	lit	1	200	200	1,200	lit	2	200	400	2,400
4) Fungicides	lit					lit	1	250	250	1,500
Machinery Requirement										
1) Tractor										
- Plowing/harrowing	hour	5	70	350	350	hour	5	70	350	350
- Levelling/ridging	hour	5	70	350	350	hour	5	70	350	350
2) Well operation	month	12		1,850	11,100	month	12		1,850	11,100
Labour Requirement										
1) Land preparation	man-day	2.0	50	100	100	man-day	2.0	50	100	100
2) Digging (1,100 pits)		10.0	50	500	500		10.0	50	500	500
3) Planting		10.0	50	500	500		10.0	50	500	500
4) Fertilizer application		3.5	50	175	600		5.0	50	250	600
5) Insecticide application		1.5	50	75	450		4.0	50	200	1,200
6) Fungicide application							2.0	50	100	600
7) Weeding		10.0	50	500	3,000		10.0	50	500	3,000
8) Water management		10.0	50	500	3,000		10.0	50	500	3,000
9) Harvesting		10.0	50	500	2,500		15.0	50	750	3,750
10) Packing, others		5.0	50	250	1,250		7.5	50	375	1,875
	(sub-total)	(62.0)				(sub-total)	(75.5)			
Miscellaneous (5 % of above production cost)		5%		484	1,493		5%		563	1,849
Total Production Cost				10,152 (d)	31,343				11,813 (d)	38,824
Net Return per Ha (c - d)				5,098	33,500				5,953	36,678
					(5,583)					(6,113)

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (7/11)

- Lucerne -								
Items	Unit	Without Project			With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	
Unit Yield	kg	13,900	0.42	5,838 (c)	kg	26,000	0.42	10,920 (c)
Farm Inputs								
1) Seeds	kg	25.0	3	75	kg	25.0	3	75
2) Fertilizers								
- Urea	kg	75	3.0	225	kg	125	3.0	375
- D.A.P.	kg				kg			
- Farmyard Manure	ton	3	60	180	ton	5	60	300
3) Insecticides	lit				lit	1	200	200
4) Fungicides	lit				lit			
Machinery Requirement								
1) Tractor								
- Plowing/ harrowing	hour	4	70	280	hour	4	70	280
- Levelling/ ridging		2.5	70	175		2.5	70	175
2) Well operation	month	10		1,120	month	10		1,120
Labour Requirement								
1) Land preparation	man-day	2.5	50	125	man-day	2.5	50	125
2) Nursery work								
3) Sowing		2.5	50	125		2.5	50	125
4) Fertilizer application		1.0	50	50		5.0	50	250
5) Insecticide application						2.0	50	100
6) Fungicide application								
7) Weeding						3.0	50	150
8) Water management		5.0	50	250		5.0	50	250
9) Harvesting		15.0	50	750		25.0	50	1,250
10) Packing, others		5.0	50	250		10.0	50	500
	(sub-total)	(31.0)			(sub-total)	(55.0)		
Miscellaneous (5 % of above production cost)		5%		180		5%		264
Total Production Cost				3,285 (d)				5,532 (d)
Net Return per Ha (c - d)				2,053				3,381

- Maize -								
Items	Unit	Without Project			With Project			
		Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	Quantity (a)	Unit Price (b) (Rs)	Amount (a x b) (Rs) (c)	
Unit Yield	kg	10,600	0.32	3,392 (c)	kg	18,000	0.32	5,760 (c)
Farm Inputs								
1) Seeds	kg	80.0	3	240	kg	80.0	3	240
2) Fertilizers								
- Urea	kg	75	3.0	225	kg	125	3.0	375
- D.A.P.	kg				kg			
- Farmyard Manure	ton				ton	5	60	300
3) Insecticides	lit				lit			
4) Fungicides	lit				lit			
Machinery Requirement								
1) Tractor								
- Plowing/ harrowing	hour	4	70	280	hour	4	70	280
- Levelling/ ridging		2	70	140		2	70	140
2) Well operation	month	2		540	month	2		540
Labour Requirement								
1) Land preparation	man-day				man-day	2.5	50	125
2) Nursery work								
3) Sowing		2.5	50	125		2.5	50	125
4) Fertilizer application		1.0	50	50		3.0	50	150
5) Insecticide application								
6) Fungicide application								
7) Weeding						3.0	50	150
8) Water management		2.5	50	125		2.5	50	125
9) Harvesting		10.0	50	500		12.5	50	625
10) Packing, others		4.0	50	200		5.0	50	250
	(sub-total)	(20.0)			(sub-total)	(31.0)		
Miscellaneous (5 % of above production cost)		5%		121		5%		171
Total Production Cost				2,546 (d)				3,596 (d)
Net Return per Ha (c - d)				846				2,164

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (8/11)

- Mango - Without Project															
Items	Unit	Year										Total (a)	Unit Prices (b)	Amount (a x b) (Rs)	20 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	0	0	1,020	2,040	3,060	4,080	6,100	6,100	22,400	4.01	89,824 (c)	334,434
Farm Inputs															
1) Seeds	seedling	85										85	20	1,700	1,700
2) Fertilizers															
- Urea	kg			50	50	125	125	125	250	250	250	1,225	3	3,675	11,175
- Farmyard Manure	ton	6				6					6	18	60	1,080	1,440
3) Agro-chemicals	lit	1	1	1	1	2	2	2	3	3	3	19	200	3,800	9,800
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	37,000
Labour Requirement															
1) Land preparation	man-day	10										10	50	500	500
2) Digging (85 pits)	man-day	20										20	50	1,000	1,000
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	5		1	1	5	2	2	4	4	5	29	50	1,450	3,550
5) Spraying	man-day	1	1	1	1	2	2	2	3	3	3	19	50	950	2,450
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	6,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	9,000
8) Harvesting	man-day					5	5	8	8	10	10	46	50	2,300	7,300
9) Packing/loading	man-day					3	3	4	4	5	5	24	50	1,200	3,700
(sub-total)		(57)	(12)	(13)	(13)	(31)	(28)	(32)	(35)	(38)	(39)	(298)			(680)
Miscellaneous															
(5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,214	4,787
Total Production Cost		7,970	2,783	2,993	2,993	4,762	4,226	4,436	5,198	5,355	5,786			46,492 (d)	100,532
Net Return per Ha		-7,970	-2,783	-2,993	-2,993	-672	3,954	7,834	11,163	19,106	18,676			43,325	233,902
(c - d)															(11,695)

- Mango - With Project															
Items	Unit	Year										Total (a)	Unit Prices (b)	Amount (a x b) (Rs)	20 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	0	0	1,800	3,600	5,400	7,200	9,000	9,000	36,000	4.01	144,360 (c)	505,260
Farm Inputs															
1) Seeds	seedling	85										85	20	1,700	1,700
2) Fertilizers															
- Urea	kg	125		125	125	250	250	250	250	250	250	1,875	3	5,625	13,125
- Farmyard Manure	ton	10				10					10	30	60	1,800	2,400
3) Agro-chemicals	lit	2	2	2	2	4	4	4	5	5	5	35	200	7,000	17,000
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	37,000
Labour Requirement															
1) Land preparation	man-day	10										10	50	500	500
2) Digging (85 pits)	man-day	20										20	50	1,000	1,000
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	7.5		1	1	7.5	2	2	2	2	10	35	50	1,750	3,550
5) Spraying	man-day	2	2	2	2	4	4	4	5	5	5	35	50	1,750	4,250
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	6,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	9,000
8) Harvesting	man-day					7.5	7.5	10	10	15	15	65	50	3,250	10,750
9) Packing/loading	man-day					5	5	7.5	7.5	10	10	45	50	2,250	7,250
(sub-total)		(61)	(13)	(14)	(14)	(40)	(35)	(40)	(41)	(48)	(56)	(360)			(856)
Miscellaneous															
(5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,663	5,733
Total Production Cost		9,009	3,045	3,491	3,491	6,300	5,381	5,644	5,906	6,300	7,350			55,918 (d)	120,388
Net Return per Ha		-9,009	-3,045	-3,491	-3,491	918	9,055	16,010	22,966	29,790	28,740			88,442	384,872
(c - d)															(19,244)

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (9/11)

- Guava - Without Project															
Items	Unit	Year										Total	Unit Prices	Amount	20 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	760	1,520	2,280	3,040	3,800	3,800	3,800	3,800	22,800	3.54	80,712 (c)	215,232
Farm Inputs															
1) Seeds	seedling	85										85	12	1,020	1,020
2) Fertilizers															
- Urea	kg			50	50	125	125	125	125	125	125	850	3	2,550	6,300
- Farmyard Manure	ton	6				6					6	18	60	1,080	1,440
3) Agro-chemicals	lit	2	2	2	2	3	3	3	3	3	3	26	200	5,200	11,200
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	37,000
Labour Requirement															
1) Land preparation	man-day	10										10	50	500	500
2) Digging (85 pits)	man-day	20										20	50	1,000	1,000
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	5		1	1	5	2	2	2	2	5	25	50	1,250	2,750
5) Spraying	man-day	2	2	2	2	3	3	3	3	3	3	26	50	1,300	2,800
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	6,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	9,000
8) Harvesting	man-day			5	5	10	10	15	20	20	20	105	50	5,250	15,250
9) Packing/ loading	man-day			2	2	3	3	4	4	5	5	28	50	1,400	3,900
(sub-total)		(58)	(13)	(21)	(21)	(37)	(34)	(40)	(45)	(46)	(49)	(364)			(830)
Miscellaneous															
(5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,359	4,965
Total Production Cost		7,518	3,045	3,623	3,623	5,287	4,751	5,066	5,329	5,381	5,917			49,539 (d)	104,255
Net Return per Ha		-7,518	-3,045	-932	1,758	2,784	6,010	8,386	8,123	8,071	7,535			31,173	110,978
(c - d)															(5,549)

- Guava - With Project															
Items	Unit	Year										Total	Unit Prices	Amount	20 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	1,400	2,800	4,200	5,600	7,000	7,000	7,000	7,000	42,000	3.54	148,680 (c)	396,480
Farm Inputs															
1) Seeds	seedling	85										85	12	1,020	1,020
2) Fertilizers															
- Urea	kg	125		125	125	250	250	250	250	250	250	1,875	3	5,625	13,125
- Farmyard Manure	ton	10				10					10	30	60	1,800	2,400
3) Agro-chemicals	lit	2	2	2	2	4	4	4	4	4	4	32	200	6,400	14,400
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	37,000
Labour Requirement															
1) Land preparation	man-day	10										10	50	500	500
2) Digging (85 pits)	man-day	20										20	50	1,000	1,000
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	7.5		1	1	7.5	2	2	2	2	10	35	50	1,750	3,250
5) Spraying	man-day	2	2	2	2	4	4	4	4	4	4	32	50	1,600	3,600
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	6,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	9,000
8) Harvesting	man-day			5	10	20	20	20	25	25	25	150	50	7,500	20,000
9) Packing/ loading	man-day			2	4	5	5	7.5	7.5	10	10	51	50	2,550	7,550
(sub-total)		(61)	(13)	(21)	(28)	(53)	(47)	(50)	(55)	(57)	(65)	(448)			(1,034)
Miscellaneous															
(5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,819	5,999
Total Production Cost		8,295	3,045	3,859	4,226	6,956	6,038	6,169	6,431	6,563	7,613			59,194 (d)	125,974
Net Return per Ha		-8,295	-3,045	1,097	5,686	7,912	13,787	18,611	18,349	18,218	17,168			89,486	270,506
(c - d)															(13,525)

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (10/11)

- Chikoo - Without Project															
Items	Unit	Y e a r										Total (a)	Unit Prices (b)	Amount (a x b) (Rs)	30 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	460	920	1,380	1,840	2,300	2,300	2,300	2,300	13,800	3.50	48,300 (c)	209,300
Farm Inputs															
1) Seeds	seedling	85										85	20	1,700	1,700
2) Fertilizers															
- Urea	kg			50	50	50	50	125	125	125	125	700	3	2,100	9,600
- Farmyard Manure	ton	5				5					5	15	60	900	1,800
3) Agro-chemicals	lit														
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	55,500
Labour Requirement															
1) Land preparation	man-day	10										10	50	500	500
2) Digging (85 pits)	man-day	20										20	50	1,000	1,000
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	5		1	1	5	1	2	2	2	5	24	50	1,200	3,800
5) Spraying	man-day														
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	9,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	14,000
8) Harvesting	man-day			2	2	3	3	5	5	10	10	40	50	2,000	12,000
9) Packing/ loading	man-day			1	1	2	2	2	2	4	4	18	50	900	4,900
(sub-total)		(56)	(11)	(15)	(15)	(26)	(22)	(25)	(25)	(32)	(35)	(262)			(914)
Miscellaneous (5% of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			1,847	5,747
Total Production Cost		7,644	2,520	2,888	2,888	3,780	3,255	3,649	3,649	4,016	4,489			38,777 (d)	120,677
Net Return per Ha (c - d)		-7,644	-2,520	-1,278	333	1,050	3,185	4,401	4,401	4,034	3,561			9,524	88,624 (2,954)

- Chikoo - With Project															
Items	Unit	Y e a r										Total (a)	Unit Prices (b)	Amount (a x b) (Rs)	30 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	600	1,200	1,800	2,400	3,000	3,000	3,000	3,000	18,000	3.50	63,000 (c)	273,000
Farm Inputs															
1) Seeds	seedling	85										85	20	1,700	1,700
2) Fertilizers															
- Urea	kg	50		125	125	250	250	250	250	250	250	1,800	3	5,400	20,400
- Farmyard Manure	ton	10				10					10	30	60	1,800	3,600
3) Agro-chemicals	lit	1	1	2	2	3	3	3	3	3	3	24	200	4,800	
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	55,500
Labour Requirement															
1) Land preparation	man-day	10										10	50	500	500
2) Digging (85 pits)	man-day	20										20	50	1,000	1,000
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	7.5		1	1	7.5	2	2	2	2	10	35	50	1,750	4,350
5) Spraying	man-day	1	1	2	2	3	3	3	3	3	3	24	50	1,200	
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	9,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	14,000
8) Harvesting	man-day			4	4	6	6	10	10	10	10	60	50	3,000	13,000
9) Packing/ loading	man-day			2	2	4	4	5	5	5	5	32	50	1,600	6,600
(sub-total)		(60)	(12)	(20)	(20)	(37)	(31)	(36)	(36)	(36)	(44)	(331)			(1,083)
Miscellaneous (5% of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,469	6,539
Total Production Cost		8,510	2,783	3,806	3,806	5,906	4,988	5,250	5,250	5,250	6,300			51,849 (d)	137,319
Net Return per Ha (c - d)		-8,510	-2,783	-1,706	394	394	3,413	5,250	5,250	5,250	4,200			11,151	135,681 (4,523)

Table F.4.4 CROP BUDGETS PER HA WITHOUT AND WITH PROJECT CONDITION (11/11)

- Coconut - Without Project															
Items	Unit	Year										Total (a)	Unit Prices (b)	Amount (a x b) (Rs)	50 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	0	0	540	1,080	1,620	2,160	2,700	2,700	10,800	5.50	59,400 (c)	653,400
Farm Inputs															
1) Seeds	seedling	170										170	40	6,800	6,800
2) Fertilizers												850	3	2,550	17,550
- Urea	kg			50	50	125	125	125	125	125	125				
- Farmyard Manure	ton	4				4					4	12	60	720	1,440
3) Agro-chemicals	lit														
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	92,500
Labour Requirement															
1) Land preparation	man-day	20										20	50	1,000	1,000
2) Digging (170 pits)	man-day	30										30	50	1,500	1,500
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	5		1	1	5	2	2	2	2	5	25	50	1,250	6,450
5) Spraying	man-day														
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	15,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	24,000
8) Harvesting	man-day					5	5	5	5	10	10	40	50	2,000	22,000
9) Packing/ loading	man-day					1	1	2	2	4	4	14	50	700	8,700
(sub-total)		(76)	(11)	(12)	(12)	(27)	(24)	(25)	(25)	(32)	(35)	(279)			(1,583)
Miscellaneous (5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,158	9,904
Total Production Cost		13,986	2,520	2,730	2,730	4,006	3,596	3,649	3,649	4,016	4,426			45,308 (d)	207,974
Net Return per Ha (c - d)		-13,986	-2,520	-2,730	-2,730	-1,036	2,344	5,261	8,231	10,834	10,424			14,093	445,427 (8,909)

- Coconut - With Project															
Items	Unit	Year										Total (a)	Unit Prices (b)	Amount (a x b) (Rs)	50 years
		1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th				
Unit Yield	kg	0	0	0	0	800	1,600	2,400	3,000	4,000	4,000	15,800	5.50	86,900 (c)	966,900
Farm Inputs															
1) Seeds	seedling	170										170	40	6,800	6,800
2) Fertilizers												1,800	3	5,400	35,400
- Urea	kg	50		125	125	250	250	250	250	250	250				
- Farmyard Manure	ton	10				10					10	30	60	1,800	3,600
3) Agro-chemicals	lit														
Machinery Requirement															
1) Tractor															
- Plowing	hour	5										5	70	350	350
- Levelling	hour	4										4	70	280	280
2) Well operation	month	12	12	12	12	12	12	12	12	12	12	120	1,850	18,500	92,500
Labour Requirement															
1) Land preparation	man-day	20										20	50	1,000	1,000
2) Digging (85 pits)	man-day	30										30	50	1,500	1,500
3) Planting	man-day	10										10	50	500	500
4) Fertilizer application	man-day	7.5		1	1	7.5	2	2	2	2	10	35	50	1,750	8,950
5) Spraying	man-day														
6) Weeding	man-day	6	6	6	6	6	6	6	6	6	6	60	50	3,000	15,000
7) Water management	man-day	5	5	5	5	10	10	10	10	10	10	80	50	4,000	24,000
8) Harvesting	man-day					10	10	10	15	15	15	75	50	3,750	33,750
9) Packing/ loading	man-day					2.5	2.5	5	5	5	5	25	50	1,250	11,250
(sub-total)		(79)	(11)	(12)	(12)	(36)	(31)	(33)	(38)	(38)	(46)	(335)			(1,919)
Miscellaneous (5 % of above production cost)		5%	5%	5%	5%	5%	5%	5%	5%	5%	5%			2,494	11,744
Total Production Cost		14,653	2,520	2,966	2,966	5,250	4,331	4,463	4,725	4,725	5,715			52,374 (d)	246,624
Net Return per Ha (c - d)		-14,653	-2,520	-2,966	-2,966	-850	4,469	8,738	11,775	17,275	16,225			34,526	720,276 (14,406)

Table F.4.5 GROSS AND NET CROP INCOME WITHOUT PROJECT

Crops	Cropped Area (ha)	Gross Crop Income				Production Cost		Net Crop Income	
		Unit Yield (t/ha)	Pro-duction (tons)	Unit Price (Rs/kg)	Gross Income (Rs 000)	Unit Cost (Rs/ha)	Total Cost (Rs 000)	Total Income (Rs 000)	per Ha (Rs/ha)
A. Fodder Crops									
Lucerne	100	13.9	1,390	0.42	583.8	3,785	378.5	205.3	2,053
Maize, others	90	10.6	954	0.32	305.3	2,546	229.1	76.1	846
All Fodder	<u>190</u>	(12.3)	<u>2,344</u>	(0.38)	<u>889.1</u>	(3,198)	<u>607.6</u>	<u>281.4</u>	(1,481)
B. Vegetables									
Tomato	400	3.3	1,320	3.46	4,567.2	7,471	2,988.4	1,578.8	3,947
Eggplant	140	4.9	686	2.45	1,680.7	6,447	902.6	778.1	5,558
Chilli	20	1.0	20	7.66	153.2	5,759	115.2	38.0	1,901
Sponge Gourd	160	3.1	496	3.31	1,641.8	5,258	841.3	800.5	5,003
Bottle Gourd	120	4.7	564	2.88	1,624.3	5,841	700.9	923.4	7,695
Cauliflower	100	13.3	1,330	3.06	4,069.8	6,843	684.3	3,385.5	33,855
Spinach	110	2.6	286	1.73	494.8	4,274	470.1	24.6	224
Carrot	120	5.4	648	1.56	1,010.9	5,822	698.6	312.2	2,602
Raddish	70	4.0	280	1.95	546.0	6,200	434.0	112.0	1,600
Tunip	50	6.6	330	2.22	732.6	6,400	320.0	412.6	8,252
Peas	80	2.6	208	3.68	765.4	5,754	460.3	305.1	3,814
Others	170	4.5 *	788	2.80 *	2,208.5	6,289 *	1,069.1	1,139.4	6,702
All Vegetables	<u>1,540</u>	(4.5)	<u>6,956</u>	(2.80)	<u>19,495.2</u>	(6,289)	<u>9,684.9</u>	<u>9,810.3</u>	(6,370)
C. Fruit									
				(Rs./ha)					
Mango (2)	390	6.1	2,379	16,722	6,521.5	5,027	1,960.4	4,561.1	11,695
Guava (2)	280	3.8	1,064	10,762	3,013.2	5,213	1,459.6	1,553.7	5,549
Chikoo (2)	80	2.3	184	6,977	558.1	4,023	321.8	236.3	2,954
Coconut (2)	90	2.7	243	13,068	1,176.1	4,159	374.4	801.8	8,909
Papaya (2)	50	7.3	365	10,807	540.4	5,224	261.2	279.2	5,583
Others	110	4.8 *	523	13,269 *	1,459.6	4,918 *	541.0	918.6	8,351
All Fruit	<u>1,000</u>	(4.8)	<u>4,758</u>	(13,269)	<u>13,268.9</u>	(4,918)	<u>4,918.3</u>	<u>8,350.6</u>	(8,351)
Total	<u>2,730</u>		<u>14,058</u>		<u>33,653</u>		<u>15,211</u>	<u>18,442</u>	<u>6,755</u>

- Remarks : (1) ; Detail crop budgets, see Table F.4.4 (1/11 - 11/11).
(2) ; Gross income and unit cost for fruit are weighted average as following period.
Mango 20 years, Guava 20 years, Chikoo 30 years, Coconut 50 years and Papaya 6 years.
(3) ; All fodder, vegetable, fruit crops and others(*) are weighted average of unit yield,
unit prices and unit costs.

Table F.4.6 GROSS AND NET CROP INCOME WITH PROJECT

Crops	Cropped Area (ha)	Gross Crop Income			Production Cost		Net Crop Income		
		Unit Yield (t/ha)	Pro-duction (tons)	Unit Price (Rs/kg)	Gross Income (Rs 000)	Unit Cost (Rs/ha)	Total Cost (Rs 000)	Total Income (Rs 000)	per Ha (Rs/ha)
A. Fodder Crops									
Lucerne	100	26.0	2,600	0.42	1,092.0	5,539	553.9	538.1	5,381
Maize, others	100	18.0	1,800	0.32	576.0	3,596	359.6	216.4	2,164
All Fodder	<u>200</u>	(22.0)	<u>4,400</u>	(0.38)	<u>1,668.0</u>	(4,568)	<u>913.5</u>	<u>754.5</u>	(3,773)
B. Vegetables									
Tomato	1,000	7.0	7,000	3.46	24,220.0	9,440	9,440.0	14,780.0	14,780
Eggplant	500	9.0	4,500	2.45	11,025.0	9,033	4,516.5	6,508.5	13,017
Chilli	350	2.5	875	7.66	6,702.5	8,560	2,996.0	3,706.5	10,590
Sponge Gourd	1,000	11.0	11,000	3.31	36,410.0	6,770	6,770.0	29,640.0	29,640
Bottle Gourd	400	8.0	3,200	2.88	9,216.0	7,190	2,876.0	6,340.0	15,850
Cauliflower	300	16.0	4,800	3.06	14,688.0	8,681	2,604.3	12,083.7	40,279
Spinach	300	6.0	1,800	1.73	3,114.0	6,145	1,843.5	1,270.5	4,235
Carrot	200	11.0	2,200	1.56	3,432.0	8,744	1,748.8	1,683.2	8,416
Raddish	150	13.0	1,950	1.95	3,802.5	8,807	1,321.1	2,481.5	16,543
Tunip	150	15.0	2,250	2.22	4,995.0	8,954	1,343.1	3,651.9	24,346
Peas	200	5.0	1,000	3.68	3,680.0	7,526	1,505.2	2,174.8	10,874
Others	750	8.9 *	6,071	2.99 *	18,147.2	8,124 *	6,093.0	12,054.1	16,072
All Vegetables	<u>5,300</u>	(8.8)	<u>46,646</u>	(2.99)	<u>139,432.2</u>	(8,124)	<u>43,057.5</u>	<u>96,374.7</u>	(18,184)
C. Fruit									
				(Rs./ha)					
Mango	390	9.0	3,510	25,263	9,852.6	6,019	2,347.6	7,505.0	19,244
Guava	280	7.0	1,960	19,824	5,550.7	6,299	1,763.6	3,787.1	13,525
Chikoo	80	3.0	240	9,100	728.0	4,577	366.2	361.8	4,523
Coconut	90	4.0	360	19,338	1,740.4	4,932	443.9	1,296.5	14,406
Papaya	50	8.5	425	12,584	629.2	6,471	323.5	305.6	6,113
Others	110	7.3 *	761	20,788 *	2,286.6	5,893 *	648.2	1,638.4	14,894
All Fruit	<u>1,000</u>	(7.3)	<u>7,256</u>	(20,788)	<u>20,787.5</u>	(5,893)	<u>5,893.1</u>	<u>14,894.4</u>	(14,894)
Total	<u>6,500</u>		<u>58,302</u>		<u>161,888</u>		<u>49,864</u>	<u>112,024</u>	<u>17,234</u>

- Remarks : (1); Detail crop budgets, see Table F.4.4 (1/11 - 11/11).
(2); Gross income and unit cost for fruit are weighted average as following period.
Mango 20 years, Guava 20 years, Chikoo 30 years, Coconut 50 years and Papaya 6 years.
(3); All fodder, vegetable, fruit crops and others(*) are weighted average of unit yield, unit prices and unit costs.

Table F.4.7 INCREMENTAL NET INCOME WITHOUT AND WITH PROJECT

Crops	Unit : Rs ,000						
	Without Project			With Project			Incremental Value
	Gross Income	Total Cost	Net Income	Gross Income	Total Cost	Net Income	
A. Fodder Crops							
Lucerne	583.8	378.5	205.3	1,092.0	553.9	538.1	332.8
Maize, others	305.3	229.1	76.1	576.0	359.6	216.4	140.3
Sub-total	<u>889.1</u>	<u>607.6</u>	<u>281.4</u>	<u>1,668.0</u>	<u>913.5</u>	<u>754.5</u>	<u>473.1</u>
B. Vegetables							
Tomato	4,567.2	2,988.4	1,578.8	24,220.0	9,440.0	14,780.0	13,201.2
Eggplant	1,680.7	902.6	778.1	11,025.0	4,516.5	6,508.5	5,730.4
Chilli	153.2	115.2	38.0	6,702.5	2,996.0	3,706.5	3,668.5
Sponge Gourd	1,641.8	841.3	800.5	36,410.0	6,770.0	29,640.0	28,839.5
Bottle Gourd	1,624.3	700.9	923.4	9,216.0	2,876.0	6,340.0	5,416.6
Cauliflower	4,069.8	684.3	3,385.5	14,688.0	2,604.3	12,083.7	8,698.2
Spinach	494.8	470.1	24.6	3,114.0	1,843.5	1,270.5	1,245.9
Carrot	1,010.9	698.6	312.2	3,432.0	1,748.8	1,683.2	1,371.0
Radish	546.0	434.0	112.0	3,802.5	1,321.1	2,481.5	2,369.5
Turnip	732.6	320.0	412.6	4,995.0	1,343.1	3,651.9	3,239.3
Peas	765.4	460.3	305.1	3,680.0	1,505.2	2,174.8	1,869.7
Others	2,208.5	1,069.1	1,139.4	18,147.2	6,093.0	12,054.2	10,914.8
Sub-total	<u>19,495.2</u>	<u>9,684.9</u>	<u>9,810.3</u>	<u>139,432.2</u>	<u>43,057.5</u>	<u>96,374.7</u>	<u>86,564.4</u>
C. Fruit							
Guava	6,521.5	1,960.4	4,561.1	9,852.6	2,347.6	7,505.0	2,943.9
Mango	3,013.2	1,459.6	1,553.6	5,550.7	1,763.6	3,787.1	2,233.5
Chikoo	558.1	321.8	236.3	728.0	366.2	361.8	125.5
Coconut	1,176.1	374.4	801.7	1,740.4	443.9	1,296.5	494.8
Papaya	540.4	261.2	279.2	629.2	323.5	305.7	26.5
Others	1,459.6	541.0	918.6	2,286.6	648.2	1,638.4	719.8
Sub-total	<u>13,268.9</u>	<u>4,918.3</u>	<u>8,350.6</u>	<u>20,787.5</u>	<u>5,893.1</u>	<u>14,894.4</u>	<u>6,544.0</u>
Total	33,653	15,211	18,442	161,888	49,864	112,024	93,581

Remarks : Without project, see Table F.4.5
With project, see Table F.4.6

Table F.4.8 INCREMENTAL FARM GROSS MARGIN UNDER WITHOUT AND WITH PROJECT

Description	Owner Operated Farm			Tenant Operated Farm		
	Without Project	With Project	Increment	Without Project	With Project	Increment
A. Holding Size (ha) (1)						
Average holding size	<u>12.1</u>	<u>12.1</u>		<u>6.1</u>	<u>6.1</u>	
B. Cropped Area (ha) (2)						
Summer season	5.81	10.54	4.73	2.95	5.35	2.40
Winter season	0.91	5.97	5.06	0.45	2.98	2.53
	<u>6.72</u>	<u>16.51</u>	<u>9.79</u>	<u>3.40</u>	<u>8.33</u>	<u>4.93</u>
C. Cropped Pattern (ha) (2)						
Fodder 7.0% 3.0%	0.47	0.50	0.03	0.23	0.25	0.02
Vegetables 56.4% 82.0%	3.79	13.55	9.76	1.93	6.84	4.91
Fruit 36.6% 15.0%	2.46	2.46		1.24	1.24	
Total (without) (with)	<u>6.72</u>	<u>16.51</u>	<u>9.79</u>	<u>3.40</u>	<u>8.33</u>	<u>4.93</u>
D. Crop Production (tons) (3)						
Fodder 12.3 22.0	5.8	11.0	5.2	2.8	5.5	2.67
Vegetables 4.5 8.8	17.1	119.2	102.2	8.7	60.2	51.51
Fruit 4.8 7.3	11.8	18.0	6.1	6.0	9.1	3.10
Total (t/ha) (t/ha)	<u>34.6</u>	<u>148.2</u>	<u>113.6</u>	<u>17.5</u>	<u>74.7</u>	<u>57.3</u>
E. Gross Income (Rs) (3)						
Fodder 0.38 0.38	2,197	4,180	1,983	1,075	2,090	1,015
Vegetables 2.80 2.99	47,754	356,528	308,774	24,318	179,974	155,656
Fruit 2.79 2.86	32,944	51,360	18,416	16,606	25,889	9,283
Total	<u>82,895</u>	<u>412,067</u>	<u>329,172</u>	<u>41,999</u>	<u>207,953</u>	<u>165,954</u>
F. Production Cost (Rs) (4)						
Labour cost (50 Rs/man-day)						
Fodder 25.8 43.0	606	1,075	469	297	538	241
Vegetables 60.6 74.6	11,484	50,542	39,058	5,848	25,513	19,665
Fruit 37.4 46.4	4,600	5,707	1,107	2,319	2,877	558
Total (without) (with)	<u>16,690</u>	<u>57,324</u>	<u>40,634</u>	<u>8,463</u>	<u>28,928</u>	<u>20,464</u>
Other cost (Rs/ha)						
Fodder 1,908 2,418	897	1,209	312	219	302	83
Vegetables 3,259 4,394	12,352	59,539	47,187	3,145	15,027	11,883
Fruit 2,852 3,295	7,016	8,106	1,090	1,768	2,043	275
Total (without) (with)	<u>20,264</u>	<u>68,853</u>	<u>48,589</u>	<u>5,133</u>	<u>17,373</u>	<u>12,240</u>
G. Net Crop Income						
				(50%)	(50%)	
Gross income	82,895	412,067	329,172	21,000	103,976	82,977
Production cost	36,954	126,177	89,223	13,596	46,300	32,704
Gross margin	<u>45,941</u>	<u>285,890</u>	<u>239,950</u>	<u>7,404</u>	<u>57,676</u>	<u>50,273</u>

Remarks : (1) ; Average farm size, see in Table F.2.2.
(2) ; Cropped area and pattern are estimated based on Tables F.2.20, F.4.1, and as follows :
Summer season , 92.3% (without project) and 167.2% (with project)
Winter season , 91.6% (without project) and 597.2% (with project)
(3) ; Weighted average unit yield and price, see Tables F.4.5 and F.4.6.
(4) ; Weighted average unit cost, see Tables F.4.5, F.4.6 and F.4.9.

Table F.4.9 INCREMENTAL LABOUR REQUIREMENT

Crops	Without Project			With Project			Increment (man-day)
	Area (ha)	Lobour (man-day/ha)	Total (man-day)	Area (ha)	Lobour (man-day/ha)	Total (man-day)	
A. Fodder Crops							
Lucerne	100	31.0	3,100	100	55.0	5,500	2,400
Maize, others	90	20.0	1,800	100	31.0	3,100	1,300
All Fodder	<u>190</u>	(25.8) *	<u>4,900</u>	<u>200</u>	(43.0) *	<u>8,600</u>	<u>3,700</u>
B. Vegetables							
Tomato	400	72.0	28,800	1,000	91.5	91,500	62,700
Eggplant	140	75.5	10,570	500	93.5	46,750	36,180
Chilli	20	68.0	1,360	350	86.5	30,275	28,915
Sponge Gourd	160	41.5	6,640	1,000	54.0	54,000	47,360
Bottle Gourd	120	43.0	5,160	400	54.0	21,600	16,440
Cauliflower	100	64.0	6,400	300	83.5	25,050	18,650
Spinach	110	35.0	3,850	300	49.0	14,700	10,850
Carrot	120	64.0	7,680	200	81.0	16,200	8,520
Radish	70	64.0	4,480	150	81.0	12,150	7,670
Turnip	50	65.0	3,250	150	81.0	12,150	8,900
Peas	80	60.0	4,800	200	75.0	15,000	10,200
Others	170	60.6	10,298	750	74.6	55,941	45,643
All Vegetables	<u>1,540</u>	(60.6) *	<u>93,288</u>	<u>5,300</u>	(74.6) *	<u>395,316</u>	<u>302,028</u>
C. Fruit							
Guava	280	41.5	11,620	280	51.7	14,476	2,856
Mango	390	34.0	13,260	390	42.8	16,692	3,432
Chikoo	80	30.5	2,440	80	36.1	2,888	448
Coconut	90	31.7	2,853	90	38.4	3,456	603
Papaya	50	62.0	3,100	50	75.5	3,775	675
Others	110	37.4	4,112	110	46.4	5,103	990
All Fruit	<u>1,000</u>	(37.4) *	<u>37,385</u>	<u>1,000</u>	(46.4) *	<u>46,390</u>	<u>9,004</u>
Total	<u>2,730</u>	(49.7) *	<u>135,573</u>	<u>6,500</u>	(69.3) *	<u>450,306</u>	<u>314,732</u>

Remark : (*) ; Weighted average for all fodder, vegetables and fruit.

FIGURES

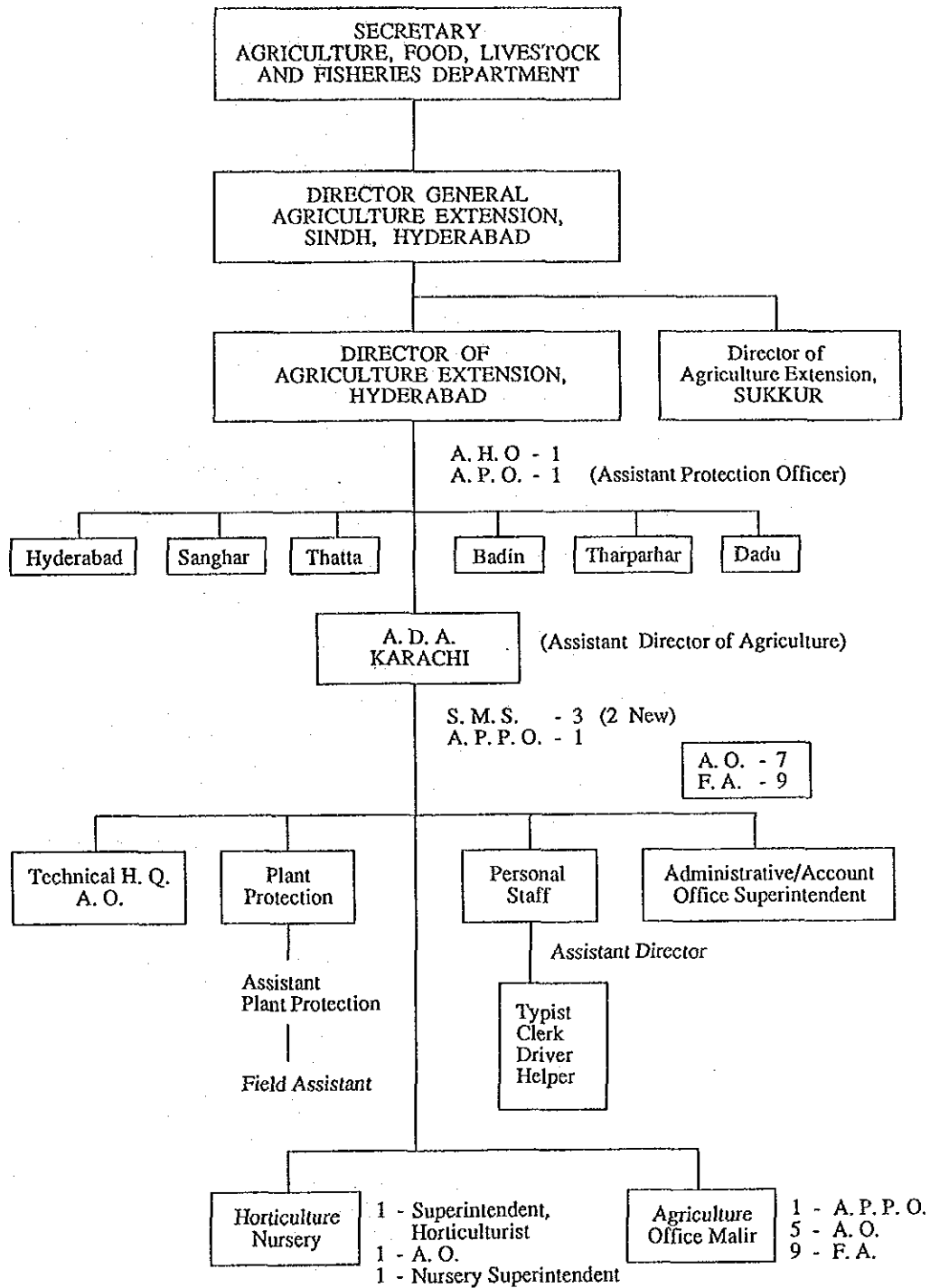


Fig. F.3-1 Organization of Agriculture Extension in Sindh Province

ISLAMIC REPUBLIC OF PAKISTAN
GOVERNMENT OF SINDH

FEASIBILITY STUDY ON
WATER RESOURCES DEVELOPMENT PROJECT
IN THE MALIR BASIN

JAPAN INTERNATIONAL COOPERATION AGENCY

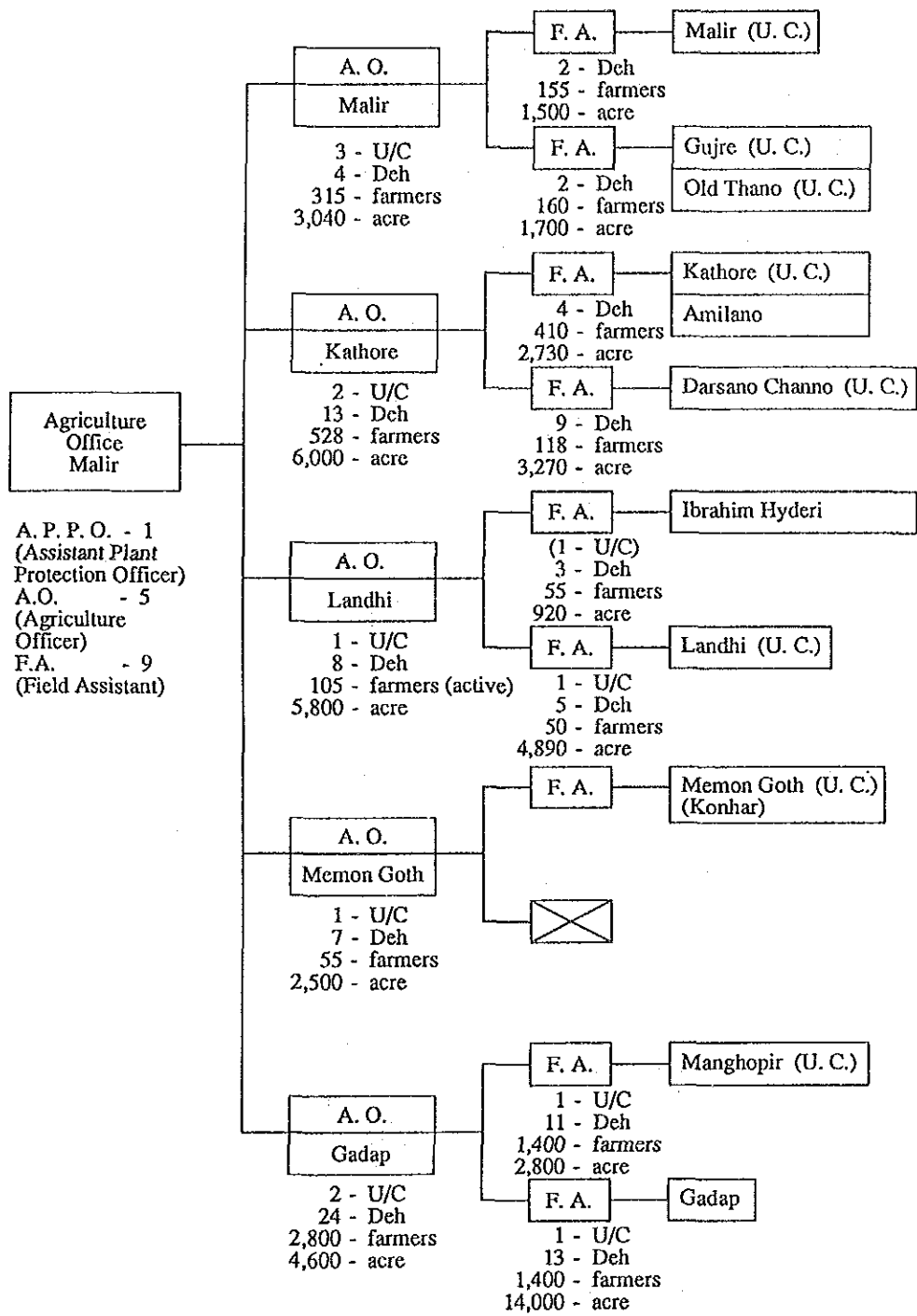


Fig. F.3-2 Present Staffing of Agriculture Extension in the Study Area

ISLAMIC REPUBLIC OF PAKISTAN
 GOVERNMENT OF SIND
 FEASIBILITY STUDY ON
 WATER RESOURCES DEVELOPMENT PROJECT
 IN THE MALIR BASIN
 JAPAN INTERNATIONAL COOPERATION AGENCY