

**MARKET PROSPECTS FOR
UPLAND CROPS IN PAKISTAN**

Muhammad Ramzan Akhtar

The CGPRT Centre

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List of Abbreviations

ADBP	:	Agricultural Development Bank of Pakistan
APCom	:	Agricultural Prices Commission
BARD	:	Barani (Rainfed) Agricultural Research and Development
CEC	:	Cotton Export Corporation
CIDA	:	Canadian International Development Agency
CIMMYT	:	Centro Internacional de Mejoramiento de Maiz y Trigo (International Maize and Wheat Improvement Centre)
CGPRT	:	Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific
EPB	:	Export Promotion Bureau
FAO	:	Food and Agricultural Organization
FBC	:	Federal Bank for Cooperatives
GDP	:	Gross Domestic Product
HIES	:	Household Income and Expenditure Survey
IRRI	:	International Rice Research Institute
MINFAL	:	Ministry of Food, Agriculture and Livestock
NARC	:	National Agricultural Research Centre
NODP	:	National Oilseed Development Project
NWFP	:	North Western Frontier Province
PARC	:	Pakistan Agricultural Research Council
PASSCO	:	Pakistan Agricultural Storage and Supply Corporation
PCCC	:	Pakistan Central Cotton Committee
PIA	:	Pakistan International Air Lines
PODB	:	Pakistan Oilseed Development Board
PSPDP	:	Pakistan Swiss Potato Development Project
RECP	:	Rice Export Corporation of Pakistan
SBP	:	State Bank of Pakistan
UCPs	:	Upland Crop Products
USC	:	Utility Stores Corporation

Pakistan Rupee: US Dollar Exchange Rate

Year	Pakistan Rupees/\$ Average During Year
1982/83	12.7063
1983/84	13.4838
1984/85	15.1512
1985/86	16.1391
1986/87	17.1793
1987/88	17.5994
1988/89	19.2154
1989/90	21.4453
1990/91	22.4228
1991/92	24.8441
1992/93	25.9598
1993/94	30.1638
1994/95	30.8517

Source: Pakistan Economic Survey 1995/96.

Map of Pakistan

Foreword

To answer the growing regional concern for the market prospects of upland crop products (UCPs), the CGPRT Centre has been implementing a research project “Market Prospect of Upland Crop Products and Policy Analysis in Selected Asian Countries (MPUPA)” since November 1994, in collaboration with partners from seven countries: China, India, Indonesia, Pakistan, Philippines, Thailand and Vietnam. In all these countries, important issues regarding UCP market prospects, such as domestic demand, marketing system and future potential, were investigated with an identical research framework by national experts.

Market Prospects for Upland Crops in Pakistan is the fourth volume of the series of the country studies. The investigation covers the major upland crops: maize, soybean, potato and rice, as well as various kinds of fruit and vegetables. I believe that readers of the study can obtain broad and practical knowledge for improving the market of UCPs in Pakistan; moreover, the information will be also useful for researchers and policy planners in other countries in the region.

I thank Dr Muhammad Ramzan Akhtar of Pakistan for his intensive research and the National Agricultural Research Centre for allowing him to work with us and for providing continuous support. Dr Boonjit Titapiwatanakun has ably coordinated the various complex steps in the study. I would also like to express appreciation to the Japanese government for funding the project.

Haruo Inagaki
Director
CGPRT Centre

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In collaboration with the Social Sciences Institute, National Agricultural Research Centre, Islamabad, Pakistan, ESCAP CGPRT Centre, Bogor, Indonesia, planned this country study for Pakistan. This piece of research has further strengthened the already existing strong research collaboration of both the institutions. This study focuses mainly on domestic demand and market potential of upland crop products (UCPs) in Pakistan, and it is a part of the larger study which looks into both passive and active aspects of market prospects for UCPs in seven countries viz Pakistan, China, Vietnam, India, Indonesia, the Philippines, and Thailand.

The ESCAP CGPRT Centre, Bogor, Indonesia, provided financial assistance in the preparation of this report. I am deeply grateful to Dr. Haruo Inagaki who played an important role in shaping the logical organization of this work in the Asian region. I sincerely acknowledge the valuable comments and guidelines of Dr. Boonjit Titapiwatanakun, Regional Advisor for this project and Professor, Faculty of Economic and Business Administration, Kasetsart University, Thailand, Mr. Sotaro Inoue and Mr. Klaus Zambra, Project Experts, CGPRT Centre. I am also indebted to Dr. Taco Bottema for generously sharing his knowledge at various stages of this study.

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Unfortunately, it is not possible to mention by name all those officials from various private and government organizations throughout Pakistan who helped in providing useful information for this project. In particular, I would like to mention, the Federal Bureau of Statistics, Export Promotion Bureau, Agricultural Prices Commission, Ministry of Food and Agriculture, Ministry of Commerce, National Fertilizer Development Centre, Pakistan Institute of Development Economics, Islamabad, Agricultural Research Station, Mangora, and Malakand Fruit and Vegetable Development Project, Swat. The Lahore Chamber of Commerce and Industry deserves special thanks for all relevant information and enthusiastic reception extended to the CGPRT Centre Mission during their visit at Lahore. In this regard cordial help of Mr.

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Islamabad, Pakistan
January, 1997

Muhammad Ramzan Akhtar
Social Sciences Institute
National Agricultural Research Centre,

Executive Summary

The agriculture sector in Pakistan occupies an important place as it contributes around 25% to Gross Domestic Product and engages about half of the total employed labour force. It is the largest source of foreign exchange earnings and meets raw material needs of the country's major industries. With the recent economic reforms, free trade policy, and integration with the global economy, structural changes in the agricultural sector of Pakistan are expected. Upland crops and their products are becoming more important in the agricultural sector and proving to be an important source of increasing the income of the farming community in Pakistan. The present study provides information on dietary patterns, domestic demand, trade performance, market potential and prospects of upland crop products (UCPs) and suggests strategies for improving trade of these products. The study covers major UCPs (soybean, maize, rice, potato), fruits and vegetables (strawberry, mango, citrus, apple, mushroom, onion, tomato) and other commodities with domestic and export market potential (canola and molasses).

Moderately rising per capita income, urbanization, changes in tastes and preference, breakthroughs in communication technology, introduction of new products, and health consciousness among the people are resulting on a shift of consumption pattern towards fruits, vegetables and livestock products. The consumption of cereals is declining. Similarly, expenditure on fruits, vegetables and livestock products is increasing and expenditure on cereals is declining, which is mainly associated with the general increase in income.

Pakistan is one of the biggest importers of edible oil. Soybean is planted on a very limited acreage and soybean oil is mostly imported from USA and soy meal from India. In the year 2000, from the domestic soybean production, industry will be able to get around 7.37 thousand tons of soybean grains and produce 5.67 thousand tons of soybean meal and only 1.33 thousand tons of soybean oil. The projected demand of soybean meal during the year 2000 will be 17.22 thousand tons (11.55 thousand import and 5.67 thousand tons domestic production of soymeal).

In the year 2000, the projected demand for potato will be around 2.3 million tons. Pakistan exports less than 1% of the total production of potato. Industrial demand for potato is also increasing slowly.

In the case of maize, the processing industry is not well developed. It is estimated that during the year 2000, industry demand will be around 508 thousand tons and demand for food will be 841 thousand tons. Total demand for maize in the year 2000 will be around 1.414 million tons. Industry demand for maize is expected to increase at a rate of 6.8% per year. However, per capita human consumption of maize in Pakistan is decreasing.

Rice is the second largest staple food in Pakistan after wheat and also it is a major foreign exchange earning source. Pakistan produces Basmati rice which is a fine, non-glutinous, long grain and aromatic variety. Basmati rice has a high international demand and fetches a premium price in the international market. By the year 2000, domestic demand for rice is expected to grow to 3.1 million tons. The volume of rice export in the year 2000 is expected to increase up to 2.0 million tons.

The livestock sector is very important in the agricultural economy of Pakistan. With the changing food consumption patterns in Pakistan, the demand for livestock products is increasing significantly, so demand for feed is also rising. Mainly oilseed cakes and meals and cereal grains are used as feed. In the year 2000, the projected demand for feed will be around 9.3 million tons.

Pakistan is gifted with a wide range of agro-climatic zones, thus allowing the production of a wide range of tropical, subtropical and temperate fruits and vegetables. It is possible to harvest a long list of fruits and vegetables, starting in the south and then moving north. The production of

almost all fruits and vegetables has considerably increased during the last two decades. The domestic market of these products is expanding and international markets for new agricultural commodities as well as for traditional products are also emerging. The main exportable fruits and vegetables include mango, citrus, guava, onion, potato and a few other vegetables. All these commodities are highly competitive in the international market. Among the new emerging agricultural commodities, strawberry, mushroom and canola are worth mentioning. The domestic and the international market for mango, citrus and molasses is already established. In the case of apple, onion and tomato, domestic and international markets could not be as well established as in the case of previous group of commodities.

Canola is a special type of rapeseed which provides a premium quality refined edible oil. Canola is still only planted on a limited scale but its acceptability as an edible oil has improved during the last five years. It is widely consumed among health conscious people, especially in Islamabad. Its oil is low in erucic acid and oil-free meal is low in glucosinolates, thus it is nutritionally rich for humans and for poultry feed. Keeping in view its potential and qualities, its replacement of traditional rapeseed/mustard varieties can substantially improve the edible oil deficit in Pakistan and save foreign exchange.

The domestic market for strawberry is still new and it is only available in big cities. Due to conducive climatic conditions in Pakistan and the low cost of production, the export potential of strawberry is substantial. It also has potential benefits for small farmers in terms of generating rural income and employment. The major constraint to strawberry export is the lack of post harvest technology in packing, grading, transportation and cool chain distribution.

Mushrooms are another new entry in Pakistan's export list of vegetables. Pakistan mainly exports dried mushroom and also some of the white button type in the canned form.

Pakistan is the third largest producer of mango in the world. Among the fruits planted in Pakistan, mango occupies the second place in terms of area. Almost all early, mid-season, mid-late and late varieties of mangoes are successfully planted over an extended period. Export markets for Pakistani mangoes are the Middle-East and Europe. With better post harvest technology, mango export can be further improved.

Citrus is the most popular and commercial fruit of Pakistan and occupies first position in terms of area under all fruits. A citrus variety "Kinnow" is very popular in the international markets of the Far East, Middle East, and European markets, and is widely grown and liked in Pakistan. With more export promotion efforts and better post harvest technology, citrus export can be considerably increased.

Molasses is a sugar containing by-product produced during the extraction of sugar from sugarcane, sugarbeet and other sugar containing commodities. The production of molasses has increased by more than 50% from 1988/89 to 1994/95. Pakistan exports more than 75% of its total production of molasses.

Due to lack of an exportable variety of apples, low standards, and poor harvest technology, Pakistan could not expand its export. The main emphasis is on expanding the domestic market for apple.

Among vegetables, onion and tomato are the major vegetables after potato. Due to poor post harvest technology and government policies, Pakistan could not make much headway in the export of vegetables. The domestic market is expanding but the quality of produce is generally poor in these markets.

Pakistan's export base for fruits and vegetables is narrow and mainly confined to the Middle East. By improving post harvest technology, Pakistan could expand its export to Europe to increase the per unit value of fresh produce.

The productivity of almost all UCPs is considerably below their potential and there is little scope for increasing the area under these crops. Therefore, it is strongly recommended that improved cultural and intensive management practices be promoted to increase yields of all the

selected UCPs. In addition to this, high quality seed and other planting material should be provided to farmers.

To improve the market and trade potential of UCPs, this study strongly recommends increased investment in research and development of soybean, maize, rice and horticultural products. In particular, the government needs to make major investments in improving post harvest technology of fruits and vegetables. There is also a need to establish a public, semi-public or private organizations to promote the "grow for export policy" and strengthen linkages between production, harvesting, grading, packing, transportation and export to potential markets. Also, to avoid cumbersome export procedures, a "one window export zone" for fruit and vegetable exports is recommended. In addition to this, port facilities must be improved.

1. Introduction

1.1 Background

Agriculture in Pakistan plays a direct role in determining economic growth as it contributes almost one-fourth of total Gross Domestic Product (GDP). This sector also contributes indirectly in the economic growth of Pakistan. This is true because agriculture requires inputs and output processing from the non-agricultural sector. The crucial role of Pakistan's agriculture in contributing to GDP has remained almost stagnant during the last ten years (Table I.1). Its share in the economy has been slowly decreasing and that of industry is slowly increasing. Crops remain the most important sub-sector, but livestock now accounts for more than 30% of agricultural GDP. The contribution from minor crops and fisheries has increased slightly.

In 1994/95, the agricultural sector engaged about half of the total employed labour force. Only 30% of the total population live in urban areas and the rest live in rural areas. Out of the total population (128 million), there are 5.1 million farmers with an average farm size of 3.8 ha. (Govt. of Pakistan 1996).

Table 1.1 Agriculture's contribution to Gross Domestic Product (GDP).

Year	GDP* (billion Rs)	Total (billion Rs)	Major Crops	Agriculture Contributions to GDP				Total	Total % of GDP
				Minor Crops	Live- stock	Fish- eries	Forestry		
..... (% share of total).....									
1985/86	342.2	93.4	49.5	17.9	27.7	3.8	1.1	100	27.3
1986/87	362.1	96.5	48.7	18.0	28.3	3.8	1.2	100	26.7
1987/88	385.4	99.1	48.8	17.0	29.2	3.8	1.2	100	25.7
1988/89	403.9	105.9	48.9	17.2	28.9	3.8	1.2	100	26.2
1989/90	422.5	109.1	47.5	17.5	29.8	3.9	1.3	100	25.8
1990/91	446.0	114.5	47.8	17.3	29.8	3.8	1.3	100	25.7
1991/92	480.4	125.4	50.4	16.2	28.8	3.7	0.9	100	26.1
1992/93	491.3	118.8	44.9	17.8	32.2	4.1	1.0	100	24.2
1993/94	510.8	122.2	43.7	18.2	33.2	4.0	0.9	100	23.9
1994/95	536.2	132.3	44.4	18.3	32.4	3.8	1.1	100	24.7

Source: Government of Pakistan 1996.

* GDP is in billion rupees at constant factor cost, 1980/81.

Pakistan's trade balance has been negative for most of the period since independence in 1947. Agriculture plays a key role in external trade. This sector is an important source of foreign exchange earnings through export of agricultural raw and agriculturally based products. Raw cotton and its products, rice and leather products are the major export commodities. Raw cotton exports contributed from 7 to 20% in total Pakistan export earnings from 1985/86 to 1991/92 and fell as low as 1% in 1993/94 due to cotton leaf curl virus and climatic factors (Table 1.2).

Foreign exchange earnings from rice exports were 4 to 8% of the total value of all exports during the same period. Fruits, spices, and fish follow as the next highest export earning commodities. Total agricultural export earnings ranged from as high as 32% during 1985/86 to as low as to 9% in 1993/94 of the total value of all Pakistan exports.

The import of agricultural commodities contributes considerably to the negative trade balance of Pakistan (Table 1.2). The two major agricultural import commodities are edible oils and grains, pulses and flour. These commodities accounted for 30 to 40% of the trade balance deficit from 1985/86 to 1993/94. Palm oil and soybean oil imports were the major import items comprising 80 and 20% of the total import bill of edible oils respectively. The value of import of grains, pulses and flour is primarily for wheat imports (85%) during the same period. The next largest import

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commodities were tea and coffee, which accounted for 2 to 3% of the value of total imports during the last ten years. Overall, around 12 to 18% of the total value of imports to Pakistan consisted of agricultural commodities between 1985/86 to 1993/94.

Table 1.2 Pakistan's trade in agriculture.

	1985/86	1986/87	1987/88	1988/89	1989/90	1990/91	1991/92	1992/93	1993/94
Foreign Trade (billion Rs in current prices)									
Total export	49.6	63.4	78.4	90.2	106.5	138.3	171.7	177.0	205.5
Total imports	90.9	92.4	112.6	135.8	148.9	171.1	229.9	258.6	258.3
Trade balance	-41.3	-29.0	-34.2	-5.6	-42.4	-32.8	-58.2	-81.6	-52.8
Agricultural Exports (percent of total exports)									
Rice	11.1	8.1	8.2	6.7	4.8	5.6	6.0	4.6	3.6
Raw cotton	16.7	12.1	13.8	20.2	9.0	6.9	7.5	4.0	1.2
Others	4.64	4.8	5.0	4.4	3.9	3.9	3.7	4.6	4.3
Total	32.44	25.0	27.0	31.3	17.7	16.4	17.2	13.2	9.1
Agricultural Imports (percent of total imports)									
Edible oils	6.7	4.4	6.9	6.3	5.6	5.3	4.3	5.9	5.7
Grains or pulses	5.6	1.9	2.1	6.3	6.2	2.3	4.3	5.5	3.4
Flour									
Others	5.3	5.6	5.8	5.4	6.6	6.9	4.6	4.2	4.5
Total	17.6	11.9	14.8	18.0	18.4	14.5	13.2	15.6	13.6

Source: Govt. of Pakistan 1996.

Note: Financial year is from July to June.

Pakistan is blessed with diverse agro-climatic conditions and one of the best irrigation systems in the world. Major crops grown in Pakistan are wheat, cotton, rice, sugarcane, gram, maize, sorghum, millet, rapeseed/mustard and tobacco. Minor crops include pulses (chickpea, lentil, mungbean, and black gram), potato, onions, chili, garlic, etc. Upland crops (coarse grains, pulses, roots and tuber crops) occupy an important position in Pakistani agriculture. The status in terms of area, production and yield of major crops and their growth rates are portrayed in Table 1.3. The growth rates for wheat, sugarcane, and pulses were very modest. The growth rate for yield of rice was negative, particularly Basmati rice, which is a large foreign exchange earner for Pakistan. Also, performance of pulses was not very encouraging. Cotton productivity has increased steadily during 1989/90 to 1994/95. Despite the fact that fruits and vegetables have remained at low priority in Pakistan, these crops have shown an increasing trend in area and production. However, this increase in production of almost all fruits and vegetables was due to increase in total area under these crops.

Upland crops are grown all over the country but generally planted in marginal areas where soils are poor and climatic conditions are uncertain. These crops, especially pulses and coarse grains, in Pakistan are the victim of the green revolution in cereals since the mid sixties. With the introduction of seed-fertilizer based technology during the mid sixties, Pakistan's food grain production has increased many-fold. However, all the increase in the food grain production has been contributed by wheat and rice. Production and area under upland crops witnessed a continuous decline, as all the growth policies, research, extension and input availability efforts were diverted towards wheat, rice, cotton, sugarcane, etc. Wheat is the staple food of Pakistani people. Therefore, it was crucial to focus on wheat at that time to make the country self-sufficient in food grain production.

Table 1.3 Area, production and yield of major crops, average of 1989/90 to 1993/94.

Crop	Area		Production		Yield	
	Hectares (‘000)	Growth Rate (%)	Tons (‘000)	Growth Rate (%)	kg/ha	Growth Rate (%)
Wheat	7,993	0.4	15,187	1.2	1,899	0.8
Rice (all types)	2,095	0.3	3,367	0.1	1,604	-0.2
Rice (Basmati)	1,086	1.2	1,184	0.8	1,090	-0.4
Rice (IRRI types)	863	-0.1	1,984	0.1	2,285	0.2
Maize	860	0.5	1,193	0.7	1,386	0.3
Sugarcane	896	0.1	38,566	0.7	42,900	0.6
Cotton	2,747	1.0	1,636	3.4	595	2.4
All pulses	1,477	0.5	673	0.3	-	-
Rapeseed/mustard	290	-1.2	217	-0.5	748	0.7
Potato	77	-0.03	886	6.6	11,560	6.0
All vegetables	217	2.2	2,910	1.4	-	-
All fruits	476	1.4	4,157	1.6	-	-

Source: Government of Pakistan 1995.

Upland crops in Pakistan have also been neglected due to low demand of their products. For example, all over Pakistan, coarse grains and their products are considered as inferior commodities compared to rice and wheat. Also, most of the upland crop products (UCPs) require further processing before consumption which adds to their cost and results in making these products more expensive to use. The prices of all these crops, especially pulses and coarse grains, have increased considerably over time. However, area, production and yield of these crops did not experience a similar increase. For example, local production of pulses in Pakistan could not meet the requirements of the people. To meet the deficit over time, the government had to import pulses from other countries. The import of pulses increased from 100 thousand tons in 1982 to 238.3 thousand tons (valued Rs 1,735.5 million) in 1992/93 and 153.7 thousand tons (valued Rs 1,319.0 million) in 1993/94 (Govt. of Pakistan 1995).

In Pakistan, the demand for agricultural commodities in general and UCPs in particular is expected to increase significantly in the near future. The first source of increasing demand for food is the present population of 128 million people which is increasing at a rate of about 3% per year. A second source of demand for agricultural commodities is the modest rising per capita income of Pakistan at a real rate of 5% per annum which results in changing tastes and preferences of the people in Pakistan. The demand for edible oils, fruits, milk, meat and other livestock products such as butter, cheese, etc., is improving considerably, and new products, such as potato chips, fried potato, Canola oil, other different types of edible oils, different types of breads, preserved fruits and vegetables, feed, etc., have emerged. Another source of demand for agricultural commodities is the international trade reforms which have important implications for domestic demand and export of various raw and finished agricultural products. It is expected that these changes will bring quantitative as well as qualitative changes in the demand for agricultural commodities and their products. In light of these changing sources of demand for agricultural products and the economic scenario, it would be extremely useful to examine the demand and marketing prospects of UCPs. It will help in setting research priorities, increasing farm income, setting policy guidelines on production and marketing, and provide useful information to producers. Also, increasing demand for these products will provide more possibilities for further market expansion.

The food consumption pattern and demand for food, especially the shift from traditional to non-traditional products, have changed considerably. The per capita availability of many food products and demand for feed has increased in Pakistan. These changes offer ample opportunities for emerging new products. The present study will examine the past trends in demand of UCPs and predict the demand for these products, such as processed food and feed and industrial uses in the near future. The study will also review the policy impacts, marketing potential and constraints, and external trade performance of UCPs. Case studies for specific new products through personal

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interviews with traders, exporters, policy makers, bankers, processors, etc., will help in examining major marketing constraints and policies to promote export of these products.

1.2 Objectives

This study is a part of the larger study of the Asian region initiated by the United Nations, ESCAP CGPRT Centre, Bogor, Indonesia. The major objective of this country study is to determine the domestic demand and market prospects of selected UCPs in Pakistan and to suggest measures for improving the market and trade UCPs. The specific objectives of this country study are:

- to review changes in dietary patterns and the domestic demand for major UCPs;
- to analyze changes in the domestic demand for major UCPs;
- to examine external trade performance for major UCPs;
- to project the demand for selected UCPs in the medium-term, 1996-2000;
- to examine the domestic market systems, government policies, export promotion efforts and give recommendations for improving market prospects and export of UCPs.

1.3 Commodity coverage

Commodity coverage in the different parts of the study is shown in Table 1.4.

Table 1.4 Commodity coverage in different parts of the study.

Study	Commodity
Domestic demand study	
a. Dietary pattern	Wheat, rice, and other food groups as listed in the FAO Food Balance sheets (rice, wheat, coarse grains, pulses, milk and milk products, vegetables, sugar and others)
b. Demand composition (including feed, industry)	Rice, soybean, potato, maize
c. Policy impact	Rice, soybean, potato, maize, feed
d. Demand projection	Rice, soybean, potato, maize
Market potential study	
a. Marketing/processing of representative UCPs	Rice, soybean, potato, maize
b. External trade performance	Rice, soybean, potato, maize
c. New/emerging (non-traditional) products/markets	Strawberry, mushroom, canola oil
d. Case studies of successful attempts and failed attempts	Mangoes, citrus fruits, molasses
	Apples, onion, tomato

1.4 Analytical approach

Several approaches were used to explain market prospects and policy analysis of CGPRT crops and their products in Pakistan, such as identification and analysis of policies regarding selected CGPRT crops, descriptive tables, impact analysis, etc. Demand projections for selected CGPRT crops were made on the basis of growth rates, trend analysis, income elasticities, real per capita income and population growth rates, etc.

A simple linear or log-linear equation form of the trend equation was used for trend projection, below:

$$\ln Q_d = a + \beta T \quad (1.1)$$

where,

$\ln q_d$ = natural log of quantity demanded

T = time

The annual rate of change was also estimated for demand projections using the following procedure:

$$Q_{dn} = Q_{d0}(1 + \gamma)^n \quad (1.2)$$

where,

- Q_{dn} = quantity demanded at year n
- Q_{d0} = quantity demanded at year 0
- γ = annual change rate
- n = years

The following simple model was used to estimate income elasticity of quantity demanded (human consumption) of selected CGPRT crops:

$$Q_d = a + \beta_1(\text{PCI/CPI}) + \beta_2(\text{PRC}_i/\text{CPI}) \quad (1.3)$$

where,

- Q_d = quantity demanded of ith product in a year
- PCI = per capita Income
- CPI = consumer price index
- Y = PCI/CPI is real per capita income
- PRC_i = whole sale price of ith commodity demanded
- PCI/CPI = real per capita income
- PRC_i/CPI = real prices of ith commodity

The growth rate of quantity demanded for a selected commodity was estimated as follows:

$$\gamma_q = \gamma_p + \varepsilon_y * \gamma_y \quad (1.4)$$

where,

- γ_q = growth rate of a quantity demanded of a selected product
- γ_p = population growth rate
- γ_y = growth rate of real per capita income
- ε_y = income elasticity of a quantity demanded from equation (1.3)

The total quantity demanded of a selected CGPRT commodity during 1996 to 2000 was estimated using the following model:

$$Q_m = Q_{m0}(1 + \gamma_q) \quad (1.5)$$

where,

- Q_m = total quantity demanded of a selected commodity in year n
- Q_{m0} = total quantity demanded of a selected commodity in year 0
- γ_q = growth rate of total quantity demanded from equation (1.4)

Data on per capita consumption of various commodities from the HIES data set were used to estimate income elasticities. Per capita consumption of various commodities from this data set is only available for 1979, 1985 to 1987, 1991 and 1993. To make this data set continuous, using annual growth rates, data were extrapolated for 1980 to 1984, 1988 to 1990 and 1992.

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1.5 Organization of the report

The first chapter explains the background, objectives, commodity coverage and scope of the study. The next chapter presents a review of the major agricultural policy measures adopted in Pakistan. Chapter 3 examines dietary patterns, protein and calorie intake, and expenditure patterns by rural, urban and national levels. Chapter 4 explains the demand for feed, and domestic demand and market potential of selected UCPs. The emerging markets/commodities are discussed in Chapter 5. Case studies on the successful and failed market promotion attempts for selected commodities are given in Chapter 6. The last chapter of the report summaries the main findings, and suggests strategies, and policy measures to improve market prospect of UCPs.

2. Agricultural Policy Measures in Pakistan

The objectives and priorities of Pakistan's agricultural policy are explained in the Eighth Five Year Plan for 1993-98 as follows:

"....to formulate specific, monitorable targets for increasing national self-reliance, supported by legislative safeguards as necessary, especially in the areas of government finance, food, defence, export-oriented manufacturing, high-technology products and energy," and

"....to implement a concrete programme of poverty alleviation, especially in rural areas, to attain full employment, and to ensure continued growth with stability."

Priorities set for the development of the agricultural economy of Pakistan are mainly based on: i) national food security, ii) full employment in rural areas, and iii) expanded foreign exchange earnings. Self-sufficiency in food, specially wheat, has been a major priority set by the government of Pakistan. Presently, import of wheat (2.62 million tons in 1994/95), edible oils (1.34 million tons in 1994/95 worth Rs 22.08 billion), milk and milk products, pulses, etc., is a big burden on the country's balance of payments. Pakistan has a distinct comparative advantage in the production of cotton and Basmati rice and exports its surplus of these two commodities to meet its deficit in wheat, oil seeds, and other commodities (Ali 1992). Pakistan is also developing its export markets for other products, such as high value crops including fruits and vegetables and poultry to keep up the momentum of development and to finance the import of other food items, such as wheat, edible oils, milk, etc.

To achieve self-sufficiency in food and to transform the agricultural and rural economy of Pakistan, the government is involved in various activities, such as supply of inputs and credit, different types of subsidies, procurement of different commodities, support prices, development of infrastructure, extension, agricultural research, etc. Some of these policy measures affect the whole agricultural sector and others only focus on specific commodities. For example, the benefits of agricultural infrastructure and input subsidies are not targeted for a specific commodity and generally these policy measures are designed for all commodities and the welfare of all farming communities. The other set of policy measures are commodity specific, such as minimum support prices, and procurement and taxing policies of different commodities.

A summary of policy measures related to rice, maize, potato and soybean is given in Table 2.1. The details of some of the major policy measures implemented by the government of Pakistan are given in this section of the report.

2.1 Input subsidies

Input subsidies are provided on various agricultural inputs, such as fertilizer, seeds, tubewells, etc., and they play an important role in disseminating new agricultural technologies, and thereby improving the productivity of almost all crops, forestry, livestock, and poultry. In Pakistan, in the past, federal and provincial governments have given subsidies on various inputs in different forms, such as fertilizer subsidy, irrigation subsidy, interest rate subsidy, interest free loans to small farmers, loan waiving, power subsidy, and subsidy on improved seeds of major crops, plant protection, herbicides, farm machinery, etc.

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Table 2.1 Major policy measures implemented on maize, rice, soybean and potato, 1994/95.

Policy Measure	Commodity			
	Maize	Rice	Soybean	Potato
Farm level				
1. Input subsidies				
Fertilizer	-	-	-	-
Seed	+	+	+	+
Cheap credit for inputs	+	+	+	+
2. Investment grants				
Machinery	-	-	-	-
Irrigation systems	+	+	+	+
Land development	+	+	+	+
3. Production or acreage controls	-	-	-	-
4. Compulsory food requisition	-	-	-	-
5. Production subsidy: fixed or proportionate subsidy per unit of output	-	-	-	-
6. Deficiency payment	-	-	-	-
7. Guaranteed price	-	+	+	+
Marketing and processing level				
1. Parastatal trading or marketing boards	-	+	-	-
2. Intervention buying or price support programme	-	+	+	+
3. Food subsidies to consumers	-	-	-	-
4. Excise taxes	-	-	-	-
5. Grants to industry				
Investment grants	-	-	-	-
Special tax concession	-	-	-	-
6. Public investment: research, training and extension	+	+	+	+
International trade				
1. Import tariff or surcharge	+	+	+	+
2. Import/export quota	+	+	+	+
3. Export subsidies or tax	-	-	-	-
4. Non-tariff barriers	+	+	+	+

Source: Compiled from various reports of the Ministry of Food, Agriculture and Livestock and Ministry of Commerce.

2.1.1 Fertilizer

Fertilizer has played an important role in considerably improving the productivity of all crops in Pakistan during the last three decades. Chemical fertilizers in Pakistan first became available in 1957 and their adoption was very slow in the beginning, although local farm yard manure was not sufficient for cultivation. Until the 1960s productivity of all major and minor crops was very low in Pakistan. Thus, to enhance fertilizer use, the prices of fertilizers were subsidized up to 60% in Pakistan during the late 1950s and then the subsidy was gradually reduced. The development subsidy on fertilizer was very effective in increasing the use of fertilizer and it resulted in enhancing demand beyond domestic production capacity. Pakistan imported more than 50% of the required quantity of fertilizer (Table 2.2). Fertilizer use in Pakistan increased from 26 kg/ha in 1975/76 to 88 kg/ha in 1994/95 (293% increase). Total fertilizer use increased 500% in the ten years from 1964/65 to 1973/74 and increased more than 400% up to 1994/95. The subsidy on fertilizer has played a vital role in this increase in fertilizer use in Pakistan.

Table 2.2 Domestic production, import, and fertilizer use in Pakistan.

Year	Domestic Production (‘000 N. tons*)	Import (‘000 N. tons)	Total Fertilizer Use (‘000 N. Tons)	Use (N. kg/ha)
1975/76	327	182.7	509.7	25.72
1980/81	640	574.4	1,214.4	59.82
1981/82	753	202.0	955.0	46.77
1982/83	1,072	400.1	1,472.1	72.30
1983/84	1,107	286.8	1,393.8	68.56
1984/85	1,119	341.9	1,460.9	70.88
1985/86	1,129	331.0	1,460.0	71.99
1986/87	1,212	522.4	1,734.4	82.91
1987/88	1,193	521.6	1,714.6	82.99
1988/89	1,212	461.6	1,673.6	79.62
1989/90	1,262	637.9	1,899.9	90.72
1990/91	1,226	685.0	1,911.0	91.17
1991/92	1,150	632.0	1,782.0	84.62
1992/93	1,332	759.1	2,091.1	97.71
1993/94	1,659	903.0	2,562.0	119.38
1994/95	1,637	261.0	1,898.0	87.87

Source: Government of Pakistan 1995.

* Nutrient tons.

The amounts of subsidies and subsidy per nutrient ton of fertilizer are given in Table 2.3. The subsidy on nitrogenous fertilizer has been gradually withdrawn with the establishment of urea plants and an efficient marketing network in Pakistan. The subsidy on nitrogenous fertilizer was completely eliminated in May 1986. The subsidy on phosphate fertilizer has also been gradually eliminated and totally withdrawn with effect August 1993. Similarly, the subsidy on potash fertilizer was totally eliminated in October 1995. The elimination of fertilizer subsidies has resulted in more than 100% increase in prices of all types of fertilizers in Pakistan. However, this policy of gradual elimination of subsidy on fertilizer in Pakistan has led to a sustained increase in its use in all crops.

Table 2.3 Subsidy on fertilizer in Pakistan.

Year	Subsidy on Local Fertilizer (million Rs)	Subsidy on Imported Fertilizer (million Rs)	Total Subsidy (million Rs)	Total Fertilizer Use (‘000 N. tons)	Subsidy (Rs/N. ton)
1975/76	8.0	592.8	600.8	509.7	1,179
1980/81	574.8	1,873.5	2,448.3	1,214.4	2,016
1981/82	1,222.0	527.3	1,749.5	955.0	1,832
1982/83	1,007.1	941.1	1,948.2	1,472.1	1,323
1983/84	1,141.4	324.4	1,456.8	1,393.8	1,045
1984/85	826.6	671.0	1,499.6	1,460.9	1,027
1985/86	1,131.0	1,278.0	2,409.0	1,460.0	1,650
1986/87	399.0	885.0	1,284.0	1,734.4	740
1987/88	186.0	1,633.0	1,819.0	1,714.6	1,061
1988/89	366.0	2,049.0	2,415.0	1,673.6	1,443
1989/90	208.0	1,049.0	1,257.0	1,899.6	662
1990/91	192.0	1,056.0	1,248.0	1,911.0	653
1991/92	264.0	927.0	1,191.0	1,782.0	668
1992/93	113.0	697.0	810.0	2,091.1	387
1993/94	-	582.6	582.6	2,562.0	227
1994/95	-	66.6	66.6	1,898.0	35.1

Source: Government of Pakistan 1995.

2.1.2 Improved seed

Improved seed is the most important component of the green revolution and availability of better seeds of improved crop varieties has significantly increased the productivity of almost all crops during the last three decades. Estimates of subsidy given on seed show that it increased from Rs 29.00 million in 1979/80 to Rs 44.00 million during 1980/81 and again decreased to Rs 8.00 million in 1982/83, and since then subsidy on seed was withdrawn (Government of Pakistan 1988). Now in the public sector, the Provincial Seed Corporations through their network of seed depots in all the four provinces distribute seed of wheat, paddy, maize, cotton, gram, potato, traditional and non-traditional oilseeds (sunflower soybean and safflower). Seeds of all major and minor crops are also produced and distributed by the private sector all over Pakistan. However, the seed industry in the private sector is still not well developed and deserves the maximum attention of the governments, specially in the production and availability of hybrid seed. The Provincial Seed Corporations and private seed companies produce seed at their farms and also at the farms of contract growers. A limited quantity of seed is also provided by the provincial and federal Departments of Agriculture and agricultural research institutes/stations. The total quantity of improved seeds of various crops distributed from 1985/86 to 1994/95 is shown in Table 2.4. Provincial Seed Corporations only provide seed of cereals, cotton, oilseed (on a very limited scale) and potato. Pakistan also imports improved seed of vegetables, fruits and plants, tubers and bulbs, budwood of flowers and fruits for sowing and planting, and hybrid seed of oilseeds (sunflower), etc. The Federal Certification Department examines crops offered by different seed agencies, and conducts seed quality and seed health tests. The Federal Government has also established seed testing laboratories at Karachi to monitor the quality of imported and exported seed.

Table 2.4 Distribution of improved seed ('000 tons) of different crops by the public sector in Pakistan.

Year	Wheat	Paddy	Maize	Cotton	Gram	Potato	Oilseed	Others
1985/86	48.58	1.80	1.57	17.55	0.92	4.71	-	0.09
1986/87	41.81	1.76	0.78	16.48	0.26	0.98	-	0.22
1987/88	55.81	1.84	1.05	14.88	0.77	5.40	0.01	0.13
1988/89	44.78	1.74	1.00	13.96	0.82	6.49	-	0.14
1989/90	45.57	1.40	1.07	12.12	0.22	0.04	-	0.23
1990/91	43.44	1.14	1.55	14.44	0.04	0.07	-	0.35
1991/92	45.70	1.48	0.93	14.42	0.04	2.20	0.01	0.03
1992/93	49.40	2.51	0.58	11.05	0.05	0.07	0.07	0.20
1993/94	50.04	1.60	0.21	10.51	0.05	0.66	-	0.13
1994/95	63.29	1.64	0.15	11.04	0.11	0.47	-	0.17

Source: Government of Pakistan 1995.

2.1.3 Tubewells

Subsidies on tubewells have also been very effective in Pakistan. The number of tubewells has steadily increased from 172,376 in 1976/77 to 463,463 in 1994/95 (Table 2.5). The installation of these tubewells made a remarkable contribution to the level and the seasonal distribution of available water supply for crop production all over Pakistan. As a supplement to surface water supplies, the government encouraged farmers to install tubewells by providing a subsidy on the cost of tubewells. The rate of subsidy on diesel tubewells varied by type of area and preference was given to rainfed areas. The subsidy rates per diesel tubewell of one cubic capacity are given in (Table 2.6). The number of tubewells installed with the help of subsidy decreased by almost half from 1977/78 to 1985/86 (Table 2.5).

Table 2.5 Number of tubewells and amount of subsidy in Pakistan.

Year	Total Tubewells	No. of Subsidized Tubewells	Total Subsidy (Rs millions)
1976/77	172,376	5,707	-
1977/78	178,507	1,191	20
1978/79	188,912	1,345	24
1979/80	199,673	1,124	22
1980/81	207,079	1,129	20
1981/82	213,226	1,120	24
1982/83	230,536	829	16
1983/84	248,878	845	16
1984/85	257,386	546	16
1985/86	268,453	1,123	16
1986/87	288,453	-	-
1987/88	305,231	-	-
1988/89	325,179	-	-
1989/90	325,179	-	-
1990/91	339,840	-	-
1991/92	355,840	-	-
1992/93	374,099	-	-
1993/94	389,473	-	-
1994/95	463,463	-	-

Source: Ministry of Food, Agriculture & Livestock, Islamabad.

Note: Data on number of subsidized tubewells and total subsidy from 1986/87 - 1994/95 not available.

Table 2.6 Rate of subsidy (Rs per tubewell) for diesel tubewell in Pakistan.

Year	Rainfed Areas*	Sailaba Areas [†]	Canal Command Areas**
1972/74	8,000	6,000	4,000
1974/78	12,000	10,000	8,000
1978/79	13,000	12,000	10,000
1979/80 to 1993/94	20,000	18,000	16,000

Source: Government of Pakistan 1995.

* Flooded (during monsoon) areas along with river sides.

** Canal irrigated areas.

The average proportion of subsidized tubewells during this period was around one-fourth of the total private diesel tubewells. These tubewells have played a key role in increasing as well as stabilizing the country's agricultural production during the last two decades (Government of Pakistan 1988). Around 27% of total irrigation water availability to crops was contributed by private tubewells in Pakistan. These tubewells not only helped in increasing the availability of water for crops but also played a key role in controlling the severe problem of waterlogging and salinity through lowering the underground water. The government also subsidizes electric tubewells by subsidizing electricity for agricultural tubewells. The amount of subsidy on electricity during the last ten years is given in (Table 2.7).

Table 2.7 Subsidy on electricity for tubewells in Pakistan.

Year	Subsidy (million Rs)
1981/82	506
1985/86	671
1986/87	784
1987/88	1,143
1988/89	1,210
1989/90	1,380
1990/91	1,625
1991/92	1,796
1992/93	1,724
1993/94	330

Source: Ministry of Food, Agriculture and Livestock, Islamabad.

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2.1.4 Credit

Farmers in Pakistan receive interest free short term loans and low interest medium and long term loans. These loans are advanced for seasonal inputs (fertilizer, seed, insecticide/pesticide, herbicide, etc.), draught animals, poultry, dairy farming, animal husbandry, marine and inland fisheries, tubewell installation and repair, tractors and attachments, cold storage, godown, etc.

Credit requirements of the agricultural sector have been continuously rising as a result of increase in prices of agricultural inputs, farm machinery, labour charges, etc. The government of Pakistan has provided institutional credit to farmers at a concessional mark-up rate to buy inputs. Production loans were advanced on the basis of actual crop requirements rather than as a flat assessment on an acre basis.

Almost all the credit disbursing agencies have adopted a liberal credit policy in Pakistan. The Agricultural Development Bank of Pakistan (ADBP), and the Federal Bank for Cooperatives (FBC) provided the largest share of credit followed by commercial banks. The supply of agricultural credit distributed by different institutions is given in Table 2.8.

Table 2.8 Supply of agricultural credit (million Rs) by institutions in Pakistan.

Year	ADBP*	Commercial Bank	Taccavi Loans	Cooperatives*	Total
1980/81	1,066.20	1,826.77	8.59	1,122.75	4,024.31
1981/82	1,550.79	2,436.42	8.48	1,095.80	5,091.49
1982/83	2,297.74	2,338.17	11.42	1,313.03	5,960.36
1983/84	3,097.56	3,769.96	7.60	1,435.39	8,310.51
1984/85	4,101.27	4,675.77	6.28	1,544.24	10,327.56
1985/86	5,217.11	5,321.86	4.62	1,975.23	12,518.82
1986/87	5,939.83	7,305.58	13.30	2,376.83	15,635.54
1987/88	7,598.48	5,171.45	9.14	2,864.42	15,643.49
1988/89	8,526.76	3,051.95	24.93	2,559.65	14,163.29
1989/90	9,271.44	3,629.58	55.58	506.53	13,463.13
1990/91	8,218.40	3,861.80	56.30	2,831.96	14,968.46
1991/92	6,917.28	4,172.20	56.30	2,279.26	14,125.04
1992/93	8,533.52	4,519.08	50.80	2,721.81	15,825.20
1993/94	8,877.90	4,052.10	50.80	2,432.52	15,413.32
1994/95	14,399.61	4,018.10	-	3,553.34	21,971.05

Source: Government of Pakistan 1995.

* Excluding Azad Kashmir and Northern Areas.

The amount of credit increased from Rs 4,024.31 million in 1980/81 to Rs 21,971.05 million in 1994/95, at a rate of 13% per year during this period.

The subsidy on institutional loans can be calculated by taking the difference between the lending rate and the rate at which the State Bank of Pakistan advanced loans to these lending institutions. These rates of subsidy ranged from 4 to 10% during the last decade. Some lending by commercial banks and the Federal Bank of Cooperatives was interest free, which can also be counted as a subsidy to the agricultural sector.

The recovery rates on these institutional loans varied in different provinces. The percentage of recovery during 1993/94 was 90, 80, 83 and 67 in Punjab, Sindh, NWFP and Baluchistan respectively (Government of Pakistan 1995). In Pakistan, subsidy on institutional credit to the agricultural sector was of three types: i) interest subsidy due to concessional rates of interest compared to other sectors of the economy, ii) default subsidy on bad debt which was treated as unrecoverable, and iii) loan waiving done in the past by various governments. The estimated subsidy on agricultural loans is given in Table 2.9.

Table 2.9 Subsidy on agricultural loans in Pakistan.

Year	Subsidy (million Rs)
1990/91	263.0
1991/92	263.0
1992/93	75.3
1993/94	1,097.7
1994/95	1,000.0

Source: Ministry of Food, Agriculture and livestock, Islamabad.

In Pakistan, the benefits of input subsidies are generally limited only to major crops, such as, wheat, rice, cotton, and sugarcane. Compared to the major crops, most of the other minor crops including upland crops do not usually benefit from all these input subsidies.

2.2 Investment in agriculture

Investment in agriculture or investment grants includes farm capital in the form of improvement of land, provision of irrigation facilities, agricultural machinery, farm buildings, livestock, agricultural services and other agricultural and irrigation infrastructure, grain storage, etc. Both public and private sectors are active partners in the development of agriculture in Pakistan. Direct public sector investment in agriculture has been steadily declining from 9.5% of total development expenditure in the Ist Plan to 4.0% in the 5th Plan, and it declined further to less than 2% during the 7th Plan (1988-93).

Expenditure on irrigation and drainage has also come down to less than 10% of the total public sector investment. Thus, agriculture has suffered from this declining trend of public investment in Pakistan. However, the agricultural sector also benefits indirectly from general improvement in the country's infrastructure, such as roads, railways, communications and power. In addition this sector has also benefited considerably from developments in research, extension and the educational system (Govt. of Pakistan 1995).

2.3 Production or acreage control

There are no direct government policies to control acreage or production of agricultural crops. However, in the past, government took some policy measures to encourage the production of some major crops, for example, the Cotton Maximizing Programme launched by the Pakistan Central Cotton Committee (PCCC) in Punjab and Sindh and the Crop Maximizing and Rice Maximizing Programmes initiated by the Pakistan Agricultural Research Council (PARC) in Punjab, Sindh and NWFP.

2.4 Farm level measures not implemented in Pakistan

There is no policy measure concerning compulsory food requisition from growers in Pakistan. Production subsidies are not provided, nor are deficiency payments given in Pakistan.

2.5 Guaranteed or support prices and procurement policies

This is the major policy measure of the government of Pakistan to inspire the farmers to plant a specific commodity and to protect the minimum prices they get for their produce. In Pakistan, support prices play a major role in producing sustained growth in agricultural production (Government of Pakistan 1988). Support prices of agricultural commodities serve as a guarantee to

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growers that a bumper crop or market malpractice will not force the prices to fall below the guaranteed prices. For this purpose, the Agricultural Prices Commission (APCom) was established in 1981. There are ten agricultural commodities covered under the minimum support price system namely wheat, rice (paddy), cotton, sugarcane, gram, onion, potato, sunflower, soybean and safflower. Prices of other agricultural products are fixed under market supply and demand forces. The major objective of the minimum support price policy is to improve crop production through price intervention, stabilize prices, and support the farmers against an unexpected fall in prices during the post-harvest period (Government of Pakistan 1994). Support prices are reviewed periodically and, before suggesting a minimum guaranteed price for a specific commodity, APCom reviews many factors, such as cost of production, domestic demand, import and export parity prices, supply and stock position, comparative advantages of crops, changes in the purchasing power of the farmers, etc. The suggested prices of various commodities by APCom are submitted to the Federal Ministry of Food, Agriculture and Livestock, and the Ministry consults with provincial governments and other concerned federal ministries and then forwards the recommended prices to the Cabinet for final approval. The Cabinet discusses the suggested prices in a meeting. Keeping in view social and political considerations, especially the urban masses, the Cabinet gives approval for the recommended support price of a specific commodity. These prices are generally announced before the planting season to help farmers to plan timely allocation of area and arrange inputs for a specific crop. The support/procurement prices of rice, soybean and potatoes are shown in Table 2.10.

Table 2.10 Support/procurement prices (Rs/40 kg) of rice, soybean and potato in Pakistan.

Year	Basmati Rice		IRRI Rice		Soybean	Potato
	Paddy	Clean	Paddy	Clean		
1986/87	102	230	53	95	160	44.5
1987/88	130	250	55	98	160	44.5
1988/89	135	258	60	111	165	50.0
1989/90	143	276	66	124	185	55.0
1990/91	150	286	73	150	200	55.0
1991/92	155	308	78	160	230	65.0
1992/93	175	340	85	170	250	67.0
1993/94	185	360	90	181	275	77.0
1994/95	210	388	102.60	195.48	275	84.0

Source: Government of Pakistan 1995.

The support price policy in Pakistan was very effective in the case of wheat, rice, cotton and to some extent for sugarcane. However, due to inefficient implementation by the authorized agencies, this policy measure was not very successful for gram, sunflower, soybean, safflower, onion and potatoes (Government of Pakistan 1995). The following government agencies are involved in for the implementation of the guaranteed minimum support price policy in Pakistan: PASSCO and provincial food departments (procure wheat); Cotton Export Corporation, Cotton Generis (procure cotton lint and seed cotton); Rice Export Corporation of Pakistan (paddy and cleaned rice); PASSCO (paddy, gram, potato, onion); Pakistan Oilseed Development Board (all non-traditional oilseeds); and Sugar Mills (sugarcane).

These agencies intervene in the markets on behalf of the government through their procurement centers established at the harvesting time of a particular commodity. Procurement policy measures of the government for agricultural commodities help in reducing intra-year and inter-year fluctuations in food prices in the country. Also this policy helps to protect consumers against the rise in prices of agricultural products especially food items. The quantity of Basmati and IRRI types of rice and wheat procured under the support price policy of the government from 1985/86 to 1994/95 is given in (Table 2.11).

Table 2.11 Production and procurement (public sector) of rice in Pakistan.

	Basmati Rice			IRRI Rice			Wheat		
	Produced (‘000 t)	Procured (‘000 t)	(%)	Produced (‘000 t)	Procured (‘000 t)	(%)	Produced (‘000 t)	Procured (‘000 t)	(%)
1985/86	883.1	226.5	25.65	948.6	1,784.6	53.15	2,533.3	13,923.0	18.20
1986/87	916.9	236.2	25.76	1,049.0	2,309.9	45.41	5,035.1	12,015.9	41.90
1987/88	943.2	220.3	23.36	614.1	2,069.8	29.67	3,975.2	12,675.1	31.36
1988/89	1,099.0	499.9	45.49	578.7	1,872.1	30.91	3,494.0	14,419.2	24.23
1989/90	1,217.0	541.0	44.45	793.0	1,797.0	44.13	4,134.9	14,315.5	28.88
1990/91	1,220.2	142.7	11.69	673.8	1,832.0	36.78	4,412.4	14,565.0	30.29
1991/92	1,092.2	121.6	11.13	370.3	1,949.5	18.99	3,159.0	15,684.2	20.14
1992/93	1,124.1	500.5	44.52	454.0	1,797.8	25.25	3,249.0	16,156.5	20.11
1993/94	1,266.7	144.9	11.44	681.4	2,524.3	26.99	4,120.0	15,213.0	27.08
1994/95	1,351.6	284.0	21.01	-	-	-	3,644.0	17,002.4	21.43

Source: Government of Pakistan 1995.

2.6 Food subsidies to consumers

Food subsidies to consumers are meant to support food procurement and to stabilize food prices in the country. The beneficiaries of consumer subsidies are mostly the urban consumers who buy the subsidized food commodities. Wheat is the staple food in Pakistan and food subsidies are mainly for wheat. The other food items covered under the consumer food subsidy programme are sugar and edible oils. Production of wheat in Pakistan is not sufficient to meet the needs of the rapidly growing population. Pakistan imported around 1.6 million tons of wheat per year from 1989/90 to 1993/94 (Table 2.12). The food subsidy had declined from 4.4% of GDP in 1984/85 to 1.54% of GDP in 1992/93. The food subsidy as a percent of current expenditure ranged from 35% to 66% from 1984/85 to 1992/93. The government kept the prices of wheat flour in the country below the cost to the government of local and foreign purchases of wheat plus transport, handling and storage charges. The subsidy on imported wheat was mainly born by the federal government and the subsidy on local wheat was mainly paid by the provincial governments. Pakistan used to have a rationing system to ensure low wheat flour prices to mainly urban and partially rural consumers. This rationing system was replaced by a program of open market operation. Now the government procures post harvest stock at support prices all over the country and provides it to millers at a predetermined fixed margin over procurement prices. The government also controls trade of wheat. The domestic prices of wheat are lower than the import parity prices and the government meets the price differential. Therefore, local millers, foreign producers of wheat and the local urban consumers of wheat are the principal beneficiaries of the food subsidy. There was a similar food subsidy on edible oils, but no food subsidy on rice and maize.

Table 2.12 Wheat subsidy, total current expenditure and wheat import in Pakistan.

Year	Wheat Import (‘000 tons)	Wheat Subsidy (million current Rs)	Total Current Expenditure	Subsidy as % of Expenditure	Subsidy as % of GDP
1984/85	544.6	3,893	6,709	58	4.42
1985/86	1,562.0	2,816	5,907	48	3.00
1986/87	-	1,948	5,337	37	2.01
1987/88	-	2,514	5,542	45	2.53
1988/89	1,766.0	5,960	9,092	66	5.63
1989/90	1,603.0	2,501	5,563	45	2.29
1990/91	627.3	3,204	6,344	51	2.80
1991/92	1,640.4	2,735	6,321	43	2.18
1992/93	2,356.6	1,855	5,310	35	1.54
1993/94	1,408.0	-	-	-	-

Source: Government of Pakistan 1995.

2.7 Direct taxes

Direct taxes on agriculture in Pakistan include land revenue, Ushr and commodity taxes. Details of Ushr are given in Appendix 1. Total land revenues collected by the government and the amount of Ushr assessed and collected are shown in Table 2.13. The percent of Ushr collection has ranged from 17.56% to 99.86% from 1982/83 to 1992/93. Land revenue receipts of the provincial governments have increased by more than 300% from 1982/83 to 1994/95.

Another local tax which applies to almost all commodities is the *octroi* duty which is levied by local authorities on all products entering the urban areas. The rates of this tax vary from one region to another and range between 2 and 5% of the total value of the produce.

Table 2.13 Land revenue receipts and assessment and collection of Ushr in Pakistan.

Year	Land Revenue (million Rs)	Ushr		
		Assessment (million Rs)	Collection (million Rs)	(%)
1982/83	249.1	179.62	179.36	99.86
1983/84	208.6	262.39	259.62	98.94
1984/85	218.7	271.47	263.26	96.97
1985/86	235.8	264.39	247.97	90.77
1986/87	298.0	252.95	229.61	90.77
1987/88	363.9	273.64	241.84	88.38
1988/89	413.3	245.79	184.79	75.18
1989/90	480.6	247.56	143.55	57.99
1990/91	595.0	207.88	121.88	58.63
1991/92	690.5	134.88	41.17	30.52
1992/93	790.7	67.65	11.88	17.56
1993/94	1,029.8	-	-	-
1994/95	1,133.8	-	-	-

Source: Government of Pakistan 1995.

2.8 Agricultural research and extension

The research system in Pakistan is established at both the federal and provincial levels. There were 74 research institutions at the federal level and 106 research establishments at the provincial level in 1990 (Mellor 1994). In addition, agricultural universities conduct research in almost all disciplines. Each of the four provinces has its own agricultural research station and sub-stations covering almost all major and minor crops (wheat, cotton, rice, sugarcane, maize, pulses, traditional and non-traditional oilseed crops, fruits and vegetables), livestock, and forestry. Agricultural research at these establishments is more applied and adaptive. Mellor (1994) estimated the expenditure (in current Rupees) on agricultural and livestock research amounted Rs 742 million in 1988/89 and Rs. 1,099 million in 1992/93 (an increase of 48%). However, in real terms, the total expenditure increased by only 3.5% during these five years, which indicates a general shortage of funding for research and operational funds in particular in Pakistan. The desired ratio of wages to operational expenditure in agricultural research is 60:40 (World Bank 1992). The same prevailing ratios in the provinces of Pakistan are in excess of 80:20 leading to a very poor research environment (World Bank 1994).

Provincial extension departments take most of the current agricultural budget but their impact is questionable. Presently there are more than 5,000 village extension workers but operational funding for these extension agents is very low. For example, the ratio of salaries to operational expenditure in NWFP has deteriorated from 75:25 in 1982/83 to 85:15 in 1992/93 (World Bank 1994). Many studies have discussed the poor linkage of research to extension in all four provinces of Pakistan and showed that contact of extension workers is highly skewed towards those farmers with large holdings and political influence (Byerlee 1994).

2.9 Trade policy

Cotton and rice are the two major export commodities and they are traded through the Cotton Export Corporation and the Rice Export Corporation of Pakistan, respectively. Both cotton and rice are taxed through export duties and import duty is imposed on sugar and edible oils to protect the local industry. The total amount of export and import duties as a percent of government expenditure has decreased from 6.54 in 1980/81 to 4.09 in 1990/91 (Mellor 1994). Export duties include export duties on cotton and rice as well as net profits from the Cotton Export Corporation and the Rice Export Corporation of Pakistan. Import duties include a duty on sugar, a central excise duty on sugar, and an import duty on edible oils (soybean and palm oil). Export of 22 food and raw material items is not allowed (Export Promotion Bureau). These goods are categorized by the government as essential goods. The government fixes the annual quota of exports of maize, gram and gram-split, wheat flour, cream of wheat and wheat bran, soda ash, breeding buffaloes, cows, goats, camels and endemic birds. These quota restrictions are in fact bans on the export of these items. Exports of these goods are only permitted when there is excess supply in the country. These export restrictions keep down the prices of these goods in the local market.

The beneficiaries of this policy are consumers and industrial users in the country. Trade regulations on export and import of agricultural commodities are given in Table 2.14. General trade policies for all agricultural commodities are explained in this section and specific trade policies for rice, maize, soybean and potato will be explained in the Chapter 4 of the report.

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Table 2.14 Duties and taxes on import and export in Pakistan.

Description of Goods	Rate of Duty %	Rate of Sales Tax %	Condition of Import
Soybean	10	15	- Custom duty free on soybean seed - Sales tax free
Soybean (flour & meal)	25	15	
Soybean			
- Oil	Rs 8,950/ton		- Custom duty @ Rs 7,600/ton
- Other	Rs 9,950/ton		
Maize			
- Flour	25	15	
- Corn	25	15	
- Oil	65	15	
- Other	65	15	
Maize			
- Seed	25	15	
- Corn starch	25	15	
- Other	25	15	
Rice			
- Husk (paddy)	25	15	
- Husked (brown)	25	15	
- Semi or wholly milled whether or not polished	25	15	
- Broken rice	25	15	
Potato			
- Starch	25	15	
- Seed	10	15	- Custom duty free on potato seed - Sales tax free
- Other (not importable)	35	15	- Custom duty free on potato seed - Sales tax free
Tomatoes			
- Fresh or chilled	35	15	- Custom duty free on tomato
Onions	35	15	- Custom duty free - Sales tax free
Mushroom	35	15	
Oranges	35	15	
Strawberries, fresh	65	15	
Apples	35	15	

Source: Export Promotion Bureau.

3. Dietary Patterns

This section deals with food consumption patterns on the basis of Household Income and Expenditure Survey (HIES) data collected by the Federal Bureau of Statistics, Islamabad, during different periods. Differences in food intake levels between rural and urban areas also discussed. Budget shares of various food items and calorie and protein intake levels are also explained.

3.1 Data

The Federal Bureau of Statistics, Pakistan, collects the Household Income and Expenditure Survey (HIES) data at the national level at different time intervals by adopting sample survey techniques. HIES data were collected in 1970, 1971, 1979, 1985, 1986, 1987, 1991 and 1993. These surveys were designed to provide data on household income and expenditure in order to estimate household income distribution, consumption patterns, and savings and liabilities. The data pertaining to these periods also provide dis-aggregate data on food intake in terms of quantity and value for major commodities by 10 to 12 expenditure groups, by urban and rural areas, and also by province. In addition to the data on food grains consumption (wheat, rice, other coarse grains, and pulses including chickpea, mungbean, lentil and black gram), the HIES data set also contains information on other food items, such as milk and its products, vegetable oils, "Desi ghee" (fats from buffalo and cow milk), meat, fish, poultry, fruits, vegetables, sweeteners, etc. The estimates are based on statistical samples of consumption over the past one month for different expenditure classes and are subject to seasonal as well as memory bias. To examine the expenditure patterns of different food items, the 11 expenditure groups were merged into four groups (\leq Rs 2500, 2,501-4,000; 4,001-7,000, $>$ Rs 7,000 per month). Per capita expenditure is taken as a proxy for income and used interchangeably in the study.

3.2 Consumption patterns

Food consumption patterns in Pakistan are changing over time mainly because of moderately rising per capita income, urbanization, changes in tastes and preferences, breakthrough in communication technology, introduction of new products, health consciousness, etc. Table 3.1 shows estimates of annual consumption of food groups in Pakistan for rural and urban areas in 1979, 1985, 1986, 1987, 1991 and 1993. Per capita cereal consumption decreased considerably from 149 kg/year in 1979 to 140 kg/year in 1993. The low consumption of cereals was compensated by higher intake of milk, edible oils, fruits, and vegetables. However, there was no change in the consumption levels of pulses and meat during the same period. Around three-quarters of the diet consisted of cereals and milk products. Consumption of fruits and vegetables increased considerably from 1979 to 1993. This significant increase in intake of fruits and vegetables and edible oils can be associated with rising per capita income in Pakistan: with recent developments in communication technologies and availability of new food products, the consumption patterns of the rural masses are getting closer to those urban areas over time.

Annual per capita consumption of cereals is quite high in rural areas as compared to urban areas. In 1993, cereal intake in rural areas was higher than in urban areas. Milk consumption in rural areas was also higher than in urban areas during the same period. Edible oils, meat, fish and chicken consumption, and fruit intake was significantly higher in urban areas. The detailed food consumption levels of various items in 1991 and 1993 are given in Appendix 2. Annual per capita

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consumption of different food groups in 1979 and 1993 in rural and urban areas is given in Figures 3.1 to 3.3.

Consumption of vegetable oils increased from 6.48 kg in 1979 to 10.8 kg in 1993. This extraordinary increase in the consumption of oils was partly in response to rising incomes in Pakistan, but it was also a result of changing food habits and new foods. More than 75% of national vegetable oil requirements in Pakistan were met through imports worth of Rs 14.7 billion in 1994 and more than Rs 30 billion in 1995. (Govt. of Pakistan 1995) About 85% of the total import of edible oil was palm oil and the rest was soybean oil in 1994. The gap between domestic production and consumption is growing wider and efforts made so far to enhance domestic production have not succeeded in Pakistan.

Table 3.1 Per capita consumption (kg per year) of major food items in Pakistan, 1979 to 1993.

Food Item	1979	1985	1986	1987	1991	1993
Rural Pakistan						
Wheat	147.49	139.08	142.56	138.72	128.88	133.32
Rice	16.44	16.08	15.00	15.48	15.96	16.68
Pulses	7.80	6.84	6.00	6.36	7.20	7.68
Milk (fresh/boiled)	64.32	76.44	93.12	79.68	84.84	93.96
Edible oils	4.92	6.48	6.36	6.96	8.04	9.84
Mutton	1.08	1.08	0.84	0.96	1.08	1.08
Beef	3.96	4.20	4.32	4.68	4.44	4.56
Chicken	0.48	0.72	0.72	0.84	0.84	0.84
Fish	0.60	0.60	0.60	0.60	0.72	0.60
Fruits	5.88	8.40	10.44	11.44	15.00	13.68
Vegetables	29.88	34.44	38.52	37.08	47.28	64.20
Sweeteners	14.76	14.16	15.36	14.76	15.96	23.28
Tea	0.84	0.60	0.72	0.72	0.60	0.84
Urban Pakistan						
Wheat	114.60	104.64	105.36	104.76	105.24	102.84
Rice	12.48	12.60	13.44	12.48	13.92	14.28
Pulses	7.68	6.72	6.36	6.48	6.84	9.00
Milk (fresh/boiled)	50.76	62.40	63.84	65.88	65.04	70.08
Edible oils	9.12	9.24	9.24	9.24	8.88	13.08
Mutton	3.24	3.00	2.76	2.52	1.92	2.40
Beef	6.36	7.08	8.64	6.60	6.48	5.76
Chicken	0.60	0.60	0.84	0.84	1.32	1.32
Fish	0.96	0.96	0.96	0.84	1.08	0.96
Fruits	11.04	14.52	15.00	17.28	18.60	20.40
Vegetables	34.32	42.48	45.00	43.92	47.88	68.40
Sweeteners	14.04	11.76	13.08	12.6	12.48	13.32
Tea	1.08	0.72	0.72	0.84	0.72	0.84
All Pakistan						
Wheat	134.40	128.88	131.52	128.04	121.2	124.56
Rice	14.88	15.00	15.36	14.52	15.36	16.08
Pulses	8.04	6.84	6.24	6.36	7.20	8.08
Milk (fresh/boiled)	59.04	72.24	75.96	75.36	78.48	87.28
Edible oils	4.32	7.32	7.32	7.80	8.40	10.80
Mutton	1.92	1.68	1.44	1.44	1.32	1.44
Beef	4.92	5.04	5.04	5.28	5.04	4.92
Chicken	0.60	0.60	0.72	0.84	0.96	0.96
Fish	0.72	0.72	0.72	0.72	0.84	0.72
Fruits	7.80	10.08	12.48	13.32	16.20	15.72
Vegetables	31.80	36.60	40.44	39.24	47.40	65.40
Sweeteners	14.52	13.56	14.86	14.04	14.88	17.76
Tea	0.96	0.72	0.72	0.72	0.60	0.72

Figure 3.1 Annual per capita consumption of major food items in rural areas of Pakistan.

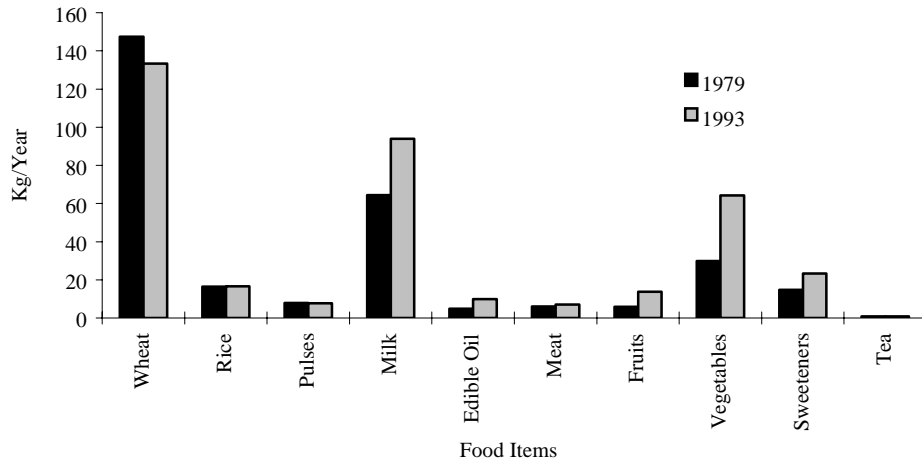


Figure 3.2 Annual per capita consumption of major food items in urban areas of Pakistan.

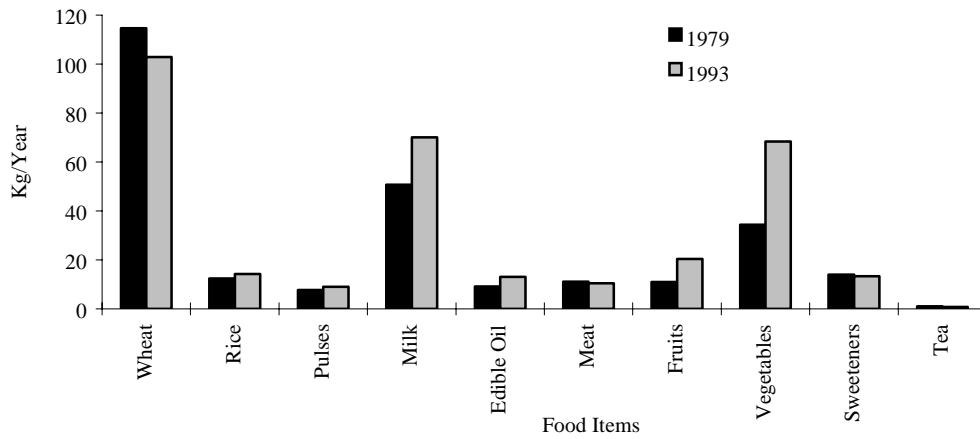
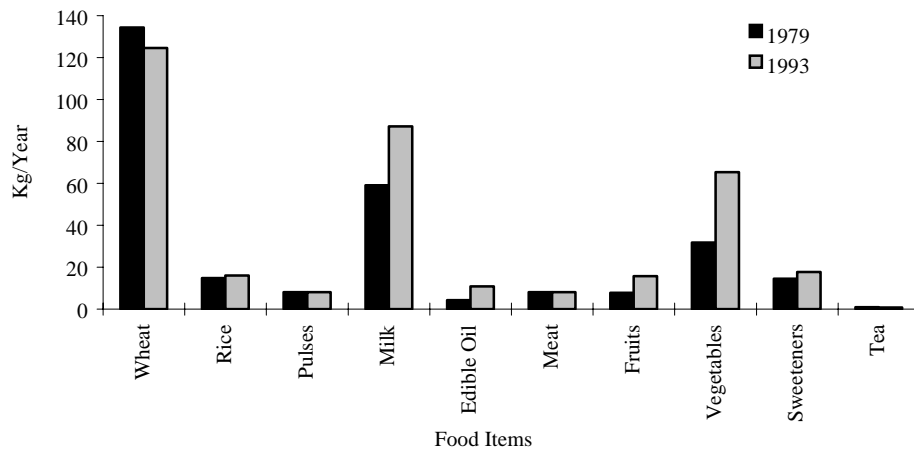


Figure 3.3 Annual per capita consumption of major food items in Pakistan.



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Distribution of calorie intake of different food items during 1979 and 1993 in rural and urban area is given in Table 3.2 and Figures 3.4 to 3.6. Total per capita calorie intake per day in Pakistan increased by 252 calories from 1979 to 1993 and this increase was due to increased use of milk and milk products, edible oils, fruits and vegetables. Per capita calorie intake in Pakistan from cereals decreased by around 6% from 1979 to 1993. At the aggregate level, average per capita calorie intake in Pakistan in 1993 was higher than the Recommended Dietary Allowance (RDA) of per capita intake of 2,250 calories per day. In 1993, more than half of the calorie consumption came from cereals, 15% from milk and its products, 11% from edible oils, and around 5% from fruits and vegetables. This skewed composition of calorie intake to cereals is actually not a balanced diet according to the Desirable Dietary Pattern (DDP) of FAO. The daily per capita calorie intake in 1979, 1985, 1986, 1987, 1991 and 1993 is given in Appendix 3.

Table 3.2 Daily per capita calorie intake of major food items in Pakistan.

Food Item	Calorie Intake		% of Total		% Change
	1979	1993	1979	1993	1979 to 1993
Rural Pakistan					
Cereals	1,611	1,479	70.47	57.26	-8.19
Pulses	77	76	3.37	2.94	-1.51
Milk & products	228	364	9.97	14.09	59.66
Vegetable oil	111	246	4.86	9.52	121.62
Meat & fish	35	39	1.53	1.52	12.12
Poultry	5	7	0.22	0.26	36.31
Fruits	9	25	0.39	0.97	177.04
Vegetables	45	89	1.97	3.45	97.91
Sweeteners	149	245	6.52	9.48	64.17
Others (tea, chili)	16	13	0.70	0.50	-21.71
Total	2,286	2,583	100	100	12.99
Urban Pakistan					
Cereals	1,249	1,157	61.23	53.10	-7.37
Pulses	75	89	3.68	4.08	18.44
Milk & products	184	248	9.02	11.37	34.67
Vegetable oil	226	327	11.08	15.01	44.69
Meat & fish	65	57	3.19	2.62	-13.07
Poultry	7	12	0.34	0.55	68.90
Fruits	18	36	0.88	1.65	99.76
Vegetables	49	97	2.40	4.46	98.46
Sweeteners	148	143	7.25	6.66	-3.57
Others (tea, chili)	19	13	0.93	0.60	-34.07
Total	2,040	2,179	100	100	6.81
All Pakistan					
Cereals	1,468	1,387	65.80	55.86	-5.51
Pulses	79	79	3.54	3.20	0.00
Milk & products	243	377	10.89	15.20	55.28
Vegetable oil	162	270	7.26	10.87	66.57
Meat & fish	47	44	2.11	1.78	-5.83
Poultry	6	8	0.27	0.32	36.89
Fruits	12	28	0.54	1.11	129.86
Vegetables	47	91	2.11	3.66	94.48
Sweeteners	149	187	6.68	7.53	25.80
Others (tea, chili)	18	12	0.81	0.47	-35.78
Total	2,231	2,483	100	100	11.30

Source: Household Income and Expenditure Survey, Federal Bureau of Statistics, Islamabad.

Figure 3.4 Daily per capita calorie intake of major food items in rural areas of Pakistan.

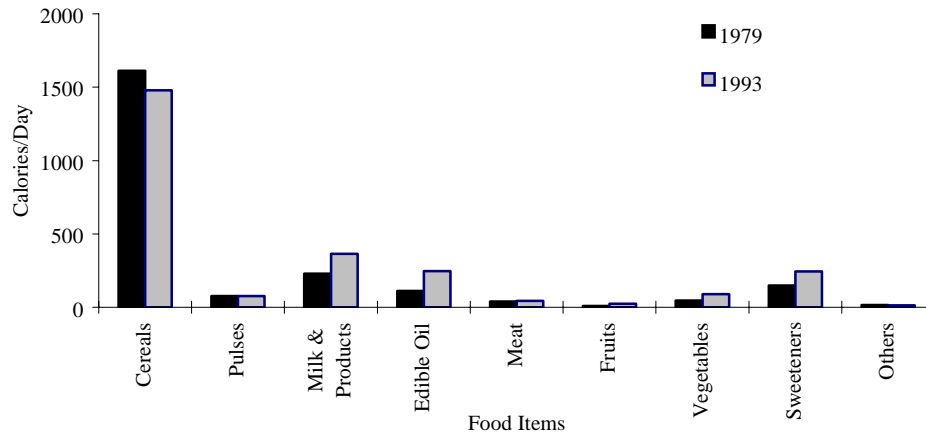


Figure 3.5 Daily per capita calorie intake of major food items in urban areas of Pakistan.

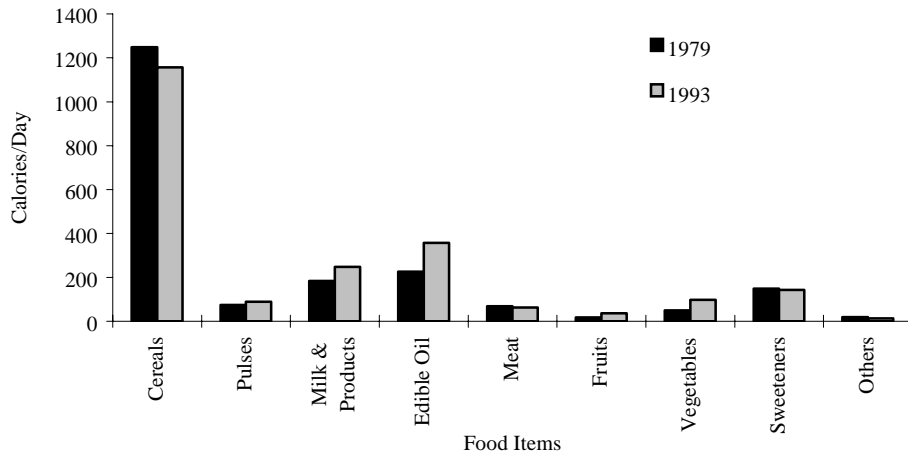
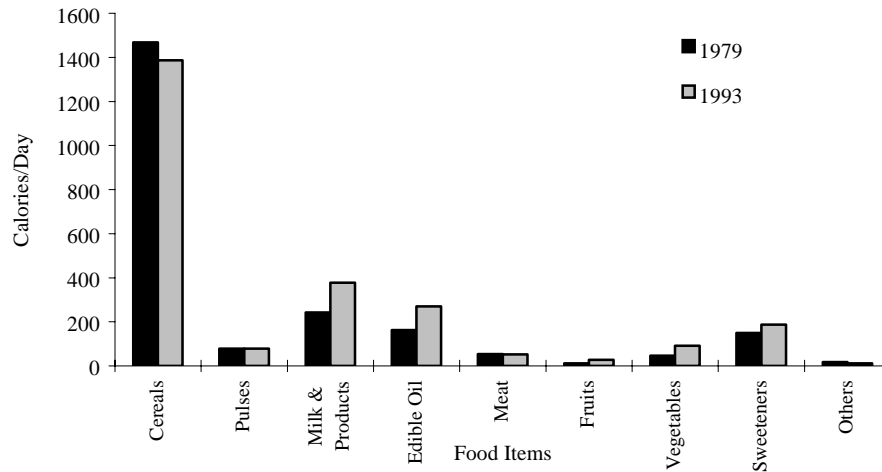


Figure 3.6 Daily per capita calorie intake of major food items in Pakistan.



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Daily per capita protein consumption of major food items in Pakistan over time is given in Table 3.3, Figures 3.7 to 3.9 and Appendix 4. The total protein intake levels from 1979 to 1993 increased by 5%. There was a slight decline in protein intake from cereals but a considerable increase from milk and milk products. Cereals are the major source of protein in Pakistan and provide around two-thirds of the total intake of protein from all food items. The daily per capita protein intake was slightly higher than the RDA of 60 grams in Pakistan.

Table 3.3 Daily per capita protein consumption of major food items in Pakistan.

Food Item	Protein Intake (gram)		% of Total		% Change
	1979	1993	1979	1993	1979-1993
Rural Pakistan					
Cereals	46.44	42.47	70.81	62.18	-8.56
Pulses	4.47	4.44	6.82	6.50	-0.75
Milk & products	9.33	14.02	14.23	20.53	50.26
Meat & fish	2.90	3.22	4.42	4.71	10.91
Poultry	0.48	0.71	0.73	1.04	48.36
Fruits	0.13	0.28	0.20	0.41	114.36
Vegetables	1.33	2.67	2.03	3.91	100.75
Others (tea)	0.49	0.49	0.76	0.72	0.00
Total	65.58	68.30	100	100	4.15
Urban Pakistan					
Cereals	36.03	33.10	63.69	56.37	-8.12
Pulses	4.45	5.20	7.87	8.86	16.90
Milk & products	7.61	10.79	13.45	18.37	41.80
Meat & fish	5.40	4.68	9.55	7.97	-13.36
Poultry	0.68	1.21	1.20	2.06	77.75
Fruits	0.25	0.39	0.44	0.66	55.20
Vegetables	1.51	2.87	2.67	4.88	89.80
Others (tea)	0.64	0.49	1.13	0.83	-22.71
Total	56.57	58.73	100	100	3.82
All Pakistan					
Cereals	42.30	39.79	68.01	60.74	-5.94
Pulses	4.62	4.65	7.43	7.09	0.57
Milk & products	8.64	13.12	13.89	20.03	51.85
Meat & fish,	3.87	3.64	6.22	5.56	-5.85
Poultry	0.60	0.85	0.96	1.29	41.33
Fruits	0.18	0.30	0.29	0.46	67.78
Vegetables	1.41	2.73	2.27	4.16	93.33
Others (tea)	0.58	0.44	0.93	0.67	-24.14
Total	62.10	65.52	100	100	5.51

Source: Household Income and Expenditure Survey, Federal Bureau Statistics, Islamabad.

Annual per capita food consumption by expenditure groups in 1993 is given in Table 3.4. The consumption of certain food items increased with increase in income. The intake of cereals is higher in rural areas and increased with the increase in income. However, in urban areas, consumption of cereals is almost the same in all income groups. The consumption of non-staple foods is higher in the urban areas compared to rural areas. Intake of milk and milk products, vegetable oils, meat, poultry, fruits, vegetables and sweeteners increased considerably from lower to higher income groups in both rural and urban areas.

Figure 3.7 Daily per capita protein consumption of major food items in rural areas of Pakistan.

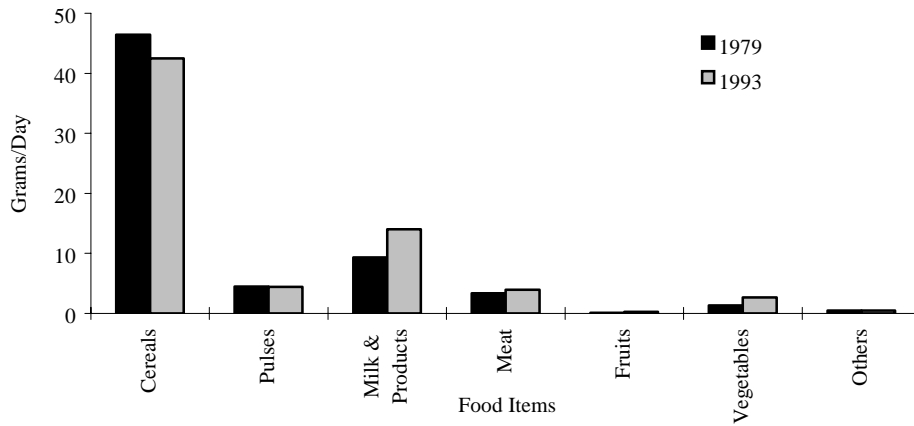


Figure 3.8 Daily per capita protein consumption of major food items in urban areas of Pakistan.

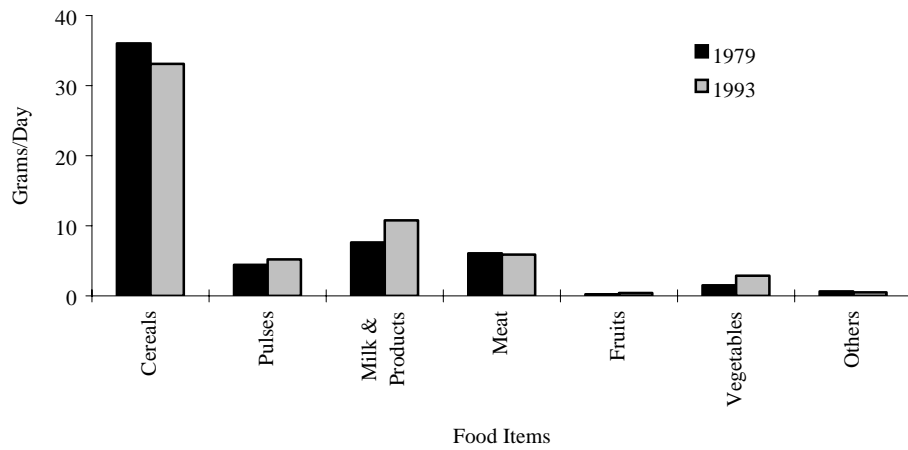
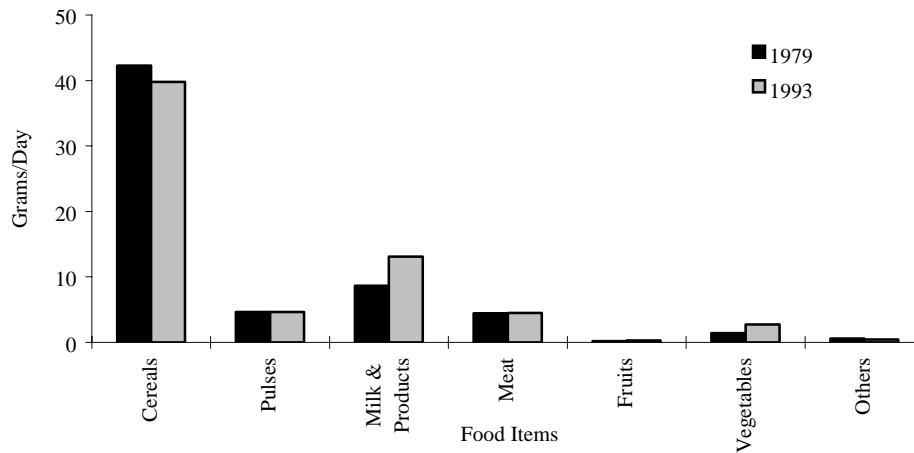


Figure 3.9 Daily per capita protein consumption of major food items in Pakistan.



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Table 3.4 Consumption of major food items (kg/capita/year) by income group in Pakistan, 1993.

Food Item	Income Group				All
	I (\leq Rs 2,500)	II (2,501 to 4,000)	III (Rs 4,001 to 7,000)	IV (\geq Rs 7,001)	
Rural Pakistan					
Cereals	144.84	148.20	156.84	179.40	150.00
Baked & fried products	0.34	0.50	0.73	0.95	0.49
Pulses	8.82	6.72	7.32	8.88	7.68
Milk, fresh	79.37	94.05	112.33	141.13	94.05
Milk, dry	0.02	0.03	0.04	0.02	0.03
Butter	0.63	0.84	1.29	1.61	0.88
Ghee*	0.78	1.64	2.44	2.88	1.44
Yoghurt	2.49	3.88	8.04	9.36	4.08
Vegetable oil	9.30	11.12	8.84	8.52	9.84
Meat & fish	5.34	6.16	8.52	9.48	6.24
Chicken	0.60	0.64	1.16	2.04	0.84
Eggs (No.)	12.42	14.24	16.96	30.72	15.00
Fruits	10.31	14.67	17.62	21.71	13.68
Vegetables	60.21	65.48	61.36	91.44	64.20
Chili	0.83	0.78	0.82	0.96	0.81
Sweeteners	20.25	18.28	17.68	24.48	23.28
Tea	0.80	0.82	0.83	0.89	0.81
Urban Pakistan					
Cereals	118.08	116.88	118.56	114.24	117.12
Baked & fried products	0.40	0.53	0.66	0.98	0.63
Pulses	8.37	9.92	8.44	7.68	9.00
Milk, fresh	60.22	62.02	72.62	92.80	70.11
Milk, dry	0.06	0.06	0.07	0.84	0.22
Butter	0.12	0.07	0.12	0.29	0.12
Ghee*	0.15	0.12	0.32	0.60	0.24
Yoghurt	4.26	3.72	4.68	7.20	4.92
Vegetable oil	12.98	9.51	10.61	18.81	13.08
Meat & fish	7.26	7.56	9.40	13.80	9.12
Chicken	0.51	0.68	1.36	3.36	1.32
Eggs (No.)	13.98	18.64	26.72	66.60	29.40
Fruits	13.72	13.91	24.61	32.31	20.40
Vegetables	56.70	70.96	63.64	83.64	68.40
Chili	0.77	0.75	0.77	0.81	0.77
Sweeteners	15.09	12.48	13.56	14.28	13.32
Tea	0.73	0.74	0.89	1.06	0.83
All Pakistan					
Cereals	141.00	139.32	139.80	145.80	140.64
Baked & fried products	0.35	0.50	0.70	0.96	0.53
Pulses	8.91	7.60	7.72	8.28	8.04
Milk fresh	76.49	84.84	95.53	116.17	87.32
Milk dry	0.03	0.04	0.05	0.44	0.08
Butter	0.56	0.62	0.78	0.93	0.66
Ghee*	0.69	1.20	1.52	1.68	1.08
Yoghurt	2.76	3.76	6.44	8.28	4.32
Vegetable oil	10.13	10.76	9.75	13.90	10.79
Meat & fish	5.52	6.56	8.68	11.76	7.08
Chicken	0.57	0.72	1.28	2.64	0.96
Eggs (No.)	12.63	15.56	21.32	49.20	19.08
Fruits	10.90	14.45	21.31	27.16	15.72
Vegetables	59.80	66.60	62.36	87.48	65.40
Chili	0.82	0.77	0.79	0.88	0.80
Sweeteners	19.35	16.72	15.96	19.20	17.76
Tea	0.79	0.80	0.86	0.98	0.81

Source: Household Income and Expenditure Survey, Federal Bureau Statistics, Islamabad.

* Fats from buffalo and cow milk.

Table 3.5 shows the calorie intake from different food items by expenditure group in rural and urban areas, and at the national level in 1993. Income group I in rural and urban areas derived around 60% of its total calorie intake from cereals. On the other hand, the higher income groups derived less than 50% of their calorie intake from cereals. The average per capita calorie intake varied from 2,033 calories by urban areas to 3,145 calories by rural higher income groups. At the aggregate level, average per capita calorie intake in all income groups in 1993 was higher than the RDA of 2,250 calories per day. However, in urban areas, in the first three income groups, per capita calorie intake was less than the recommended level. Therefore, slight nutritional deficiency occurred only among the urban poor and it was mainly due to lower use of milk and milk products. A declining trend was observed in the calorie share of cereals with the increase in per capita expenditure in urban areas. The decline in calorie share of cereals is compensated by a significant increase in calorie intake from milk and milk products, edible oils, meat, sugar, fruits, vegetables, etc. With increase in income levels, people generally diversify their food consumption patterns by shifting towards more expensive and higher quality food commodities, and this was observed in Pakistan.

Table 3.5 Daily per capita calorie intake of major food items by income group in Pakistan in 1993.

Food Item	Income Group				All
	I (\leq Rs 2,500)	II (2,501 to 4,000)	III (Rs 4,001 to 7,000)	IV (\geq Rs 7,001)	
Rural Pakistan					
Cereals	1,427	1,462	1,549	1,773	1,479
Pulses	88	66	72	88	76
Milk & products	292	368	466	578	364
Vegetable oil	232	278	221	213	246
Meat & fish	34	38	54	58	39
Poultry	5	6	9	15	7
Fruits	19	26	31	42	25
Vegetables	85	93	87	105	89
Sweeteners	212	192	186	258	245
Others (tea, chili)	13	13	13	15	13
Total	2,407	2,542	2,688	3,145	2,583
Urban Pakistan					
Cereals	1,165	1,154	1,172	1,132	1,157
Pulses	83	99	83	75	89
Milk & products	210	212	255	347	248
Vegetable oil	325	238	265	470	327
Meat & fish	47	47	58	84	57
Poultry	5	7	12	29	12
Fruits	24	24	42	60	36
Vegetables	81	106	88	115	97
Sweeteners	161	134	145	153	143
Others (tea, chili)	12	12	13	15	13
Total	2,113	2,033	2,133	2,480	2,179
All Pakistan					
Cereals	1,390	1,374	1,381	1,442	1,387
Pulses	88	75	76	81	79
Milk & Products	280	323	375	458	377
Vegetable Oil	253	269	244	348	270
Meat & Fish	35	41	54	71	44
Poultry	4	6	10	22	8
Fruits	20	26	37	51	28
Vegetables	85	95	88	110	91
Sweeteners	203	177	169	204	187
Others (tea & chili)	13	13	13	15	12
Total	2,371	2,399	2,447	2,802	2,483

Source: Household Income and Expenditure Survey, Federal Bureau Statistics, Islamabad.

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Table 3.6 reveals daily per capita protein consumption of different food items by income group in rural and urban areas. The protein consumption pattern during 1993 was similar to per capita calorie intake in both rural and urban areas and at aggregate levels.

Table 3.6 Daily per capita protein consumption (grams) of major food items by income group in Pakistan in 1993.

Food Item	Income Group				All
	I (≤ Rs 2,500)	II (2,501 to 4,000)	III (Rs 4,001 to 7,000)	IV (≥Rs 7,001)	
Rural Pakistan					
Cereals	41.06	41.94	44.39	50.76	42.47
Pulses	5.08	3.88	4.24	5.11	4.44
Milk & products	11.75	14.01	17.09	21.38	14.02
Meat & fish	2.76	3.17	4.38	4.83	3.22
Poultry	0.54	0.59	0.91	1.62	0.71
Fruits	0.21	0.29	0.35	0.47	0.28
Vegetables	2.52	2.73	2.57	3.60	2.67
Others	0.47	0.49	0.49	0.53	0.49
Total	64.39	67.10	74.42	88.30	68.30
Urban Pakistan					
Cereals	33.60	33.11	33.42	32.14	33.10
Pulses	4.83	5.69	4.91	4.49	5.20
Milk & products	9.17	9.37	11.01	14.74	10.79
Meat & fish	3.75	3.90	4.83	7.01	4.68
Poultry	0.52	0.69	1.19	2.96	1.21
Fruits	0.26	0.27	0.44	0.66	0.39
Vegetables	2.39	3.04	2.65	3.43	2.87
Others	0.43	0.44	0.53	0.62	0.49
Total	54.95	56.51	58.98	66.05	58.73
All Pakistan					
Cereals	40.00	39.41	39.49	41.16	39.79
Pulses	5.14	4.38	4.48	4.80	4.65
Milk & products	11.36	12.67	14.50	17.95	13.12
Meat & fish	2.85	3.38	4.46	5.98	3.64
Poultry	0.47	0.66	1.05	2.27	0.85
Fruits	0.22	0.29	0.39	0.57	0.30
Vegetables	2.51	2.80	2.60	3.52	2.73
Others	0.47	0.47	0.51	0.58	0.44
Total	63.02	64.06	67.48	76.83	65.52

Source: Household Income and Expenditure Survey, Federal Bureau Statistics, Islamabad.

3.3 Expenditure patterns

Expenditure patterns for food and non-food items for rural and urban areas in Pakistan are shown in Table 3.7. Large differences were observed between rural and urban areas in per capita and per household expenditures on food and non-food items. In 1993, monthly per capita expenditures for rural and urban areas were Rs 490.16 and Rs 683.01, respectively. Per capita expenditure per month was 39% higher in urban areas compared to rural areas. Almost the same expenditure patterns were observed in other periods. In rural areas, annual per capita total expenditure on food was 1 to 10% higher than on non-food items from 1979 to 1993. On the other hand, urban consumers spent 7 to 18% more on non-food items than on food items during the same period. Overall in Pakistan, per capita expenditure on food was a little less than 50%. In urban areas, per capita expenditure on non-food items was more than 50%, and alternatively, rural consumers spent more than 50% on food items.

Table 3.7 Distribution of monthly expenditure in rural and urban areas of Pakistan.

Item	1979	1985	1986	1987	1988	1991	1993
Rural Pakistan							
Average monthly expenditure (Rs):							
per household	803.34	1,448	1,533	1,709	1,760	2,527	3,088
per capita	134.56	239.34	248.46	270.41	285.71	392.39	490.16
% of per capita expenditure on:							
food	55.00	51.35	51.54	49.66	49.90	52.39	51.70
non-food	45.00	48.65	48.46	50.34	50.10	47.61	48.30
Urban Pakistan							
Average monthly expenditure (Rs):							
per household	1,188	2,190	2,383	2,602	2,745	3,579	4,542
per capita	185.63	329.32	352.00	383.21	412.16	528.66	683.01
% of per capita expenditure on:							
food	46.40	43.88	42.45	41.21	41.0	43.02	42.73
non-food	53.60	56.12	57.55	58.79	59.0	56.98	57.27
All Pakistan							
Average monthly expenditure (Rs):							
per household	951.47	1,653	1,770	1,976	2,032	2,851	3,485
per capita	155.22	266.18	279.18	305.88	322.54	435.93	545.38
% of per capita expenditure on:							
food	50.80	48.61	48.13	46.34	46.60	48.75	48.51
non-food	49.20	51.39	51.87	53.66	53.40	51.25	51.49

Source: Federal Bureau of Statistics, Islamabad.

Expenditure patterns for food follow almost the same patterns as the food consumption patterns in Pakistan (Table 3.8). The food consumption pattern and, as a result, the expenditure pattern are shifting towards products which are generally associated with increase in income. For example during the last two decades, both the total quantity and the expenditure were shifting from cereal to milk and milk products, meat, fish, poultry, fruits and vegetables, and edible oils. However, among the food items, the share of cereals and milk and milk products dominated the food expenditure. Wheat is the staple food of Pakistan; therefore, around 90% of the total expenditure on cereals is for wheat.

In 1993, the rural population spent a higher proportion per capita on milk and milk products compared to urban consumers. On the other hand, the urban consumers spent a higher proportion of per capita expenditure on edible oils, fruits, vegetables, meat, fish, poultry, etc., and a lower proportion per capita on cereals as compared to the rural masses. Thus, compared to rural areas, people in urban areas of Pakistan showed a more diversified food basket. Overall in Pakistan, the share of per capita expenditure on milk and milk products ranked first among food items followed by cereals. It can be concluded from this analysis that demand for milk, fruits, vegetables, meat, poultry, and edible oils will significantly increase in the future. The consumption and expenditure pattern of pulses was almost the same during the last two decades.

Table 3.9 shows the distribution of household monthly expenditure on major food items by income group in 1993. At the national level, expenditure on food items decreased with increase in income level. Among the food items, the share of cereals and milk and milk products is almost the same in the first income group in rural and urban areas. However, in the case of all other income groups the share of milk and milk products ranked first among food items. The urban population also spent a higher proportion on meat and poultry. Thus, urban areas had a more diversified food basket compared to rural areas. In both urban and rural areas, and on the national level, significant variation existed in the share of expenditure on various food items among the income groups.

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Table 3.8 Distribution of monthly expenditure on major food items, percent per household.

Food Item	1979	1985	1986	1987	1991	1993
Rural Pakistan						
Cereals	27.64	26.87	26.96	25.38	21.14	22.55
Pulses	3.76	4.05	3.77	3.63	3.48	3.36
Milk & products	25.68	25.73	26.67	25.15	25.76	27.44
Edible oil	6.06	6.28	5.96	6.04	6.64	6.96
Fruits	1.82	2.22	2.34	2.52	3.64	3.00
Vegetables	6.47	7.59	7.19	8.02	10.03	10.15
Meat, & fish	5.64	5.98	5.66	6.20	6.74	6.10
Poultry	1.73	2.06	2.03	2.04	2.04	1.81
Sweeteners	8.99	7.33	7.83	8.40	7.66	6.74
Others*	12.21	11.89	11.59	12.62	12.87	11.89
Total	100	100	100	100	100	100
Urban Pakistan						
Cereals	19.21	21.03	21.50	20.55	19.65	19.77
Pulses	3.45	3.38	3.33	3.07	3.02	3.03
Milk & products	18.13	20.14	19.91	20.85	20.37	21.08
Edible oil	9.22	7.67	7.53	6.93	7.12	7.60
Fruits	3.55	3.94	4.14	3.99	4.86	4.89
Vegetables	7.01	8.11	7.60	8.58	9.70	9.77
Meat, & fish	10.52	10.91	10.75	10.38	10.00	10.24
Poultry	2.14	2.27	2.17	2.40	2.31	2.69
Sweeteners	7.48	6.09	6.88	6.94	6.21	5.50
Others*	19.29	16.46	16.19	16.31	16.76	15.43
Total	100	100	100	100	100	100
All Pakistan						
Cereals	23.94	24.93	25.15	23.69	20.63	21.68
Pulses	3.62	3.83	3.63	3.43	3.32	3.26
Milk & products	22.33	23.88	24.43	23.65	23.91	25.45
Edible oil	7.45	6.74	6.48	6.35	6.80	7.16
Fruits	2.58	2.79	2.94	3.03	4.06	3.59
Vegetables	6.70	7.76	7.32	8.21	9.91	10.03
Meat, & fish	7.78	7.61	7.35	7.66	7.86	7.39
Poultry	1.92	2.13	2.08	2.17	2.13	2.08
Sweeteners	8.32	6.92	7.52	7.89	7.16	6.35
Others*	15.36	13.41	13.10	13.92	14.22	13.01
Total	100	100	100	100	100	100

Source: Household Income and Expenditure Survey, Federal Bureau of Statistics, Islamabad.

* Condiments and spices, tea, coffee, soft drinks, tobacco and chewing products, ready-made food products, miscellaneous food products.

It is concluded from the above analysis that changes in food consumption and expenditure patterns over time, and the availability of a wide variety of food items in Pakistan can be attributed to an increase in real per capita income, urbanization, changing tastes and preferences, trade policies, price policies, communications, new emerging products, etc. The rate of urbanization has a significant effect on demand structure (Rosegrant et al. 1995). Bouis (1994) has shown that, in the more developed countries of Asia, greater urbanization has resulted in a substantial increase in demand for meat and other livestock products and a further shift from rice to wheat. The increasing rate of urbanization in Pakistan will also further widen the rural-urban income disparity, which will result in reducing per capita intake of food grains and considerably increase the consumption levels of other food items, such as meat, fruits and vegetables, edible oils, etc. The increasing demand for livestock products, such as meat, milk, butter, poultry meat and eggs will also significantly improve the demand for feed.

Table 3.9 Percent distribution of monthly expenditure per household on major food items by income group, 1993.

Food Item	Income Group				All
	I (≤ Rs 2,500)	II (2,501 to 4,000)	III (Rs 4,001 to 7,000)	IV (≥Rs 7,001)	
Rural Pakistan					
Cereals	24.15	21.82	19.77	17.48	21.80
Baked & fried products	0.56	0.72	0.96	1.25	0.75
Pulses	3.63	3.24	3.05	3.33	3.36
Milk & products	24.70	27.12	30.98	30.58	27.44
Edible oils	7.85	7.05	5.98	4.90	6.96
Meat & fish	5.01	6.28	6.91	8.39	6.10
Poultry	1.59	1.59	2.03	3.08	1.81
Fruits	2.36	2.97	3.45	4.64	3.00
Vegetables	10.88	10.42	8.94	8.01	10.15
Sweeteners	7.11	6.71	6.36	6.35	6.74
Condiments & spices	2.99	2.77	2.52	2.37	2.77
Tea	3.60	3.43	3.14	3.11	3.38
Urban Pakistan					
Cereals	20.67	19.80	16.83	12.45	17.01
Baked & fried products	1.68	1.92	2.73	4.15	2.76
Pulses	3.39	3.51	3.06	2.33	3.03
Milk & products	20.15	20.74	21.82	21.19	21.08
Edible oils	8.17	8.42	7.73	6.35	7.60
Meat & fish	7.02	8.72	10.41	13.07	10.24
Poultry	1.67	1.86	2.49	4.27	2.69
Fruits	3.32	3.85	4.72	6.90	4.89
Vegetables	10.88	10.71	9.65	8.40	9.77
Sweeteners	5.99	5.93	5.52	4.76	5.50
Condiments & spices	3.03	3.10	2.99	2.60	2.93
Tea	3.59	3.55	3.82	3.98	3.76
All Pakistan					
Cereals	23.69	21.26	18.42	14.74	20.30
Baked & fried products	0.72	1.05	1.76	2.83	1.38
Pulses	3.61	3.32	3.03	2.79	3.26
Milk & products	24.02	25.37	27.02	25.48	25.45
Edible oils	7.92	7.44	6.76	5.69	7.16
Meat & fish	5.31	6.95	8.44	10.93	7.39
Poultry	1.61	1.67	2.24	3.73	2.08
Fruits	2.50	3.22	4.01	5.87	3.59
Vegetables	10.90	9.51	9.27	8.22	10.03
Sweeteners	6.96	6.49	5.99	5.48	6.35
Condiments & spices	3.01	2.87	2.73	2.50	2.82
Tea	3.61	3.46	3.45	3.58	3.50

Source: Household Income and Expenditure Survey, Federal Bureau Statistics, Islamabad.

Since 1971, the changing pattern of food consumption and expenditure in Pakistan indicates that some progress have been made in food security, which is a national goal and the fundamental objective of an agricultural economy. Food security means that the entire population has access to the quantity and quality of food necessary for good health (Aziz 1990; Reutlinge and Pellekaan 1986; Alderman 1993). The increasing levels of calorie and protein intake and the shifting of food expenditure from cereals to other food items show that improvement in food security has been made during the last two decades. However, the high population growth rate (3.0%), and the increasing dependence on imports of edible oils and wheat is an alarming situation for Pakistan.

4. Demand Composition, Market Potential, Trade and Demand Projections

4.1 Soybean

Many oil crops are cultivated in Pakistan and most of these crops are grown in small areas. Rapeseed/mustard, sesame, linseed and castor are traditional oil crops, and sunflower, soybean and safflower are considered non-traditional oil crops in Pakistan. Cotton-seed is the major source of edible oil in the country and accounts for more than 70% of the total domestic vegetable oil production in the country. Rapeseed/mustard contribute around 16-18% and non-traditional oilseed crops account for only 5-8% of the total available domestic edible oil production during the last two decades. Maize and rice bran are the other small sources of oil in the country. Total production of edible oil is very small and large quantities of edible oils are imported. Both traditional and non-traditional oilseed crops contributed around one-fourth of the domestic requirements and nearly three-fourths of the local demand of edible oils were met through imports during the last ten years. Import of edible oil was only 82 thousand tons in 1970/71, which increased to 1,390 thousand tons in 1994/95. A large amount of foreign exchange is spent every year for the import of edible oils in Pakistan. This drain of foreign exchange was only Rs 135 million in 1970/71, but had increased to Rs 30.773 billion in 1994/95 (Table 4.1).

Table 4.1 Domestic production and import of edible oil in Pakistan.

Year	Domestic Production ('000 tons)	Import ('000 tons)	Total Availability ('000 tons)	Import as % of Total Availability	Value of Import (million Rs)
1970/71	210	82	292	28.1	135
1975/76	184	270	454	59.5	1,047
1979/80	228	439	667	65.8	2,295
1980/81	246	471	717	65.7	2,625
1985/86	335	815	1,150	70.9	6,128
1990/91	338	1,013	1,351	74.0	9,020
1991/92	486	1,045	1,531	75.0	1,025
1992/93	377	1,231	1,608	68.3	15,185
1993/94	352	1,131	1,483	78.0	14,699
1994/95	385	1,390	1,775	78.3	30,773

Source: Agricultural Statistics of Pakistan (various issues); Economic Survey of Pakistan (various issues).

Palm oil and soybean oil are the major imported oils in Pakistan. Up to 1983/84, soybean oil was imported to substitute for cotton seed oil in better quality ghee. However, due to comparatively low prices of palm oil in the international market during the last ten years, its import into Pakistan increased many-fold compared to soybean oil. The import of soybean and palm oils is shown in Table 4.2. During 1975/76, 43% of the total edible import was soybean and 57% was palm oil. However, in 1994/95, due to low international prices of palm oil, its import increased to 83%. In the case of soybean oil, its import decreased to only 17% of the total edible oil import during the same year. Since soybean oil was expensive compared to palm oil, its import by the private sector remained limited. Most of the palm oil was imported from Malaysia and Indonesia, while soybean oil came from USA and Brazil. During 1994, Pakistan signed an agreement for import of soybean oil from USA under concessional bilateral arrangements under PL-480 (NODP, 1995).

Table 4.2 Import of palm and soybean oils (tons) in Pakistan.

Year	Soybean Oil	Palm Oil	Total
1975/76	101,880 (42.82)*	136,057 (57.18)	237,937 (100)
1980/81	232,110 (49.89)	233,110 (50.11)	465,220 (100)
1985/86	238,597 (29.29)	576,078 (70.71)	814,675 (100)
1990/91	220,000 (21.56)	800,356 (78.44)	1,020,356 (100)
1991/92	160,090 (15.31)	886,658 (84.69)	1,046,948 (100)
1992/93	292,000 (21.94)	1,039,000 (78.06)	1,331,000 (100)
1993/94	151,878 (13.42)	979,461 (86.58)	1,131,339 (100)
1994/95	239,041 (17.20)	1,150,712 (82.80)	13,899,753 (100)

Source: Federal Bureau of Statistics

* Figures in parenthesis are percentage of total quantity of oil.

In Pakistan, commercial cultivation of soybean started during the early 1970s and since then planting of soybean has not made a significant contribution in the total production of all non-traditional oilseed crops. It was planted on a very small area and a declining trend was observed during the last two decades. Soybean area, production, yield are given in Table 4.3. It was planted on only 2,441 hectares in 1970/71 and much success was not made for almost the next two decades, except in 1986/87 when the area under soybean increased to 5,980 hectares. Area under soybean increased at an annual growth rate of 4.14% from 1970/71 to 1993/94. A similar trend was observed for soybean production. Soybean production increased from 927 tons in 1970/71 to 7,200 tons in 1993/94 and registered a per annum growth rate of 9.31%. However, soybean yield remained stagnant of around 500 kg/ha for almost two decades and growth in production was totally due to the growth in area. From 1989/90 onward, soybean yield in Pakistan was greater than 1,000 kg/ha. Soybean yield in Pakistan increased at an annual growth rate of 4.86%. Despite the best possible research, extension, and other efforts to enhance soybean productivity in the country, a soybean yield potential of 2.5 ton/ha could not be achieved (Aslam et al. 1993). Also, Pakistan's performance with soybean was very poor compared to other new entrant countries such as, China, Brazil and Argentina.

Table 4.3 Soybean area, production and yield in Pakistan.

Year	Area (⁰ 000 ha)	Production (⁰ 000 tons)	Yield (kg/ha)
1970/71	2.44	0.93	390
1975/76	0.83	0.40	484
1980/81	3.16	1.34	424
1985/86	5.45	2.59	475
1986/87	5.98	3.78	632
1990/91	3.32	5.02	1,512
1991/92	4.23	6.13	1,449
1992/93	5.17	6.16	1,191
1993/94	6.20	7.20	1,161

Source: Agriculture Statistics of Pakistan (various issues); NODP, 1995.

Soybean is mainly cultivated in NWFP, followed by Punjab and Sindh province. About 80% of the total area under soybean in Pakistan is planted in NWFP. Farmers in NWFP mostly plant soybean in orchards and obtain higher yields due to the mild climate of the northern areas compared

to the plains of Punjab and Sindh (NODP 1995). Also, soybean farmers in the northern areas successfully plant this crop in sugarcane, while its mono-culture is also popular in rainfed areas.

4.1.1 Demand projection

Soybean is cultivated in Pakistan on a very limited scale. It has remained limited to a very small acreage with a declining trend during the last two decades. Mostly, it was planted only for research purposes, seed, and industry use (feed and edible oil) and was not used directly for human consumption. Domestic production of soybean is not sufficient and every year a considerable amount of foreign exchange is lost to import soybean oil and soybean meal. Pakistan imported 100 thousand tons of soybean meal in 1993/94.

Domestic demand for soybean consists of seeds and industrial demand for poultry feed and edible oil. The quantities demanded for seed purposes were estimated through planted area under soybean by multiplying the prevailing seed rate (100 kg/hectare) with the growing area. Simple trend regression equations were estimated to project area under soybean and soybean required for industry. The projections were made using the data from 1980/81 to 1993/94 given in Appendix 5.

The simple trend regression equations for soybean area, quantity demanded for industry uses, and imported quantity demanded of soybean meal are as follows:

$$\text{SAREA}_t = 3.871 + 0.0405T \quad (4.1)$$

where,

$$\begin{aligned} \text{SAREA}_t &= \text{Soybean area in year } t \\ T &= \text{Time, year } 1980/81=1, 1981/82 = 2 \end{aligned}$$

$$\text{SDEMIND}_t = -0.29123 + 0.3833T \quad (4.2)$$

where,

$$\begin{aligned} \text{SDEMIND}_t &= \text{Soybean quantity demand by the industry in year } t \\ T &= \text{Time, year } 1980/81=1, 1981/82 = 2 \end{aligned}$$

$$\text{SMEALIMP}_t = -22.145 + 6.80T \quad (4.3)$$

where,

$$\begin{aligned} \text{SMEALIMP}_t &= \text{Soybean meal imported in year } t \\ T &= \text{Time, year } 1983/84=1, 1984/85 = 2 \end{aligned}$$

The projected soybean area, seed, and quantity demanded by the industry for feed and edible oil are shown in Table 4.4. The area under soybean will increase from 4.56 thousand hectares in 1996/97 to 4.68 thousand hectares in 1999/2000 (increase of 0.87% per annum). The domestic soybean grain quantity demanded by industry will increase by 5.82% per annum from 1996/97 to 1999/2000.

In 1999/2000 it is expected that industry will be able to provide 5.67 thousands tons of soybean meal for poultry feed (around 77% of the total quantity of soybean) and 1.33 thousand tons of edible oil (18% of the total quantity of soybean).

Demand for imported soybean meal for poultry feed will increase from 9.48 thousand tons in 1996/97 to 11.55 thousand tons in 1999/2000. Demand for imported soybean meal will increase by around 6.8% per annum during the same period. Around two-thirds of the required quantity of the soybean meal for poultry feed will be imported in 1999/2000 and the rest will be provided by the domestic industry.

Chapter 4

Table 4.4 Projected domestic demand for soybean in Pakistan from, 1996/2000.

	1996/97	1997/98	1998/99	1999/2000
Area ('000 ha)	4.56	4.60	4.64	4.68
Seed ('000 tons)	0.46	0.46	0.46	0.47
Industrial Uses				
Soybean ('000 tons)	6.22	6.61	6.99	7.37
Soybean meal ('000 tons)	4.79	5.09	5.38	5.67
Soybean oil ('000 tons)	1.12	1.19	1.26	1.33
Waste ('000 tons)	0.31	0.33	0.35	0.37
Imported soybean meal ('000 tons)	9.48	10.17	10.86	11.55
Total soybean meal ('000 tons)	99.59	106.79	113.98	121.17

4.1.2 Soybean marketing

One of the most important reasons for the low popularity of soybean compared to other oilseed crops in Pakistan is its inefficient marketing system. In Pakistan, soybean is planted as a cash crop and farmers keep the produce only for seed and the rest sold to wholesalers, commission agents and also directly to private processors. Middlemen procure the farmers' produce and sell directly to private oilseed processors. Presently, the Pakistan Oilseed Development Board (PODB) also has its contract growers. These contract growers plant soybean for seed and also for commercial purposes under the supervision of PODB technical staff. The staff of PODB also procure at the support price and assist farmers in marketing of their produce. The present marketing channels of soybean in Pakistan are shown in Figure 4.1. Since soybean is planted on a limited acreage, marketing of soybean grain is completed just after the harvesting season. The private processing companies also procure soybean directly from producers on a seasonal basis. The private sector is involved only in the oilseed processing industry and is not playing any role at any level of crop production. The government of Pakistan also announces the support price of soybean every year to encourage farmers to increase area under this crop. All the private traders and public agencies involved in the procurement of soybean generally procure at or above the minimum support prices. The minimum support prices of soybean are shown in Table 2.10.

A comparison of domestic soybean prices and international prices is given in Table 4.5. The price of soybean in the international market in 1994/95 was US\$ 239/ton while the domestic price during the same year was US\$ 219/ton. The international price of soybean was about 9% higher than the support price of soybean during the same year, which indicated that production of soybean in Pakistan has a significant comparative advantage and the government should promote the cultivation of soybean on a large scale in the country.

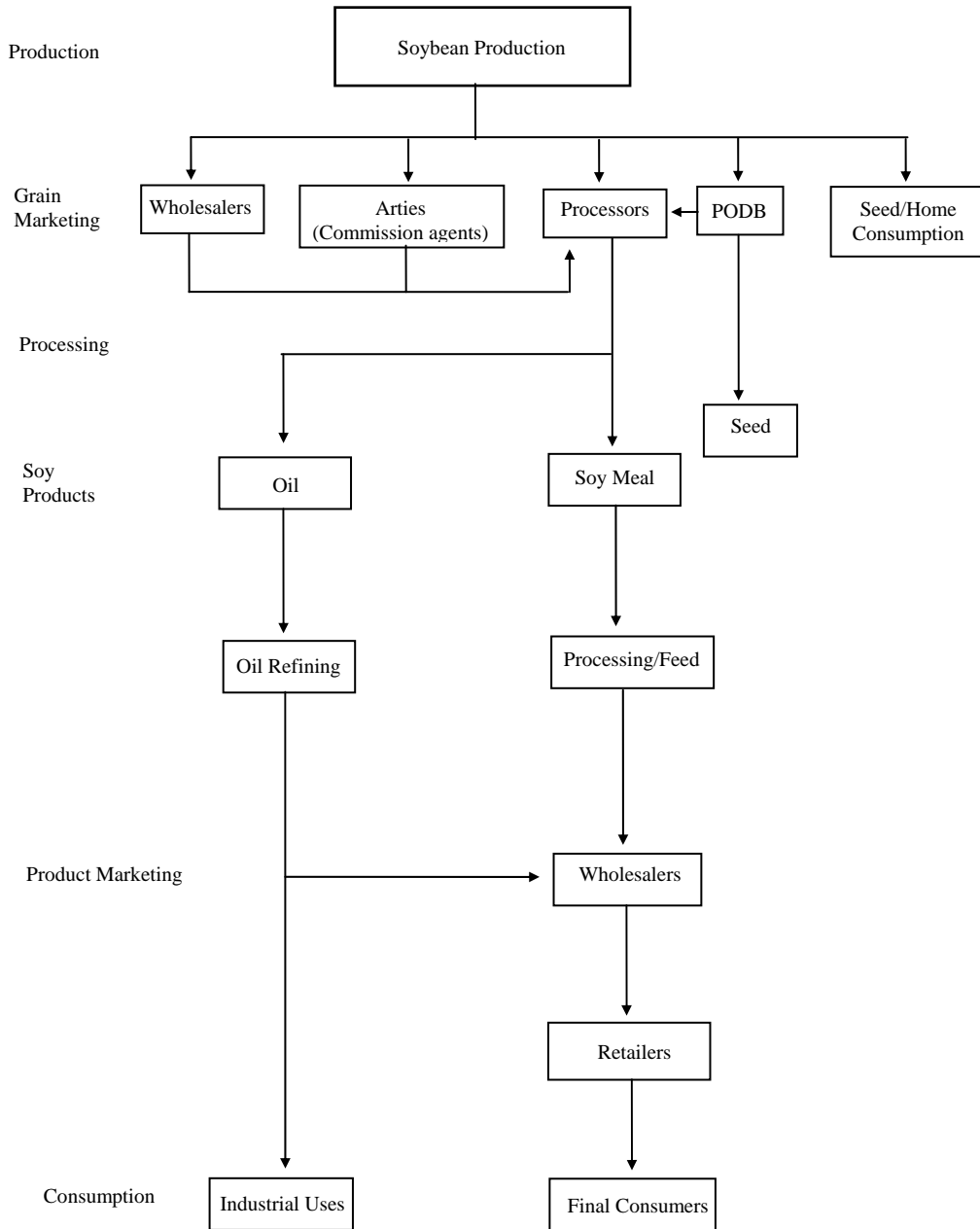
Table 4.5 Local and international prices of soybean.

Year	International Price (US\$/ton)	Local Price (US\$/ton)
1990/91	241	223
1991/92	237	231
1992/93	246	260
1993/94	259	224
1994/95*	239	219

Source: Oilseeds: World Markets and Trade, USDA, April, 1995.

* Average of first six months.

Figure 4.1 Domestic soybean marketing channels.



4.1.3 Soybean processing and trading

Soybean in Pakistan is mainly utilized for extraction of oil for human consumption and industrial uses. The main by-product of the soybean oilseed extraction process is soymeal which is mainly utilized for poultry feed. In Pakistan, processing of oilseed is mainly done by domestic or conventional devices such as "Kohlus", low and high pressure expellers and solvent extraction plants. The "Kohlus" is mostly used for rapeseed and mustard oil extraction. The expellers are generally utilized for cottonseed and rapeseed/mustard seed oil extraction. It is estimated that presently there are around 6,000 medium and small expellers working in various parts of the country. NODP (1995) has reported that presently there are about 68 solvent extraction plants working in Pakistan with a crushing capacity of 1.875 million tons and most of these plants, on average, run at less than 50% capacity. The problem faced by the processing industry is the shortage of seed material. The total crushing capacity including all types of extraction in Pakistan is around 6.0 million tons. It is reported that soybean grains are mostly processed at these solvent extraction plants. The oil processing industry in Pakistan is well developed but mostly runs on imported RBD edible oils, mainly palm and soybean oils. This imported oil is already processed but during shipment the free fatty acid (FFA) content is usually increased and a little odor develops in storage tanks, which requires further processing before reaching the ultimate consumer. There are around 147 oil processing plants in the country with an annual capacity of 2.8 million tons, and these are also considerably under utilized (NODP 1995).

Soybean in Pakistan is mainly utilized for extraction of edible oil and soybean meal for poultry feed. Despite the fact that soybean is rich in protein, soya products are not used as human food in Pakistan. The oil extracted from soybean can be used as edible oil or for industrial uses and soybean meal can be used in animal feed. Detailed information on the domestic production of edible oil and meal from soybean in Pakistan is not available. However, various reports on oilseeds in Pakistan, information on production of edible oil from soybean, soybean meal, and uses of soybean for other purposes was generated (Table 4.6). A small percentage of soybean production was kept by the soybean growers for seed, direct feeding to animals and other uses, and it is estimated that around 5% of the total produce was wasted at the farm level. The rest of the soybean produce was available for industry to process for oil and meal. The crushed beans give approximately 73% meal, 18% oil, 4% that is used for soap manufacturing and other industrial uses, and the remaining 5% is dust and other industrial waste. Around 83% of the soybean oil is utilized as edible oil and the rest is used for industrial purposes. Protein rich soybean meal, which is the main by-product of soybean, is mainly utilized by the poultry sector in Pakistan. Production of domestic soybean meal increased at a rate of 10.4% per annum.

Table 4.6 Soybean utilization in Pakistan.

Year	Production (tons)	Seed ¹	Farm Level Uses (tons)			Industry Uses (tons)			
			Other ²	Waste ³	Available ⁴	Meal Production	Oil	Soap & Others	Waste
1970/71	927	244.1	18.5	46.4	618.0	451.1	111.2	24.7	30.9
1980/81	1,342	316.2	26.8	67.1	931.9	680.3	167.7	37.2	46.6
1985/86	2,586	544.6	51.7	129.3	1,859.4	1,357.4	334.7	74.4	93.0
1989/90	2,500	230.0	50.0	125.0	2,095.0	1,529.4	377.1	83.8	104.8
1990/91	5,020	332.0	1,00.4	251.0	4,336.6	3,165.7	780.6	173.5	216.8
1991/92	6,130	430.0	1,22.6	306.5	5,270.9	3,847.8	692.6	210.8	263.5
1992/93	6,200	510.0	1,24.0	310.0	5,256.0	3,836.9	690.6	210.2	262.8
1993/94	7,200	620.0	1,44.0	360.0	6,076.0	4,435.5	1,093.7	243.0	303.8

Source: NODP Reports & Ministry of Food, Agriculture and Livestock, Islamabad.

¹Estimated at 100 kg/ha.

²2% of total production used as direct feeding for animals and other direct consumption.

³Estimated farm level losses @ 5% of total production.

⁴Available for industry use = production - (seed + other uses + farm level wastes).

Demand Composition, Market Potential, Trade and Demand Projections

Pakistan has mostly imported edible oil over the last two decades and so was never able to export any edible oil due to low domestic production. The rapid population growth rate, liberal government consumption policies, and the increase in per capita consumption resulted in exponentially increasing imports of edible oil into the country. Now more than 70% of the demand of edible oil is met through imports. The soybean oil import was quite high until 1987/88, thereafter palm oil import increased many-fold. The soybean oil import decreased from 406.951 thousand tons in 1983/84 to 151.878 thousand tons in 1993/94 due to low international prices of palm oil compared to soybean oil during this period (Table 4.7). The tariff structure for imported soybean oil in Pakistan is given in Table 4.8. The regulatory Import Duty (RID) in 1987/88 was around 37% and it was reduced to 24% with the exchange rate fluctuations. RID was again increased to around 37% in 1995. The United States has been the major exporter of soybean oil to Pakistan.

Table 4.7 Soybean oil and soybean meal import in to Pakistan.

Year	Soybean Oil		Soybean Meal	
	Quantity ('000 tons)	Value (million Rs)	Quantity ('000 tons)	Value (million Rs)
1983/84	406.951	-	4.825	21.157
1984/85	195.030	-	2.574	10.342
1985/86	238.597	3,221.2	3.408	15.722
1986/87	248.903	1,702.3	1.290	5.938
1987/88	500.313	4,035.2	22.239	11.133
1988/89	383.744	4,439.8	1.894	14.870
1989/90	343.225	3,863.4	5.235	36.199
1990/91	220.000	3,760.7	14.000	110.600
1991/92	160.290	1,967.6	27.000	243.750
1992/93	292.000	3,446.6	48.000	441.600
1993/94	151.878	2,406.9	100.000	956.000

Source: Federal Bureau of Statistics, Islamabad.

Table 4.8 Duty structure for imported soybean oil in Pakistan.

Duty (per ton)	1987/88	1988/89	1990/91	1994/95
CIF (US\$) Trade Unit	459	605	560	654
Exchange Rate	17.6	19.21	21.7	30.84
CIF Trade Unit Value (Rs)	8,070	11,630	12,477	20,169
Regulatory Import Duty	3,000	3,000	3,000	7,400
After-Duty Value	11,070	14,630	15,477	27,569
Sales Tax	0	0	0	0
Surcharge on CIF (7%)	565	814	873	1,412
Import License fee (5%)	404	582	624	1,008
Iqra* Surcharge (5%) (Rs)	404	582	624	1,008
Total Landed Cost/CIF Price	8,813	16,607	17,598	30,997
Release Price (Rs)	11,003	12,416	13,200	30,997

Source: NODP 1995.

* See Appendix 6 for Iqra tax explanation.

Due to remarkable progress in the poultry sector in the country, soybean meal requirements expanded substantially. Import of soybean meal was 4.825 thousand tons worth of Rs 21.157 thousand in 1983/84. The private feed industry imported more than one million tons worth of Rs 956.0 thousand in 1993/94 due to rapid growth in the poultry industry in Pakistan (Table 4.7). Most of this soymeal was imported from India to meet the requirements of poultry feed. Before 1989/90, Pakistan mostly imported soymeal from Belgium and USA at much higher prices than those prevailing presently from India. The international prices of soy meal during 1995 are given in Table 4.9. The price of soy meal was about 50% lower in India compared to USA. Presently there is no regulatory duty on import of soy meal into Pakistan.

Table 4.9 International prices of soy meal, 1995.

Country	Price (Rs/ton)
Brazil	5,363.00
USA	5,456.00

Source: Oilseeds: World Markets and Trade, June 1995.

4.1.4 Constraints and policies for soybean crop development

In Pakistan, soybean was planted on a very limited scale in NWFP and never achieved a respectable position among the oilseed crops. Over the last 25 years, it has been planted on only a few thousand widely dispersed hectares in the country. Soybean has been successfully field tested in all four provinces of Pakistan under irrigated and rainfed conditions. It has demonstrated a yield potential of up to 2.5 tons/ha under diverse ecological conditions and its adaptability has been tested in different cropping systems, such as, rice-wheat and cotton-wheat (Aslam et al. 1993). A remarkable increase in its production can be realized through extended popularization of this crop in different agro-ecological zones of Pakistan. However, on average, farmers' yield has been less than one ton/ha during the last two decades. Therefore, strong research and extension efforts are still required to improve the productivity of soybean. This can be done mainly by providing the farmers with inputs, technical know how, attractive prices and assured marketing.

Soybean seed availability is another major bottleneck for expanding its limited area. Due to rapid loss of seed viability, farmers remain reluctant to take risks so availability of viable seed became a major factor in its popularization in Pakistan (Akhtar et al. 1996; NODP 1995). Lack of soybean threshers was another very serious factor in its promotion and a constraint in its low productivity (Akhtar et al. 1996).

The provincial agricultural extension departments have been concentrating only on major crops and due attention has not been given to this crop, so farmers are not aware of production technologies of soybean.

Inefficient and inadequate marketing of soybean was the most important factor limiting the adoption of this crop. Farmers were very upset when they were unable to dispose of their produce in the market. Many farmers quit planting soybean in the past in the Mansehra area of NWFP when they were unable to sell soybean in the market. There is no open market for soybean as there is for other crops in the country. Farmers are unaware about procurement centers.

Presently only the public sector (PODB) is responsible for procurement and promotion of soybean planting in the country. The private sector has only been involved in the oilseed processing industry and has not played a role at any level of crop production. The oilseed processing industry in the private sector is well developed in Pakistan. This industry may be encouraged through a viable government policy for the promotion of the soybean crop throughout the country. The industry may be involved at production, procurement and processing levels of soybean in all four provinces of Pakistan. Presently most of the processing industry in Punjab and the crop is planted in NWFP. Soybean competes for area with rice, cotton and maize in different parts of the country and these are the major cash crops in Pakistan. Low profitability compared to competing crops was another factor for low adoption of soybean.

Presently soybean in Pakistan is only utilized for edible oil and soya meal is used for poultry. The private sector may be encouraged to introduce through campaigns other uses of soybean such as soya milk, soya meat, soya nuts and beans, soysauce, etc. Industries producing soybean by-products for food can be established in the country, which would also help in increasing the demand for this crop. Since soybean is rich in protein, growers may be trained and introduced through extension services to use soybean as part of their normal household diet. This will also help considerably in increasing the area under this crop.

4.2 Potato

In Pakistan potato is not consumed as a staple food as in many other countries in the world, but is primarily used as a vegetable. Presently potato is considered an important cash crop all over the country. The area under potato increased from 3,000 hectares in 1947/48 to 79.3 thousand hectares in 1994/95. Similarly, production of potato increased from 27 thousand tons to 1,105 thousand tons during the same period. However, its cultivation is confined to a few regions of the Punjab, NWFP, and Baluchistan. More than 80% of the area under potato is planted in Punjab, followed by NWFP and Baluchistan. The area under potato and production in all four provinces is shown in Table 4.10. In Pakistan, area under potato increased at a rate of 5.8% per annum and production at an annual rate of 6.7% from 1975/76 to 1994/95. Most of the increase in the production of potato was due to a remarkable increase in area because during the same period yield per hectare increased from 11.2 tons to only 13.3 tons per hectare (per annum increase of less than 1%).

Potato cultivation in Pakistan is carried out in autumn, spring and summer over a wide range of agro-ecological zones. The season, region and percent share of total potato production in the three main seasons are given in Table 4.11.

The potato crop in Pakistan is mainly grown in autumn and harvesting of this crop starts in late December to January. A part of this crop may be available as early as mid-November. A small part of this crop is marketed by the growers just after harvesting at very low marketing costs. A major part of this crop is put into cold storage and made available at a high price during May to October (PARC 1991). The major part of the spring crop (around 80%) is generally kept as seed in cold storage for the next autumn crop. The summer crop is generally cultivated in hilly areas and mainly consumed in the plains of Punjab and Sindh during September to November. The planting and harvesting calendar of potato in Pakistan and its strong regional concentration within the country shows that potato is readily available to consumers throughout the year.

Imported and domestic potato seed to plant all the three crops is also easily available. Imported seed and seed from the local summer crop from the hilly areas is used to grow the spring crop in the plains of Punjab for further multiplication. Seed from the spring crop is kept in cold storage and used to plant the following autumn crop and this seed is then multiplied in an autumn to autumn seed cycle for three to four years (PARC 1991). Figure 4.2 shows the marketing flow of the potato seed cycle in Pakistan. Both public (Punjab Seed Corporation) and private agencies (such as Jaffar Brothers Limited) import potato seed to supply to potato growers. In addition, commission agents, wholesalers, and growers of potato also store seed and distribute it at planting time. However, poor quality of the available seed is widely recognized (PSPDP 1988; Kokab and Smith 1989).

4.2.1 Potato consumption

In Pakistan, potatoes are consumed in a variety of ways in different parts of the country. Potatoes are generally used in curries and mixed with meat and other vegetables. Fried potatoes (chips and French fries) are a popular snack with tea in urban areas. Other common local snacks with potato as the main ingredient are *Pakora* and *Samosa*. The use of potato as a snack has increased over time especially in urban areas of Pakistan. Various kinds of potato chips can be seen in the market, most of which have appeared during the last few years. Now a few industrial plants produce high quality packed chips for domestic consumption and also for export to the Gulf states. For industrial use, the main consumers of potato are the potato chip manufacturers followed by potato flour and dehydrated potato processors. However, there is a very limited demand for dehydrated potato and potato flour in Pakistan. The main user of dehydrated potato is the Armed Forces of Pakistan. It is estimated that less than 2% of the total production of potato is used by industry in Pakistan, 10% is waste and around 12% is used as seed (Smith 1989; PSPDP 1988).

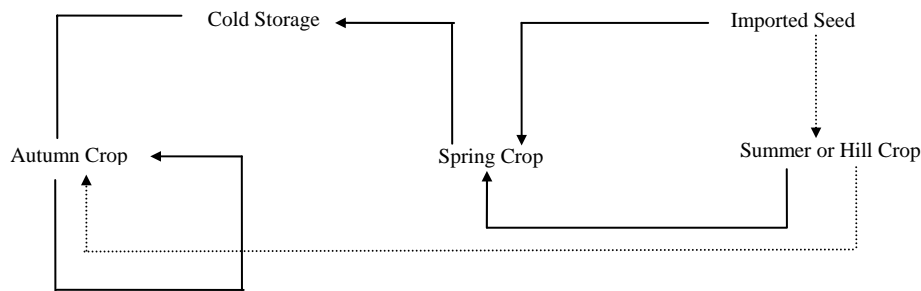
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Table 4.10 Area, production and yield of potato in Pakistan.

Year		Area (‘000 ha)	Production (‘000 tons)	Yield (tons/ha)
1975/76	Punjab	17.6	223.9	12.7
	Sindh	1.4	11.8	8.6
	NWFP	7.5	67.1	9.0
	Baluchistan	2.1	18.0	8.3
	Pakistan	28.6	320.8	11.2
1980/81	Punjab	25.6	277.4	10.9
	Sindh	0.9	7.9	8.6
	NWFP	8.1	75.8	9.3
	Baluchistan	3.4	33.2	9.6
	Pakistan	38.0	394.3	10.4
1985/86	Punjab	45.9	427.8	9.3
	Sindh	1.0	8.6	8.6
	NWFP	10.6	104.3	9.8
	Baluchistan	5.4	77.7	14.4
	Pakistan	62.9	618.4	9.8
1990/91	Punjab	56.5	571.7	10.1
	Sindh	0.6	5.1	8.9
	NWFP	8.1	78.9	9.7
	Baluchistan	6.8	95.6	14.1
	Pakistan	72.0	751.3	10.4
1991/92	Punjab	61.9	695.6	11.2
	Sindh	0.6	5.2	8.9
	NWFP	8.1	81.3	10.3
	Baluchistan	6.8	77.7	15.0
	Pakistan	72.0	859.8	11.4
1992/93	Punjab	61.5	757.1	12.3
	Sindh	0.6	5.2	8.8
	NWFP	8.7	92.0	10.6
	Baluchistan	5.2	78.5	15.1
	Pakistan	76.0	932.8	12.3
1993/94	Punjab	64.4	868.3	13.5
	Sindh	0.6	5.0	8.8
	NWFP	8.5	96.8	11.4
	Baluchistan	5.8	86.1	14.9
	Pakistan	79.3	1,056.2	13.3
1994/95	Punjab	64.4	917.0	14.2
	Sindh	0.6	5.4	9.0
	NWFP	8.0	91.3	11.4
	Baluchistan	6.1	91.3	15.0
	Pakistan	79.3	1,105.0	13.9

Source: Government of Pakistan 1995.

Figure 4.2 Potato seed market in Pakistan.



Source: PARC 1994.

Table 4.11 Potato growing seasons, planting time and area distribution in Pakistan.

Season	Planting Month	Harvesting Time	Area	% Share in Total Production
Autumn	Sep. - Oct.	Dec. - Feb.	Punjab, NWFP & Sindh	70
Spring	Jan. - Feb.	May - June	Punjab, NWFP	12
Summer	Mar. - Apr.	Sep. - Oct.	Baluchistan NWFP & Northern Areas	18

Source: Agricultural Prices Commission, Islamabad.

Generally, the use of potato varies with the change in season. Consumption of potato increases considerably during winter and decreases during summer. The average consumption of potato for an average family (7.9) is 10.8 kg/month in winter and 4.1 kg/month in summer. Low consumption of potato during summer is mainly due to reduced availability of fresh potato and the higher price during this time of the year. Another important factor is the much disliked sweet taste of stored potato which is due to storage at too low a temperature. In summer, sweet potato from the hilly areas is generally available in the market and this too is a result of being stored at too low a temperature in these hilly areas. Also in summer, more vegetables are available at cheaper rates compared to winter (Kokab and Smith 1989).

Annual total and per capita consumption of potato in Pakistan using Household Income and Expenditure Survey (HIES) data collected by the Federal Bureau of Statistics on per capita potato consumption are shown in Table 4.12. The per capita consumption estimates show that there is no significant difference between rural and urban areas. However, total consumption of potato almost doubled from 1971 to 1993. In 1971, annual per capita consumption was 5.64 kg which increased to 9.96 kg per year in 1993.

Table 4.12 Consumption of potato in Pakistan.

Year	Per Capita Consumption (kg/year)			Population of Pakistan (million)	Total Consumption ('000 tons)
	Rural Areas	Urban Areas	All		
1971	5.52	6.12	5.64	61.49	346.80
1979	8.64	8.76	8.76	78.94	691.51
1985	9.24	8.76	9.12	94.73	863.94
1986	9.48	9.12	9.36	97.67	914.19
1987	8.88	8.88	8.88	100.70	894.22
1991	9.72	9.36	9.60	113.78	1,092.29
1993	9.60	10.92	9.96	120.83	1,203.47

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According to the HIES data, total consumption of potato increased from 347 thousand tons in 1971 to 1,203 thousand tons in 1993. However, these estimates of potato consumption give a completely different picture from production of potato during the same period given by official estimates (see Table 4.1). For example, production of potato given by the Ministry of Food, Agriculture and Livestock (MINFAL) during 1993 was 933 thousand tons, whereas consumption of potato according to HIES data during the same year was 1,203 thousand tons (about 29% higher). Pakistan also exported potato (about 2.4 thousand tons worth Rs 5.7 million) during the same year and did not import any quantity. This wide difference in consumption and production can be attributed to the fact that the consumption estimates are based on statistical samples observed over one month and are subject to seasonal as well as recall bias. Kokab and Smith (1989) also observed that consumption of potato was almost double in winter compared to summer in urban areas of Pakistan. Similar consumption estimates are obtained if per capita consumption figures given by Kokab (1989) are used. In addition, many studies conducted by PARC/PSPDP during the 1980s show that the official production statistics are not reliable and that official yield estimates are considerably under estimated. Surveys conducted by PSPDP/PARC in collaboration with federal and provincial agencies show an average yield of 20 tons per hectare compared to 10.0 tons per hectare given in the official statistics. These studies indicate that actual potato yields are almost double those reported in the official statistics. These survey results were confirmed during 1990/91, 1984/85 and 1983/84, and same results as discussed above were achieved. Based on these observations, it can be concluded that, to some extent, consumption estimates were over estimated and production estimates in Pakistan were considerably under estimated. However, per capita consumption of potato and total production have significantly increased during the last two decades.

FAO Food Balance Sheet data show that per capita consumption of potato in Pakistan increased from 2.7 kg/annum in 1970/71 to 6.96 kg/annum in 1993/94. Details of potato production, consumption, export, import and waste are given in Appendix 7.

Potatoes in Pakistan are not used as a staple food but are consumed as a vegetable or mixed with meat in the form of curry. The use of potatoes in industry is also very slight. However, with a population growth rate of around 3.0% annually, around 3 million potato consumers join the population annually adding considerably to the demand in the country. It can be concluded that, in the light of existing eating habits of the people, demand for potato will increase considerably in the future, even to maintain the present level of per capita consumption and industry use.

4.2.2 Domestic demand projection for potato

Domestic demand for potato can be divided into three categories, namely demand for direct human consumption, demand for seed, and demand by industry. Demand for human consumption was estimated from per capita consumption of potato from HIES data. Income elasticity of demand for potato for human consumption was calculated from HIES data simply by regressing the consumption of potato with real per capita income and real prices of potato in Pakistan. The estimated demand equation in linear form is:

$$\text{POTCON}_t = 5.259 + 0.102\text{PCI}_t/\text{CPI} - 4.636\text{WPOTP}/\text{CPI} \quad (4.4)$$

(3.631) (3.136) (0.561)

$$R^2 = 0.891$$

Note: Figures in parenthesis are t-statistics

Total demand for potato increases as per capita real income increases and decreases as the real price of potato increases. The coefficient of real per capita income is highly significant and the coefficient of the real price of potato is non-significant. The elasticity of demand for potato with respect to real income is 0.46 which is inelastic, which means that every 1% increase in income will result in 0.46% increase in consumption of potato on average.

Demand Composition, Market Potential, Trade and Demand Projections

The demand projection for human consumption of potato was estimated using Equations 1.3 to 1.5. In the 8th Five Year Plan, it is assumed that the population growth rate up to 1998 will be 2.7% per annum. The same population growth rate of 2.7% was used in determining the growth rate of potato for human consumption. The estimated annual growth rate of real per capita income was 1.8% in Pakistan. The estimates of income elasticity (Equation 4.4), population growth rate (2.7%), and growth rate of real per capita income (1.8%) are substituted in Equation 1.4 to get the per annum growth rate of per capita human consumption of potato. The resulting annual growth rate of per capita human consumption of potato is 3.5% which is substituted in Equation 1.5 to determine the future demand of potato for human consumption. The projected per capita consumption of potato was multiplied by the projected population of a base year to estimate the total demand for potato for human consumption.

The details of the demand composition of potato from 1996 to 2000 are given in Table 4.13 and estimated using Equation 1.5. The demand of potato for human consumption will increase from 1,386 thousand tons in 1996 to 1,775.25 thousand tons in 2000. The projected total domestic demand for potato in Pakistan for the year 2000 will be approximately 2,336 thousand tons. Similarly the projected demand for seed and industry will also increase from 1996 to 2000.

Table 4.13 Demand projection for potato in Pakistan ('000 tons).

Year	Food	Seed ¹	Industry ²	Waste ³	Total ⁴
1996	1,386.06	218.76	36.47	182.37	1,823.66
1997	1,474.69	232.85	38.81	194.04	1,940.39
1998	1,569.03	247.74	41.29	206.45	2,064.51
1999	1,668.49	263.45	43.91	219.54	2,195.39
2000	1,775.25	280.30	46.72	233.59	2,335.86

¹ Assuming 12% of total domestic demand of potato.

² Assuming 2% of total domestic demand of potato.

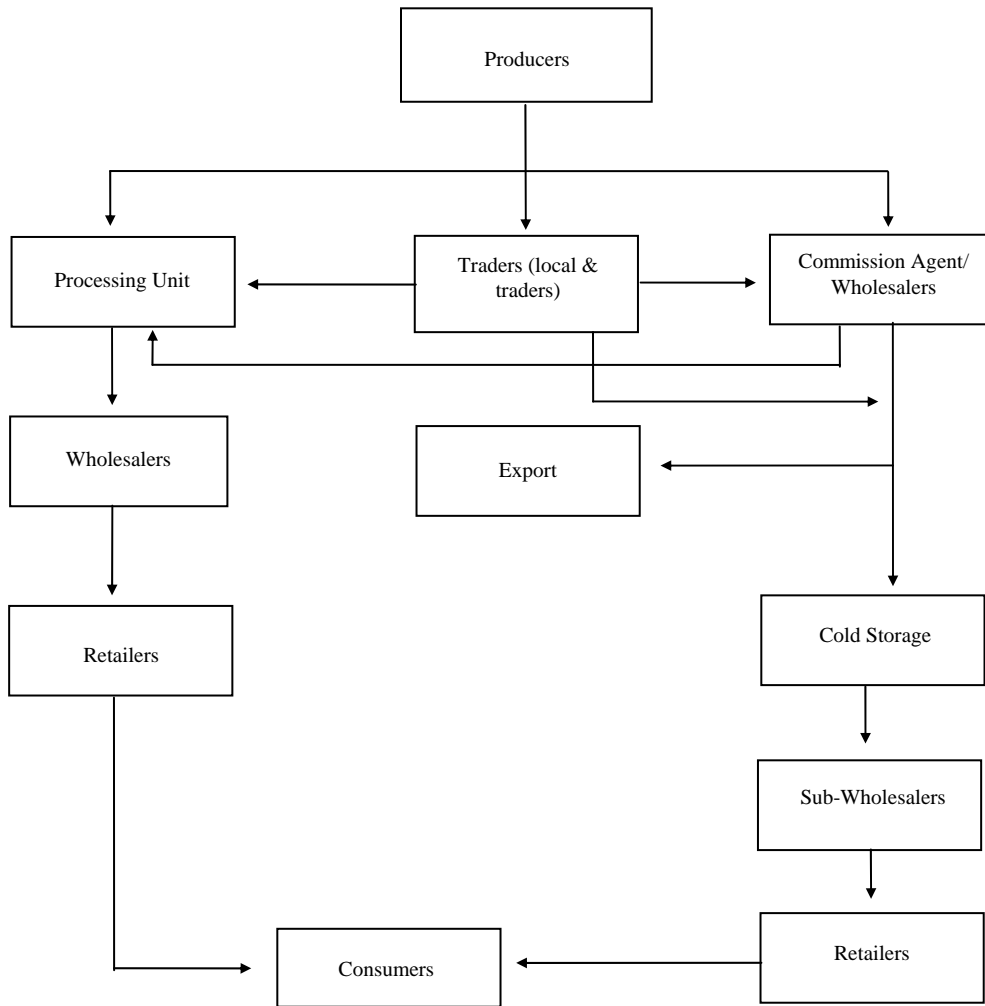
³ Assuming 10% of total domestic demand of potato.

⁴ (Quantity demanded for food)/1-024.

4.2.3 Marketing and trade of potato

Potato markets in Pakistan generally operate in a competitive environment due to the large number of buyers and sellers. There are many weaknesses in the system, such as inadequate information on prices and grading, shortage of good quality storage facilities, post harvest losses, excessive profits made by the middlemen, low prices, high marketing costs and margins, etc. The private sector is playing a major role in all aspects of potato marketing (Kokab and Smith 1989). The existing table potato marketing channels in Pakistan are shown in Figure 4.3. Potato producers in the Punjab usually bring their produce to commission agents (Arties) in wholesale markets (Mandies). Growers in the hilly areas generally sell their produce to traders from outside the region. These traders transport potato in trucks to the major wholesale markets (Mandies) in the Punjab and sell through local commission agents. In these markets, the sale is mainly done by auction. Both retailers and wholesalers take part in the auction.

Figure 4.3 Marketing channels of potato.

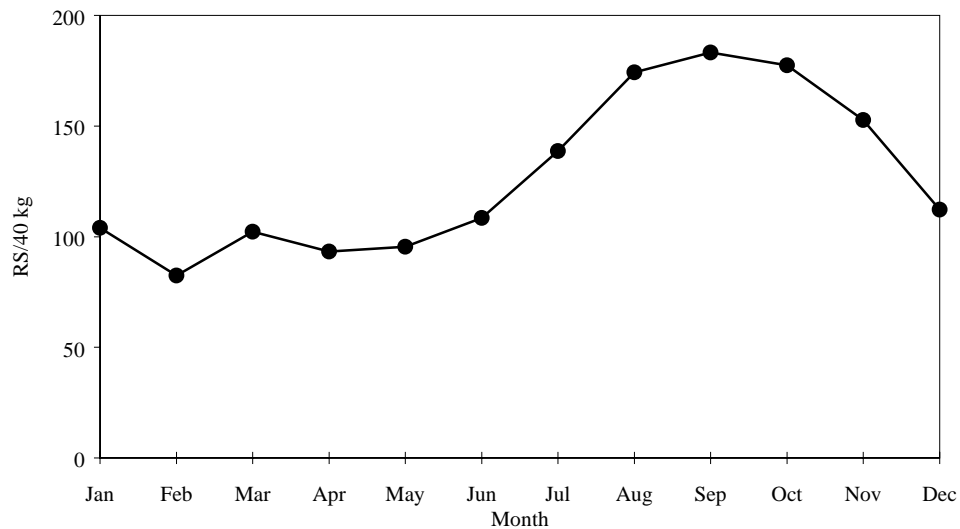


Some wholesalers purchase potato for cold storage and resale at a higher price at a later time. Other wholesalers also transport to distant markets in other parts of the country. Sub-wholesalers (Pharias) purchase potatoes from the wholesalers and sell to local retailers. Potato is sold by the bag not by weight (one bag is 110 kg in the plains and 85 kg in the hilly areas) at the wholesale but by weight at the retail level. The industrial sector also purchases potato from traders for their processing units. Less than 2% of the total production of potato is utilized in the processing industry. Generally, these processing units have permanent contacts with traders who supply them with sorted potatoes. Prices of the sorted potato are usually higher by Rs 20-30 per 40 kg. The chip manufacturers prefer potato from the autumn crop and from hilly areas. Potatoes from the summer and spring crops are not preferred due to the high moisture content which results in shrinkage of the chips (PSPDP 1988). A few firms also exported potato chips to the Gulf. A considerable amount of potato is also used by the local cottage industry to make different traditional products, such as Pakora, Samosa, etc.

Support prices of potato in Pakistan from 1977 to 1994 are given in Table 3.10. Support prices are fixed to protect the growers from any sharp fall in potato prices. The market prices were

generally higher than the minimum support prices fixed by the government. Potato prices fluctuate throughout the year in all the main markets, primarily caused by seasonality in supply (autumn, spring and summer crops) from various regions of Pakistan, timing and size of the new crop, and supply from cold storage. For example, potatoes stored from the autumn crop compete with fresh supply of potato from the spring and summer crops. Generally, after harvest of the autumn potato crop, prices are at the lowest during January, February and March. Potato prices start increasing from April and usually reach the highest level during October and November when only potatoes from the summer crop are available. After the influx of potato from early harvest of the autumn crop at the end of November, prices again start decreasing (Smith 1989). The average wholesale prices of potato during different months are shown in Figure 4.4.

Figure 4.4 Average monthly wholesale price of potato in Pakistan (1994).



Pakistan exports potato mainly to Afghanistan, Dubai, and Iran. Export of potato has remained below 7 thousand tons during the last fifteen years with the exception of 1979/80 and 1989/90 when more than 40 thousand and 20 thousand tons of potato, respectively, were exported to Iran and the Middle East (Table 4.14). The share of export in the total production of potato in Pakistan during the last two decades was not more than 1% excepting 1979/80 and 1989/90. There was no regular pattern of potato export from Pakistan. PSPDP (1989) had estimated that there were about 50 thousand tons of potato available for export every year. However, due to poor export performance in the past, the exportable surplus also had to be consumed in the country.

A number of reasons for the low export of potato from Pakistan are discussed in the literature. The major constraints are poor packing and packaging, grading, the size of potatoes (potatoes available for export are generally small size tubers ranging from 35 mm to 60 mm, whereas, the demand is for 60 mm and above), inefficient cold storage facilities, inadequate shipping facilities, and government policies. It is clear that Pakistan has a potential to increase potato export. In order to increase potato export from Pakistan, there is need to evolve new varieties of large size potato, to improve the existing storage facilities, and improve packing and grading. Also, it is very important to make available regular ships with refrigerated containers for potato export from Pakistan. In addition to traditional export markets of the Middle East, it will help to enhance export to new markets in Far Eastern countries and South East Asian countries.

Table 4.14 Export of potato from Pakistan.

Year	Quantity (‘000 tons)	Value (million Rs)	Value (Rs/ton)
1979/80	41.26	54.87	1,330
1980/81	4.85	8.88	1,831
1981/82	3.21	5.79	1,804
1982/83	7.38	14.34	1,943
1983/84	3.46	6.40	1,850
1984/85	2.66	6.03	2,267
1985/86	1.30	2.14	1,646
1986/87	2.48	3.73	1,504
1987/88	0.02	0.04	2,000
1988/89	1.00	2.10	2,100
1989/90	20.27	28.00	1,381
1990/91	2.39	5.70	2,385
1991/92	5.64	11.20	1,986
1992/93	4.64	9.90	2,134
1993/94	3.50	9.10	2,600
1994/95	6.30	15.90	2,524

Source: Federal Bureau of Statistics, Islamabad.

4.2.4 Constraints and policies for potato crop development

Pakistan is self-sufficient in table potato production, but the productivity of potato is still much less than the potential in all seasons. Despite the fact that surplus potato was available, Pakistan was unable to fully exploit its share in the international markets for potato, such as the Middle East, Far Eastern countries, and South-East Asian countries. Some of the major constraints of low productivity, and low export of potato in Pakistan are discussed below.

Low availability of high quality potato seed is a major factor in low yield in Pakistan. Presently, the public sector is unable to provide the required quantity of good quality seed to farmers. The distribution of improved potato seed in Pakistan is given in the Table 2.4. More than 90% of the required quantity of seed is provided by growers, and this is not properly tested and may not be of good quality. The availability of sufficient quality potato seed needs special attention by the government (PSPDP 1989).

Actual per capita consumption of potato, as estimated in HIES data and in various other studies, was very high compared to the per capita availability of potato in official statistical reports. This contradiction in consumption and availability of potato needs to be investigated further. Field surveys conducted by PSPDP/PARC indicated an under estimation of the yield reported in official statistics. The potato yield estimation procedure needs to be improved to determine the actual production of potato in Pakistan. This may help in further planning for development of the potato sector in Pakistan.

It was observed by a team of the Asian Development Bank that most of the cold storage facilities lacked in planning, working and business practices, which resulted in losses to cold storage owners as well as to potato traders (PSPDP 1990). In 1992, 707 thousand tons of cold storage capacity was available in the country and 80-85% of this capacity was utilized for potato (PSPDP 1994). This available capacity seemed to be sufficient but it was deficient in terms of pre-cooling, proper insulation and humidity control facilities. Also most of these cold storage facilities were not properly cleaned and fumigated and such deficiencies had badly affected the quality of the stored produce.

Despite the fact that potatoes are nutritionally rich compared to available grain crops (rice, wheat and maize) in Pakistan, they are not included in the regular diet. To reduce dependence on the grain crops (or to save foreign exchange from importing wheat), there is a need to promote awareness of potato consumption in the regular diet through media advertising campaigns. This can

be done through introducing new ways to incorporate potatoes into local regular diets in various regions of Pakistan. In urban areas, this is easier than in rural areas due to the high literacy rate.

4.3 Maize

After wheat and rice, maize is the third most important cereal crop in Pakistan. Maize occupied around 4.0% of the total cropped area and 2.0% of the total value of agricultural output in 1993/94 in Pakistan. The area under maize increased at a rate of 1.92% per annum from 1975/76 to 1994/95. Similarly, maize production grew at an annual rate of 2.65% during the same period. However, maize yield is very low compared to many other countries, averaging only 1.3 tons/ha during the last twenty years. The average national maize yield increased from 1,025 kg/ha in 1969/70 to 1,481 kg/ha in 1994/95. This increase in yield can be mainly attributed to the wider adoption of improved maize varieties and hybrid seed provided by private companies. Maize yields in Pakistan are considerably lower than the potential that could be achieved using improved production technology packages (Chatha 1982; Chaudhry 1983; CIMMYT 1989).

In 1994/95, Pakistan produced 1.318 million tons of maize. Northwest Frontier Province (NWFP) produced 64% of the national production and Punjab province accounted for 35% of the total production in the country (Table 4.15). Maize production has more than doubled during the last thirty years, from 525 thousand tons in 1966/67 to 1.3 million tons in 1994/95. During this time, growth in maize production was mainly due to increase in area rather than in yield.

In Pakistan, maize is basically a summer season crop planted in lowland and mid-altitude agro-ecological zones of NWFP and Punjab (CIMMYT 1989). The area under maize was 889.5 thousand hectares in 1994/95, almost all planted in the summer season. NWFP had the highest area under maize (528 thousand ha) followed by Punjab province (345 thousand ha) in 1994/95. Very little area was planted in Sindh and Baluchistan (Table 4.15). In Pakistan, maize is planted in both irrigated and rainfed conditions. Approximately two-thirds of the total maize area in Pakistan is planted in irrigated areas and the rest is farmed under strictly rainfed conditions. The maize crop is also very popular among small farmers who plant it as a multi-purpose food and forage crop. Generally, the resource poor maize growers use marginal lands to plant this crop, use less inputs compared to wheat, rice and cotton, and the major portion of their produce is used for home/farm consumption (CIMMYT 1989; Tetlay et al. 1987; Byerlee et al. 1988; Akhtar et al. 1986).

To improve the productivity of maize, the government of Pakistan established the National Coordinated Maize Programme (NCMP) in 1975 at Pakistan Agricultural Research Council (PARC), Islamabad. NCMP coordinates PARC's financial support to the provincial maize research programmes. The major purpose of this programme is to support and coordinate maize research through provincial research institutes. In addition, provincial research centres also conduct research on various issues leading to development of improved technology of maize. All these maize research centres, with the help of NCMP, CIMMYT, and using their own sources, developed many improved high yielding varieties which were adopted by farmers all over Pakistan. In the recent past, emphasis was also diverted towards maize hybrids having much higher yield potential. Presently private companies also distribute hybrids maize seed, which is a very positive step in the growth of the maize yield in Pakistan. Despite these developments in the past, the maize yield in Pakistan is very low compared to many other countries.

Table 4.15 Area, production and yield of maize in all provinces of Pakistan.

Year		Area (‘000 ha)	Production (‘000 tons)	Yield (kg/ha)
1975/76	Punjab	288.5	386.3	1,339
	Sindh	21.9	12.8	584
	NWFP	306.1	401.5	1,312
	Baluchistan	3.5	1.9	543
	Pakistan	620.0	802.5	1,294
1980/81	Punjab	347.1	444.7	1,281
	Sindh	22.4	12.3	549
	NWFP	396.3	510.9	1,289
	Baluchistan	3.2	2.5	781
	Pakistan	769.0	970.4	1,262
1985/86	Punjab	338.6	415.0	226
	Sindh	19.5	10.1	518
	NWFP	440.9	580.6	1,317
	Baluchistan	4.9	3.7	755
	Pakistan	803.9	1,009.4	1,256
1990/91	Punjab	319.7	425.0	1,329
	Sindh	19.6	9.6	490
	NWFP	501.1	745.7	1,487
	Baluchistan	4.5	4.2	933
	Pakistan	845.2	1,184.5	1,401
1991/92	Punjab	311.3	415.3	1,334
	Sindh	17.6	8.7	494
	NWFP	514.1	774.9	1,507
	Baluchistan	4.5	4.2	933
	Pakistan	847.5	1,203.1	1,419
1992/93	Punjab	323.4	401.9	1,243
	Sindh	12.1	6.0	495
	NWFP	527.8	771.4	1,461
	Baluchistan	4.2	4.3	1,023
	Pakistan	867.5	1,183.6	1,364
1993/94	Punjab	337.3	437.4	1,296
	Sindh	10.7	5.6	523
	NWFP	527.7	767.1	1,453
	Baluchistan	2.8	2.9	1,035
	Pakistan	878.5	1,213.0	1,380
1994/95	Punjab	345.1	460.5	1,334
	Sindh	12.2	6.4	524
	NWFP	528.0	846.7	1,603
	Baluchistan	4.2	4.5	1,071
	Pakistan	889.5	1,318.1	1,481

Source: Government of Pakistan 1995.

4.3.1 Maize utilization

In NWFP, which is a major growing province in Pakistan, maize is basically cultivated for human consumption, while only a little maize is consumed as food in Punjab. However, even in NWFP province, maize demand is declining as wheat is substituting for maize (Amir 1986). No data set on maize for human consumption is available in Pakistan. The HIES data set did not report maize consumption or expenditure on maize.

Demand Composition, Market Potential, Trade and Demand Projections

Around 75% of the total available quantity of maize in Pakistan is utilized for human consumption, and the rest is used by the industry to produce starch and poultry feed mixes (Government of Pakistan 1989). In another study, it was estimated that 70% of total maize produce is consumed on the farm, 10% is marketed locally (payment to landlords, charity, local sales), and 20% is sold to grain traders in the nearby grain market. The consumption of maize in Pakistan as human food is probably decreasing and its use in poultry and industrial sector is improving (Amir 1986).

Most small farmers use maize as a major source of food in NWFP and in northern areas of Punjab province. However, due to higher prices of maize and lower prices of wheat, maize growers prefer to sell their maize and buy wheat flour for home consumption. Maize consumers generally grind the maize grain into flour to bake chapatis. Maize is also commonly consumed as roasted green ear corn. It is reported that per household maize consumption in NWFP ranges between 60 to 125 kg/year, depending upon the part of the province. In other parts of the country, maize consumption is generally very low and it is mostly eaten in the form of roasted ears (CIMMYT 1989).

The maize crop is also commonly used as fodder in NWFP and various parts of Punjab province. In NWFP and northern areas of Punjab, it is a very common practice to thin green plants before flowering to feed to livestock and the remaining maize plants are harvested for the grain and the stalks are used as feed for farm animals. On the other hand, in central Punjab, around 32 to 40% of the total maize area is harvested and used as animal fodder. In these areas, maize grain is generally used for livestock feed or sold through the grain market for food, feed and industrial processing (CIMMYT 1989).

Around 20% of the total national maize production is utilized by industry in Pakistan. More than half of industry's share is used in the wet-milling industry to produce starch, sweeteners, corn oil, glucose, custard powder, and gluten. It is expected that the demand for maize products will improve with rapid urbanization and rising real national income in Pakistan. The another almost half share of industry is consumed by the poultry industry for manufacturing feed. Maize is the most suitable cereal for poultry feed in Pakistan and there is a considerable demand for maize in this sector. However, the price of maize in all major markets of Pakistan remained higher than the prices of other cereals, such as wheat (Figure 4.5). Due to higher prices of maize, feed producers prefer to use damaged wheat, broken rice, barley and sorghum, which are cheap substitutes for maize. The demand for maize in the industrial sector for value added products is expected to improve significantly in the near future because of the high demand for poultry feed, starch and other products.

It is estimated that industrial and feed demand for maize is growing at annual rate of 6.8%. This is estimated on the basis of a projected 2.9% annual per capita increase in income, an elasticity of demand of 1.5 for maize to supply the industrial and feed markets, and the projected population growth rate in Pakistan (CIMMYT 1989). Table 4.16 shows that the actual total production of maize in the country increased at an annual rate of 2.7% from 1985/86 to 1994/95. The demand for industry and poultry feed increased from 25% of the total maize production in 1985/86 to 28% in 1994/95. On the other hand, demand for human consumption decreased from 75% of the maize production in 1985/86 to 62% in 1994/95. During this period, maize demand for human consumption increased at an annual rate of less than 1%, and demand for industry and feed increased at an annual rate of 6.8%. Maize demand for waste and seed increased at an annual rate of 2.3% (using the average maize seed rate and 1% increase in area under maize during the same period).

Chapter 4

Figure 4.5 Average wholesale prices of maize and wheat in Pakistan.

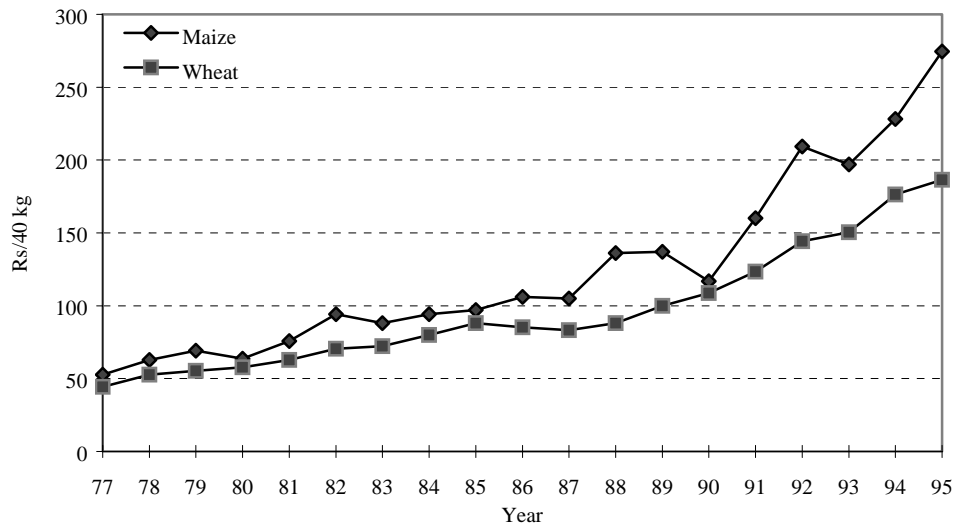


Table 4.16 Maize production and utilization in Pakistan.

Year	Production (⁰ 000 tons)	Per Capita Consumption (kg/year)	Total Human Consumption (⁰ 000 tons)	Industry & Feed (⁰ 000 tons)	Seed & Wastes (⁰ 000 tons)
1985/86	1,009	7.75	757	202	49
1986/87	1,111	8.35	841	216	54
1987/88	1,127	8.10	841	231	55
1988/89	1,204	8.39	898	247	59
1989/90	1,179	7.77	857	264	58
1990/91	1,185	7.43	845	282	58
1991/92	1,203	7.19	843	301	59
1992/93	1,184	6.67	805	321	58
1993/94	1,213	6.52	811	343	59
1994/95	1,318	6.38	817	366	60
Growth rate (%/year)	2.7	-2.1	0.9	6.8	2.3

Source: Government of Pakistan 1995; CIMMYT 1989.

The role of the private sector is increasing in maize research and seed production in Pakistan. In this sector, Rafhan Maize Products Limited, Faisalabad, is the most organized and well established private organization in Pakistan. This wet-milling private company runs its own very effective hybrid maize breeding and seed production programme. The company provides its contract growers with hybrid maize seed, fertilizer and other inputs on credit and purchases the produce after maize harvest at the farm at a predetermined price. In addition to inputs, the company also provides technical advice through its field staff who supervise the crop of the contract growers. The main products of Rafhan are maize oil, glucose, custard powder, gluten and maize starch. The demand of all these products has increased considerably over time.

4.3.2 Projected domestic demand for maize

Total domestic demand for maize in the year 2000 is projected to be 1.4 million tons. The breakdown of this projected demand is given in Table 4.17. The per annum growth rates given in Table 4.16 were used to predict demand for the year 2000. The maize demand for human consumption will increase to 841 thousand tons in the year 2000. Industry and feed demand for

maize is expected to be 508 thousand tons and around 65 thousand tons will be required for seed, wastage and other uses.

Table 4.17 Demand projection for maize in the year 2000.

Demand Composition	Thousand Tons
Food	841
Industry and feed	508
Seed, wastage, & other uses	65
Total	1,414

Per capita maize consumption was projected using the annual growth rates estimated as follows:

$$QMAIZE_T = QMAIZE_0 (1 + r)^T$$

where,

$QMAIZE_T$ = per capita maize consumption in 1994/95

$QMAIZE_0$ = per capita maize consumption in 1985/86

T = years

r = per annum growth rate

Total maize demand for the year 2000 was projected by multiplying the total projected population in 2000 by the projected per capita maize consumption in the year 2000. The same procedure was used to project the demand for industry and feed, and for seed, wastage and other uses.

4.3.3 Marketing and trade of maize

Previously, maize was a subsistence crop and most of the produce was held by the producers for their regular diet, seed, livestock, etc. With increasing real national income, urbanization, shift in the consumption patterns in favour of wheat, rice, meat, dairy, fruits and vegetables, and the introduction of new maize products, maize producers created a surplus for industry. Presently, 20 to 30% of the national production of maize is generated as a market surplus to be used in the food industry, feed industry and directly consumed (flour, cobs, grains) in different parts of the country. Most of the market surplus is generated in Punjab province, whereas in the NWFP, much of the maize is used for home consumption at the farm and very little is available for sale in the market. Figure 4.6 shows the marketing channels of maize in Pakistan. Generally, small maize growers sell their surplus maize to local grain traders (Beoparies) or to wholesalers (commission agents) in the nearby grain markets. Big farmers or contract growers either sell maize directly to the food and feed industry or to commission agents. Usually food and feed industries have permanent contacts with commission agents in various big grain markets. These agents purchase maize from the producers for their respective industrial units and charge a commission. Very little is sold in these markets for direct human consumption and seed. All the industrial units sell their products and by-products through their wholesalers all over the country. The government of Pakistan does not announce a minimum support price for maize so maize prices are generally higher than those of other grains, such as wheat. However, the contract growers of Rafhan Maize Products Limited sell their produce to the company at predetermined prices at the time of planting. Presently, the company purchases around 40% of the required quantity from their contract growers in the Punjab.

Maize is not a major export commodity of Pakistan and the pattern of maize exports has been very irregular in the past. Table 4.18 shows export and import of maize in various forms. The maximum export was in 1984/85 when 10.6 thousand tons of unmilled maize was exported; otherwise, maize exports have been marginal. Also, Pakistan imported 9.8 thousand tons of maize for the processing industry and 15.9 thousand tons for seed in 1991/92.

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Figure 4.6 Maize marketing channels.

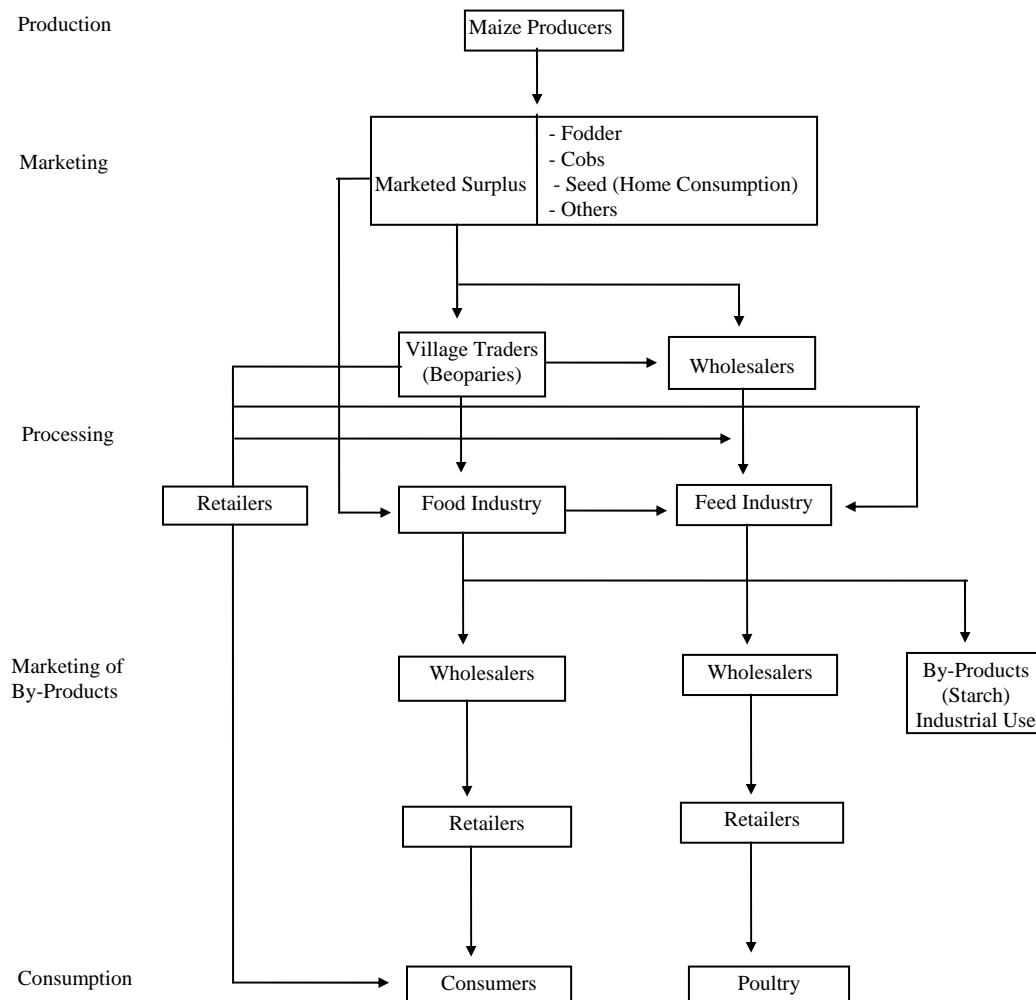


Table 4.18 Maize imports and exports from Pakistan.

Year	Exports (tons)			Imports (tons)		
	Un-Milled	Maize Flakes	Maize Flour	Un-Milled	Seed	Maize Flakes
1981/82	30	3	-	-	-	-
1982/83	1,252	-	-	-	-	-
1983/84	830	7	-	-	-	-
1984/85	10,596	14	-	-	-	-
1985/86	1,485	50	-	-	-	-
1986/87	30	21	28	-	-	-
1987/88	-	2	18	110	-	-
1988/89	-	5	11	-	-	-
1989/90	91	-	-	-	403	-
1990/91	-	3	-	-	101	6
1991/92	-	24	-	9,837	15,897	5
1992/93	-	-	20	269	673	4
1993/94	-	-	-	50	15,370	-

Source: Federal Bureau of Statistics, Islamabad.

4.4 Rice

Rice is the second most important staple food in Pakistan after wheat and it is also a major foreign exchange earning source. In terms of cropped area in Pakistan, rice is the third most important crop after wheat and cotton, occupying around 10% of the total cropped area and 17% of the total area under food grains in the country. Also it contributes about 16% in food grain production and 12% of the total value added by the major crops of Pakistan. The area under rice increased from 1.71 million hectares in 1975/76 to 2.12 million hectares in 1994/95 (an annual rate of 1.1%). During the same period, rice production increased at the rate of 1.5% per annum. However, yield increased at a rate of less than 1% per annum (Table 4.19). Most of the increase in total production of rice came through increase in area and less through yield from 1975/76 to 1994/95. The two major rice growing provinces are the Punjab and Sindh, which accounted for 63 and 28% of the total area cultivated in 1994/95. Basmati rice, a fine, non-glutinous, long grain and aromatic variety, is a high value export crop which is mainly cultivated in the Punjab. More than 50% of the total area under rice is under Basmati rice and about 44% is under IRRI rice varieties. The rest is under other rice varieties. Pakistan earns considerable foreign exchange from the export of long grain aromatic Basmati rice. In addition, it also exports IRRI type rice, which is mainly cultivated in the province of Sindh.

4.4.1 Rice utilization and processing

As the second staple food of Pakistan, rice is mainly utilized for human consumption. Demand composition and per capita availability of rice from 1983/84 to 1993/94 are shown in Table 4.20. Rice availability is estimated by deducting the quantity for seed, feed and wastage, and exports from total production of rice in the country. It is assumed that 6% of the total production is kept for seed, feed and wastage. Per capita availability of rice increased from 21.94 kg/year in 1983/84 to 22.27 kg/year in 1993/94. The net availability of total rice has increased at a per annum rate of 3.4% during this period. In 1993/94, about 69% of the total rice production was available for human consumption, 25% for exports and the rest was for seed, feed and wastage. One-fifth of the total rice produce was procured by the government during 1993/94.

Per capita consumption of rice from the HIES data is given in Table 4.21. Compared to urban areas, rice consumption is slightly higher in rural areas. Per capita consumption of rice increased from 13.8 kg/year in 1971 to 16.1 kg/year in 1993. The total consumption of rice increased from 848.56 thousand tons in 1971 to 1,942.95 thousand tons in 1993 (an annual rate of increase of 3.7%). Total consumption of rice from HIES data is lower than the total availability of rice for human consumption. Rice consumption data are based on statistical samples on consumption over one month and are subject to seasonal as well as recall bias. Therefore, it may be little lower than the actual consumption of rice in Pakistan. On the other hand, use of broken rice in feed is increasing due to higher prices of maize in Pakistan. Information on use of rice in feed is not available and the actual quantity used in feed is not included in estimating the availability of rice. Therefore, the availability of rice was higher compared to the actual consumption of rice in Pakistan in 1993.

Rice has many milling by-products, such as husk, bran, rice germ and polishings. These by-products have several food, feed and pharmaceutical uses. Rice husk is generally utilized for raising steam in the rice mills and it is also used in animal feed. Rice bran (6 to 8% of rough paddy rice) has a high oil content (14 to 17% of the bran is oil, around 80% is rice bran meal and 2% is processing loss) and can be used as cooking oil. However, the oil in bran has a short life and quickly becomes rancid (NODP 1995). Production of rice, rice bran and potential oil production are given in Table 4.22. The production of rice bran was more than 200 thousand tons during 1994/95 which can contribute about 28 thousand tons of oil. It can provide edible oil worth of Rs 1.0 million and may save significant foreign exchange from import of cooking oils (NODP 1995).

Table 4.19 Variety-wise area, production and yield of rice in Pakistan.

Year/Province	Area ('000 ha)				Production ('000 tons)				Yield (kg/ha)			
	Basmati	IRRI	Others	Total	Basmati	IRRI	Others	Total	Basmati	IRRI	Other	Total
1975/76												
Punjab	528.1	116.1	233.1	877.3	632.3	221.3	353.6	1,207.2	1,199	1,909	1,513	1,376
Sindh	0.0	522.1	209.0	731.1	0.0	1,027.6	258.5	1,286.1	0.0	1,965	1,236	1,759
NWFP	7.7	12.3	43.0	63.0	10.0	18.5	56.1	84.6	1,291	1,503	1,300	1,343
Baluchistan	0.0	15.1	23.2	38.3	0.0	22.7	16.9	39.6	0.0	1,503	729	1,034
Pakistan	535.8	665.6	508.3	1,709.7	642.3	1,290.1	685.1	2,617.5	1,199	1,937	1,347	1,531
1980/81												
Punjab	813.4	198.7	49.8	1,061.9	965.3	332.0	64.4	1,361.7	1,187	1,671	1,293	1,282
Sindh	0.0	599.9	163.9	763.8	0.0	1,343.9	206.0	1,549.9	0.0	2,240	1,257	2,029
NWFP	10.3	11.9	44.0	66.2	14.7	23.9	66.5	105.1	1,427	2,008	1,511	1,588
Baluchistan	0.0	30.6	10.6	41.2	0.0	96.8	9.7	106.5	0.0	3,163	915	2,585
Pakistan	823.7	841.1	268.3	1,933.1	980.0	1,796.6	346.6	3,123.2	1,190	2,136	1,292	1,616
1990/91												
Punjab	1,087.4	164.3	10.1	1,261.8	1,158.6	253.7	10.0	1,422.3	1,065	1,544	990	1,127
Sindh	-	567.6	112.3	679.9	-	1,310.1	123.3	1,433.4	-	2,308	1,098	2,108
NWFP	13.0	16.1	33.2	62.3	26.3	33.9	57.8	118.0	2,023	2,106	1,741	1,894
Baluchistan	19.5	81.7	7.5	108.7	35.3	234.3	17.5	287.1	1,810	2,868	2,333	2,641
Pakistan	1,119.9	829.7	163.1	2,112.7	1,220.2	1,832.0	208.6	3,260.8	1,090	2,208	1,279	1,543
1991/92												
Punjab	1,032.7	189.0	9.7	1,231.4	1,033.9	298.7	9.6	1,342.2	1,001	1,580	989	1,089
Sindh	-	591.7	100.7	692.4	-	1,376.7	110.8	1,487.5	-	2,326	1,100	2,148
NWFP	13.4	16.3	33.4	63.1	25.5	35.5	62.0	123.0	1,902	2,177	1,856	1,949
Baluchistan	19.5	82.2	8.3	110.0	32.8	238.6	19.0	290.4	1,682	2,902	2,289	2,640
Pakistan	1,065.6	879.2	152.1	2,096.9	1,092.2	1,949.5	201.4	3,243.1	1,024	2,217	1,324	1,546
1992/93												
Punjab	1,006.8	205.6	9.3	1,221.7	1,075.9	318.7	9.3	1,403.9	1,069	1,550	1,000	1,149
Sindh	-	487.3	81.5	568.8	-	1,170.4	102.4	1,272.8	-	2,402	1,256	2,237
NWFP	13.5	15.1	33.5	62.1	24.0	29.5	58.4	111.9	1,785	1,954	1,740	1,801
Baluchistan	16.1	95.1	11.0	120.8	24.2	279.2	24.1	327.5	1,646	2,936	2,191	2,711
Pakistan	1,035.0	803.1	135.3	1,973.4	1,124.1	1,797.8	194.2	3,116.1	1,086	2,239	1,435	1,579
1993/94												
Punjab	1,074.0	218.5	8.1	1,300.6	1,215.9	361.5	10.8	1,588.2	1,132	1,654	1,333	1,221
Sindh	-	630.1	72.8	702.9	-	1,840.6	114.3	1,954.9	-	2,921	1,570	2,781
NWFP	13.4	16.6	32.7	62.7	24.2	37.1	57.1	118.4	1,806	2,235	1,746	1,888
Baluchistan	16.1	95.8	9.0	120.9	26.6	285.1	21.5	333.2	1,652	2,976	2,389	2,756
Pakistan	1,103.5	961.0	122.6	2,187.1	1,266.7	2,524.3	203.7	3,994.7	1,148	2,627	1,662	1,826
1994/95												
Punjab	1,107.6	222.6	8.5	1,338.7	1,295.9	376.3	11.8	1,684.0	1,170	1,690	1,388	1,257
Sindh	-	535.6	62.7	598.3	-	1,324.7	82.0	1,406.7	-	2,473	1,307	2,351
NWFP	13.5	16.8	33.0	63.3	24.8	33.1	60.3	118.2	1,837	1,970	1,827	1,867
Baluchistan	24.3	90.3	9.7	124.3	30.9	192.5	14.2	237.6	1,271	2,131	1,463	1,911
Pakistan	1,145.5	865.3	113.9	2,124.6	1,351.6	1,926.6	168.3	3,446.5	1,180	2,226	1,477	1,622

Source: Government of Pakistan 1995.

Demand Composition, Market Potential, Trade and Demand Projections

Rice bran meal is utilized in poultry feed and most of the rice bran oil is used for industrial purposes.

Table 4.20 Per capita availability of rice in Pakistan.

Year	Production	Seed & Waste	Procurement by Govt.	Exports	Net Availability*	Per Capita Available (kg/year)
 '000 tons					
1983/84	3,340	200	1,148	1,260	1,880	21.94
1984/85	3,315	199	1,203	719	2,397	20.48
1985/86	2,919	175	1,176	1,317	1,427	16.05
1986/87	3,486	209	1,285	1,271	2,006	20.22
1987/88	3,241	194	834	1,210	1,837	17.69
1988/89	3,200	192	1,079	850	2,158	20.13
1989/90	3,221	193	1,334	744	2,284	20.70
1990/91	3,261	196	817	1,204	1,861	16.36
1991/92	3,243	195	492	1,512	1,536	13.10
1992/93	3,116	187	455	1,032	1,897	15.69
1993/94	3,995	240	807	984	2,771	22.27

Source: Government of Pakistan 1995.

* Net availability = (production - deduction for seed, feed & wastage and exports).

Table 4.21 Per capita consumption of rice in Pakistan.

Year	Rice Consumption (kg/capita/year)			Population Pakistan (millions)	Total Consumption ('000 tons)
	Rural	Urban	All		
1971	14.04	13.20	13.80	61.49	848.56
1980	16.44	12.48	14.88	78.94	1,174.63
1985	16.08	12.00	15.00	94.73	1,420.95
1986	16.20	13.44	15.36	97.67	1,500.21
1987	15.48	12.48	14.52	100.70	1,462.16
1991	15.96	13.92	15.36	113.78	1,747.66
1993	16.68	14.28	16.08	120.83	1,942.95

Source: Federal Bureau of Statistics, Islamabad.

Table 4.22 Production of rice, bran and potential oil in Pakistan.

Year	Production ('000 tons)	Rice Bran ('000 tons)	Meal Production ('000 tons)	Potential Oil ('000 tons)
1970/71	2,199.7	139.9	118.6	18.5
1980/81	3,123.0	187.6	157.5	26.3
1989/90	3,220.0	193.2	161.5	27.0
1990/91	3,143.0	188.6	158.4	26.4
1991/92	3,197.0	191.8	161.5	26.5
1992/93	3,116.1	186.9	157.0	26.2
1993/94	3,995.0	239.7	201.3	33.6
1994/95	3,358.0	201.5	169.3	28.2

Source: NODP 1995.

Rice mills in Pakistan are classified into hullers, shellers and the modern type of unit in terms of function and scale. The modern units are the latest and provide the best quality rice and the percentage of broken rice in these units is very low compared to traditional shellers. These modern rice milling units are and they process less than 10% of the total quantity available for processing. Around 90% of the rice available in the commercial market is processed by traditional sheller type mills and the rest is processed by the few modern mills. A few husking units also operate at local levels and supply rice to local markets. Due to the limited capacity of the modern mills, most of the rice available for export is processed by the traditional shellers. The percentage of broken grains is higher in rice processed by these shellers and it usually does not conform to standard specifications

required for export. There is a need for efficient milling in Pakistan to reduce the percentage of broken rice and to provide export quality rice to compete in the international market.

4.4.2 Projected domestic demand for rice

Domestic demand for rice can be categorized into direct human consumption and seed, wastage and other industry uses. Demand for direct human consumption was estimated from per capita consumption of rice from the HIES data set. The income elasticity of demand for rice for human consumption was calculated from HIES data by simply regressing the consumption of rice with real per capita income and real price of rice in Pakistan. The estimated demand equation in linear form is:

$$\text{RICCON}_t = 9.179 + 0.142\text{PCI}_t/\text{CPI} - 18.645\text{WRICP}/\text{CPI} \quad (4.5)$$

(2.182) (2.041) (0.282)

$$R^2 = 0.839$$

Note: figures in parenthesis are t-statistics.

Demand for rice for direct human consumption increases as per capita real income increases and decreases as the real price of rice increases. The coefficient of real per capita income is highly significant and the coefficient of real price of rice is non-significant. The elasticity of demand for rice with respect to real income is 0.39 and is inelastic, meaning that with every 1% increase in real per capita income, per capita rice consumption will increase by 0.39%.

The demand projection for direct human consumption of rice was determined using Equations 1.3 to 1.5. In the 8th Five Year Plan, it is assumed that the population growth rate up to 1998 will be 2.7% per annum. The same population growth rate of 2.7% was used in determining the growth rate of rice for human consumption. The estimated annual growth rate of real per capita income is 1.8% in Pakistan. The estimates of income elasticity (Equation 4.5), population growth rate (2.7%), and growth rate of real per capita income (1.8%) are substituted in Equation 1.4 to estimate the per annum growth rate of per capita human consumption of rice. The resulting annual growth rate of per capita human consumption of rice is 3.4% which is substituted in Equation 1.5 to determine future demand of rice for human consumption. The projected per capita consumption of rice was multiplied by the projected population of a base year to estimate the total demand for rice as direct human consumption in Pakistan.

The details of demand composition of rice from 1996 to 2000 estimated using Equation 1.5 are given in Table 4.23. Demand of rice for direct human consumption will increase from 2,267 thousand tons in 1996 to 2,881 thousand tons in the year 2000. The projected total domestic demand for rice will be around 3,065 thousand tons in Pakistan in the year 2000. Similarly, the projected demand for seed and industry will also increase from 1996 to 2000.

Equation 1.2 was used to project the quantity demanded for rice bran in the year 2000 using the data in Table 4.22. It is estimated that the demand for rice bran will grow at an annual rate of 0.51%. The projected quantities of rice bran, rice bran meal and potential rice bran oil are given in Table 4.23.

Table 4.23 Demand projection for rice in Pakistan ('000 tons).

	Rice Demand			Rice Bran & Products		
	Food	Other Uses	Total Demand	Rice Bran	Bran Meal	Potential Oil
1996	2,266.67	144.68	2,411.35	144.68	121.53	20.26
1997	2,406.95	153.63	2,560.58	153.63	129.05	21.51
1998	2,555.98	163.15	2,719.13	163.15	137.05	22.84
1999	2,712.75	173.15	2,885.90	173.15	145.45	24.24
2000	2,880.77	183.88	3,064.65	183.88	154.46	25.74

4.4.3 Rice marketing

Generally rice growers sell their produce to local traders or in the nearby grain markets through commission agents (Beoparies) and rice mills or their dealers directly purchase from the local grain markets. Formal specifications and testing equipment are recommended but are rarely used for the purchase of paddy. Visual inspection is the only common practice for determining the quality and price. The Rice Export Corporation of Pakistan (RECP) also procures on its own or through its subsidiaries on a very small scale through procurement centres established in the main rice growing areas just after the harvesting of rice starts. If necessary, Pakistan Agricultural Storage and Supply Corporation (PASSCO) also procures on the behalf of RECP. After milling of rice, it is sold in the domestic market freely and the surplus is sold to RECP for export at fixed prices by the government. The provincial food departments also intervene in rice marketing. The rice marketing channels from production to consumption are shown in Figure 4.7.

Support prices of paddy and rice are announced separately. The minimum support price is usually announced before the rice planting season and is set on the recommendation of the Agricultural Prices Commission (APCom). The commission sets the rice price on the basis of cost of production, current stocks and prices, international prices and appropriate net returns to farmers. The prices are fixed keeping in view the processing cost and value of rice by-products, such as, bran, husk, broken rice, etc. The support prices of rice are given in Table 3.10.

Table 4.24 Rice production and procurement by RECP and the private sector.

	Basmati Rice ('000 tons)			IRRI Rice ('000 tons)		
	Production	Procurement		Production	Procurement	
		RECP	Private Sector		RECP	Private Sector
1981/82	1,035.41	388.21	-	2,395	706.32	-
1982/83	987.22	337.4	-	2,458	889.58	-
1983/84	925.80	264.62	-	2,414	883.20	-
1984/85	854.98	266.88	-	2,460	959.01	-
1985/86	785.20	230.28	-	2,170	987.13	-
1986/87	791.00	237.20	-	2,695	1,068.84	-
1987/88	904.00	222.55	-	2,337	607.34	-
1988/89	1,024.00	499.81	4.92	2,158	578.77	-
1989/90	1,160.00	548.81	30.61	2,060	808.88	-
1990/91	1,159.00	148.49	166.58	2,102	676.45	27.72
1991/92	1,034.00	115.00	200.00	2,210	400.00	400.00
1992/93	1,074.00	-	-	2,040	453.00	250.00
1993/94	1,214.00	124.76	123.00	2,770	686.36	99.15

Source: Export Promotion Bureau.

Before the planting season of rice, the government generally states its policy including the target of procurement of rice for export. Until 1986/87, RECP had a monopoly on procurement of rice for export purpose. Presently, RECP procures rice on a voluntary basis from rice producers and millers through its procurement centres established in Punjab and Sindh provinces. However, the corporation, being a government owned organization, is obliged to procure rice at the price fixed by the government. However, generally millers or suppliers sell rice at open market prices to RECP and

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in the domestic market. In 1988/89 and 1989/90, RECP procured about 47% of the total rice produced in the country. However, as a result of a government policy of privatization of rice export, RECP procured only 12% of the total produce of Basmati rice in 1993/94. Total rice production and procurement by RECP and the private sector is given in Table 4.24. RECP was unable to procure the IRRI type rice crop of 1994/95 from Sindh because of a lower support price compared to the local price. Presently, rice export stocks from the open market are also procured by the private sector at prevailing market prices for export purposes. External trade of rice is no longer a government monopoly as it was before, and it is expected that the export of rice, especially Basmati rice, will improve in the near future.

4.4.4 Rice trade

In 1992, world trade in rice was around 15.8 million tons. Pakistan's share in the rice world trade was 10% and it was 14% in Asian rice trade. Rice exports accounted for about 5% of total production in the country. Export earnings from rice increased from US\$ 209.47 million in 1974/75 to US\$ 415.68 million in 1991/92, and decreased to US\$ 242.17 million in 1993/94 (Table 4.25). Export earnings from Basmati rice increased from US\$ 119.28 million in 1975/76 to \$230.42 million in 1991/92 and decreased to US\$ 125.96 million in 1993/94. Similarly, export of IRRI types also increased considerably until 1991/92 and started declining after this period. Export of Pakistani rice to various countries during the last ten years is given in Table 4.26. The market for Pakistani exports of Basmati rice is concentrated in a few importing countries in the near east which account for about 95% of the total exports of Basmati rice. The major competitor of Pakistan in the international market for Basmati rice is India. The main markets of Pakistani Basmati rice are Saudi Arabia, Kuwait, Oman, Dubai, Abu Dhabi, Qatar, Bahrain, Iran, Mauritius, Malaysia, UK, USA and Canada. The demand for IRRI type rice mainly comes from African nations and recently from Bangladesh, Singapore and Mauritius. For IRRI type rice, major export markets are Sri Lanka, Turkey, Bangladesh, Malagasy, Kenya, Cameroon, and Iran. The major competitors for this type of rice in the international market are Burma, China and Indonesia.

Table 4.25 Rice exports from Pakistan.

Year	Basmati		IRRI		Total	
	Quantity (^{'000} tons)	Value (US\$ million)	Quantity (^{'000} tons)	Value (US\$ million)	Quantity (^{'000} tons)	Value (US\$ million)
1974/75	153.43	119.28	273.40	90.19	426.83	209.47
1975/76	236.46	124.08	526.48	98.59	762.94	222.67
1976/77	401.97	138.79	481.32	86.76	883.30	225.55
1977/78	246.61	111.25	556.74	129.10	803.35	240.35
1978/79	180.73	134.28	829.02	204.46	1,009.75	338.74
1979/80	314.88	225.07	771.79	194.80	1,086.67	419.87
1980/81	409.65	292.02	835.01	271.97	1,244.67	563.99
1981/82	261.81	188.84	689.28	205.27	951.09	394.11
1982/83	228.57	146.07	676.27	143.19	904.85	289.26
1983/84	405.93	245.05	853.81	179.09	1,259.74	424.14
1984/85	174.04	109.37	544.63	112.65	718.67	222.02
1985/86	260.90	175.22	1,056.06	169.03	1,316.96	344.25
1986/87	187.83	135.24	1,082.70	166.49	1,270.53	301.73
1987/88	221.39	160.56	988.57	204.49	1,209.95	365.05
1988/89	215.46	150.64	633.55	151.49	849.01	302.12
1989/90	207.97	142.53	535.92	96.68	743.89	239.21
1990/91	466.39	218.45	738.18	127.77	1,204.58	346.22
1991/92	557.90	230.42	953.95	185.26	1,511.84	415.68
1992/93	462.22	199.36	569.91	117.75	1,032.13	317.11
1993/94	305.71	125.96	678.61	116.21	984.33	242.17

Source: Federal Bureau of Statistics, Islamabad.

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Table 4.26 Exports of IRRI rice to different countries (*000 tons).

Country	1985	1986	1987	1988	1989	1990	1991	1992
Afghanistan	-	-	-	-	-	-	14.6	71.9
Bangladesh	11.0	11.0	361.7	140.2	48.3	-	20.2	15.6
Iran	54.0	202.0	144.8	25.0	109.0	12.6	321.7	188.6
Jordan	-	-	-	-	-	-	15.4	148.3
Malaysia	49.0	1.0	1.0	1.7	1.0	1.1	1.6	15.2
Oman	65.0	32.0	5.7	26.2	-	15.7	4.1	38.5
Qatar	2.0	10.0	8.4	15.2	12.5	11.4	14.4	163.1
Saudi Arabia	80.0	120.0	83.5	74.1	38.9	54.3	109.4	163.1
Singapore	2.0	1.0	13.1	0.9	80.2	12.5	1.5	18.6
U.A.E.	25.0	50.0	36.1	82.3	42.2	72.6	64.2	141.0
Cameroon	119.0	126.0	62.3	-	5.9	51.4	14.0	-
Cote d'Ivoire	15.0	107.0	173.0	30.3	-	27.4	35.2	18.7
Kenya	-	-	20.5	0.5	-	3.0	57.9	77.2
Madagascar	40.0	10.0	5.0	49.7	-	-	-	-
Mauritania	-	-	15.0	11.7	63.8	-	-	-
Senegal	48.0	35.0	67.7	110.8	61.0	38.0	2.7	1.5
Togo	42.0	78.0	21.5	15.3	-	82.7	9.3	40.6
Brazil	157.0	107.0	-	-	-	-	-	-
Romania	-	-	-	-	-	-	65.3	6.3
Others	223.0	138.0	206.1	281.3	218.9	393.4	531.4	198.4
Total	962.0	1,142.0	1,310.2	942.6	761.9	851.0	1,297.0	1,357.8

Source: IRRI 1995.

In Pakistan, export of rice was in the public sector until August 1987 and RECP enjoyed a monopoly. However, export of Basmati rice was allowed in the private sector from July 1987 and export of IRRI type rice was allowed in the public sector from August 1990. Presently, both RECP and the public sector are involved in the export of rice. The major government policies concerning rice exports for the private sector are as follows (EPB 1993):

- The private sector can export both the Basmati and IRRI type rice in bulk as well as in small packet forms.
- Private exporters are registered with the Superior Rice Dealers Association of Pakistan.
- The brand names will be registered with the Registrar, Trade Marks, Government of Pakistan.
- The exporters may purchase rice either from RECP at the rate the corporation is exporting in bulk or they may use their own stocks after deposition of the difference in price between the bulk export of rice by RECP and the government fixed procurement price; and such exporters shall be subject to RECP's inspection and quality control procedures.
- The export duty on all rice varieties were abolished on October 10, 1990.
- The private sector is exempt from custom duty and Iqra tax for the import of rice milling machinery and equipment.
- Liberal credit facilities, industrial loans, working capital and loans for building warehouses and shortage facilities will be provided to the private sector.

Due to these positive liberal policies, the government expects that export of rice will improve considerably in the future. Keeping in view that presently rice is a highly competitive commodity, both research and development for quality improvement of Basmati and IRRI type rice should be strengthened to take full advantage of these government policies and GATT. In addition, good infrastructure facilities, such as transport, ports, storage, and equipment for quality control, should be developed.

4.5 Demand for feed

4.5.1 Production and demand for livestock products

The livestock sector is very important in the agricultural economy of Pakistan and accounts for more than 30% of agricultural GDP. Besides contributing milk and meat, livestock also have important traditional economic and social values in rural areas of Pakistan. Buffalo, cattle, goats and sheep are the major components of the livestock sector and are 17, 15, 38 and 25% respectively of the total population of livestock in Pakistan during 1995/96. (Table 4.27). From 1971/72 to 1995/96, the population of buffalo, cattle, goats and sheep increased at annual growth rates of 3.1, 0.9, 4.6, and 3.3% respectively. The population of poultry increased from 24.3 million in 1971/72 to 345 million during 1995/96, an annual rate of 11.7%.

Table 4.27 Livestock population (millions) in Pakistan.

Year	Buffaloes	Cattle	Goats	Sheep	Poultry
1971/72	9.8	14.6	15.6	13.7	24.3
1975/76	11.6	14.9	21.7	18.9	44.9
1980/81	11.9	15.8	25.8	22.1	67.4
1985/86	15.7	16.7	30.8	23.3	109.5
1986/87	16.1	16.9	31.2	23.7	130.0
1987/88	16.5	17.1	32.6	24.5	145.4
1988/89	17.0	17.2	34.0	25.1	162.1
1989/90	17.4	17.8	35.4	25.7	153.9
1990/91	17.8	17.7	37.0	26.3	146.9
1991/92	18.3	17.7	38.7	27.4	156.2
1992/93	18.7	17.8	40.2	27.7	182.6
1993/94	19.2	17.8	42.0	28.3	250.0
1994/95	20.2	17.9	45.6	29.0	318.8
1995/96	20.2	17.9	45.6	29.8	345.0

Source: Pakistan Economics Survey 1995/96.

Table 4.28 Production of livestock products in Pakistan.

Year	Milk (⁰ 000 tons)	Beef	Meat (⁰ 000 tons)			Total	Per Capita Consumption		
			Mutton	Poultry Meat	Eggs (million)		Meat (kg/year)	Eggs (No. /year)	
1971/72	7800	346	208	14	568	583	8.97	9.20	
1975/76	8348	362	288	34	684	1,159	9.48	16.07	
1980/81	9267	434	370	52	856	2,319	10.21	27.66	
1985/86	1,2052	600	473	126	1,199	3,460	12.28	35.43	
1986/87	1,2669	630	507	134	1,271	3,800	12.62	37.74	
1987/88	1,3319	661	542	154	1,357	4,140	13.07	39.88	
1988/89	1,4003	694	581	172	1,447	4,300	13.52	40.17	
1989/90	1,4723	729	621	157	1,507	4,670	13.66	42.32	
1990/91	1,5481	765	665	151	1,581	4,490	13.90	39.46	
1991/92	1,6280	803	713	169	1,685	4,914	14.36	41.89	
1992/93	1,7120	844	763	265	1,872	5,164	15.49	42.74	
1993/94	1,8006	887	817	296	2,000	5,740	16.07	46.11	
1994/95	1,8986	931	875	308	2,114	5,927	16.51	46.30	
1995/96	1,9919	979	937	321	2,237	6,625	16.99	50.33	

Source: Pakistan Economics Survey 1995/96.

The production of milk, beef, mutton, poultry meat and eggs in Pakistan is given in Table 4.28. Milk production grew at an annual rate of 4% and reached 19.92 million tons in 1995/96 from 7.8 million tons in 1971/72. During the same time period, meat production in Pakistan increased by an average annual growth rate of 5.9% and reached about 2.24 million tons in 1995/96 from only 0.57 million tons in 1971/72. Egg production increased by more than 10 times from 583 million in 1971/72 to 6,625 million in 1995/96, at an average rate of growth of 10.6% per year. The production of livestock products grew much faster than the population resulting in higher per capita availability of milk, meat and eggs. Per capita meat availability increased from 8.97 kg to 16.99 kg per year

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from 1971/72 to 1995/96. Similarly annual per capita availability of eggs increased from 9.20 to 50 during the same time period. However, the per capita intake of these livestock products is still less than the recommended levels.

The demand for meat (beef + mutton + poultry meat), milk and eggs was projected using the trend projection method explained by Equation 1.1. The following simple trend regression equations are estimated for meat, milk and eggs:

$$\text{LnMEAT}_t = 6.2189 + 0.0582T \quad (4.6)$$

(54.45)

$$R^2 = 0.99$$

$$\text{LnMILK}_t = 8.8001 + 0.0413T \quad (4.7)$$

(22.72)

$$R^2 = 0.96$$

$$\text{LnEGG}_t = 6.6302 + 0.0949T \quad (4.8)$$

(16.91)

$$R^2 = 0.93$$

where,

LnMEAT_t = natural log of meat demand in year t

LnMILK_t = natural log of milk demand in year t

LnEGG_t = natural log of egg demand in year t

T = time, Year 1971/72, ..., 1995/96= 1,2,3, ..., 25

Note: figures in parenthesis are t-statistics.

Using Equations 4.6, 4.7, and 4.8, the domestic demand for meat, milk and eggs was projected from 1997 to the year 2000. Details of the future demand for these animal products are given in Table 4.29. The trend line projections are based on the assumption that the recent past trend will continue in future. It is estimated that meat, milk and egg demand will grow at per annum rates of 5.8, 4.1 and 9.5%. In the year 2000, demand for meat (beef, mutton and poultry meat) will be about 2.8 million tons, milk 23.4 million tons, and eggs 9.5 billion.

Income elasticities with respect to per capita consumption of meat, milk and eggs were also estimated. The estimated equations are:

$$\text{LnPCCMT}_t = -4.5348 + 1.9461\text{RPCI} \quad (4.9)$$

(11.88)

$$R^2 = 0.91$$

$$\text{LnPCCML}_t = 0.0788 + 1.3068\text{RPCI} \quad (4.10)$$

(10.66)

$$R^2 = 0.89$$

$$\text{LnPCCEG}_t = -2.3245 + 1.6439\text{RPCI} \quad (4.11)$$

(7.56)

$$R^2 = 0.80$$

where,

LnPCCMT_t = natural log of per capita meat demand in year t

LnMILK_t = natural log of per capita milk demand in year t

LnEGG_t = natural log of per capita egg demand in year t

RPCI_t = natural log of per capita real income in year t

Note: figures in parenthesis are t-statistics.

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As expected, income elasticities with respect to meat, milk and eggs are elastic. The income elasticity of meat is 1.95 meaning that with a 1% increase in real per capita income, meat consumption will increase by 1.95%. Income elasticities of milk and eggs are 1.31 and 1.64 respectively. The demand projections for meat, milk and eggs were also made using Equation 1.5, assuming a population growth rate of 2.8%, real income growth rate of 1.8%, and income elasticities as estimated through Equations 4.9 to 4.11. Projections based on these assumptions are given in Table 4.29. Meat and milk projections are higher compared to projections made by the trend line method. However, in the case of eggs, demand projections are slightly lower than by the trend line projection method.

Table 4.29 Demand for milk, meat and eggs in Pakistan.

Year	Trend Projection			Consumer Demand Projection		
	Meat (‘000 tons)	Milk (‘000 tons)	Eggs (million)	Meat (‘000 tons)	Milk (‘000 tons)	Eggs (million)
1995/96	2,237	19,919	6,625	2,237	19,919	6,625
1996/97	2,367	20,736	7,248	2,445	21,535	7,202
1997/98	2,504	21,586	7,929	2,672	23,280	7,830
1998/99	2,649	22,471	8,674	2,920	25,166	8,511
1999/2000	2,803	23,392	9,489	3,190	27,204	9,253

4.5.2 Demand and supply of feed

Per capita increase in income, changes in tastes and preferences, and changes in consumption patterns have increased the demand for livestock products which results in increasing demand for feed. The supply of feed is mainly estimated from food grains and by-products of oilseeds. Livestock production in Pakistan depends mainly on traditional feeding methods which include green fodder, dry roughage, range land and pasture. Cereal grains are not normally used for the feeding of ruminants in Pakistan. Concentrate feeds are also used, and there are mainly by-products of vegetable oil, milling, sugar gum and starch industries. By-products of milling include wheat bran, rice bran and polishings. Cotton seed cake, and mustard/rapeseed cake are generally used for ruminants. Meals of sesame, soybean, sunflower, safflower and linseed are generally used for feeding of poultry.

Presently no reliable information on the quantity of various agricultural products diverted to feed in Pakistan is available. Pakistan is major producer of cotton and cottonseed provides more than 90% of the total oilcake produced, which is mainly used for cattle feed. Rapeseed/mustard is the second largest source of oilcake and provides around 5% of total oilcake production. Sunflower, soybean, sesame are other minor sources of meal used in poultry feeding. The supply of oilcake, meal and the share of other grains used for feed in Pakistan are given in Table 4.30. The supply of feed more than doubled from 1970/71 to 1993/94. Oilseed cake from cottonseed and meal from non-traditional oilseed crops are the major sources of protein. The supply of feed increased at an annual growth rate of 3.7% from 1970/71 to 1993/94. Pakistan imported a sizeable amount of meal (mainly soybean meal) during the 1990s, mainly from India, to meet the needs of poultry feed. In the past, Pakistan exported only a small amount of oilcake/meal to other countries. The quantity and value of export of oilcake and meal is given in Table 4.31. The maximum export was in 1977/78 when 85,483 tons of oilcake and meal worth Rs 98.8 million was exported to Japan, the Netherlands and Denmark. During the 1980s, the export remained negligible.

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Table 4.30 Supply of oilcake, meal and other feed grains in Pakistan ('000 tons).

Year	Cotton Seed	Rapeseed Mustard	Sesame	Sun-flower	Soybean	Imported Meal	Other Grains*	Total
1970/71	724	160	2.6	0.2	0.7	-	1,554	2,442
1979/80	1,008	147	4.9	0.2	1.0	-	1,763	2,924
1990/91	2,173	135	5.3	34.3	4.0	14	2,879	5,231
1991/92	2,924	130	7.1	45.9	4.6	27	1,826	4,938
1992/93	2,165	123	8.5	29.3	4.2	48	2,963	5,293
1993/94	1,837	126	8.0	32.8	4.9	100	3,605	5,614

Source: Agricultural Statistics of Pakistan 1993/94; NODP 1995.

* Estimated from FAO Food Balance Sheet and various other reports.

Table 4.31 Export of oilcake and meal from Pakistan ('000 tons).

Year	Castorseed Oil Cake	Cottonseed Cake	Rapeseed Cake/Meal	Unspecified Cake
1971/72	1,112 (0.159)*	6,316 (1.602)	5,144 (1.470)	532 (0.27)
1977/78	-	- (98.8) (34.0)	89,829	20 (0.042)
1986/87	-	837	- (1.2)	(0.6)
1988/89	-	-	- (0.1)	40
1989/90	-	-	- (0.3)	100
1990/91	-	-	- (0.1)	40

Source: Economic Survey and Agricultural Statistics of Pakistan.

* Figures in parentheses are the value of export in million rupees.

Livestock output units (LOUs) are calculated by adding the total production of meat (beef, mutton and poultry meat), one-tenth of total milk production, and eggs (assuming average weight of 50 grams per egg). The number of LOUs increased from 1,316 thousand in 1970/71 to 4,088 thousand in 1993/94. The feeding ratio, or the quantity of feed consumed to produce one unit of livestock product, decreased from 1.9 in 1970/71 to 1.4 in 1993/94 (Table 4.32).

Table 4.32 Livestock output units (LOU) and feeding ratio in Pakistan.

Year	Total Feed Supply ('000 tons)	LOU	Feeding Ratio
1970/71	2,442	1,316	1.9
1979/80	2,924	1,831	1.6
1990/91	5,231	3,554	1.5
1991/92	4,938	3,559	1.4
1992/93	5,293	3,842	1.4
1993/94	5,614	4,088	1.4

Based on the demand projection for livestock meat, milk and eggs (Table 4.29) and estimated LOUs, the demand for feed was projected from 1997 to the year 2000 (Table 4.33). The projection made through the trend line procedure for feed demand in Pakistan is lower than that derived from the consumer demand method using Equation 1.5. The demand projections for feed estimated using population growth rate, income elasticity of livestock products, and per capita real income growth seem to be more realistic.

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Table 4.33 Demand projections for feed in Pakistan.

Item	1997	1998	1999	2000
LOUs ('000)				
Trend Projection	4,803	5,059	5,330	5,617
Consumer Demand Projection	4,958	5,391	5,862	6,374
Feeding Ratio	1.46	1.46	1.46	1.46
Feed Demand ('000 tons)				
Trend Projection	7,012	7,386	7,782	8,201
Consumer Demand Projection	7,239	7,871	8,558	9,306

5. New Emerging Commodities

In this section, some of the new emerging agricultural commodities in Pakistan are discussed. Their domestic and export potential is also discussed in detail. Among the new commodities which emerged during the last few years, canola (a rapeseed variety), strawberries, and mushroom are worth mentioning. The development of a new enterprise requires coordination and management control over many stages including varietal selection, production, harvesting, grading, packaging, transport and marketing. Integration is required between the various vertical elements in the production-to-market chain. The new commodities will not succeed if researchers and producers independently select varieties and commodities according to their own mandate and schedule and only selling the commodities in local markets. They should be aware of the market potential of the commodity in both domestic and international markets and tastes and preferences of consumers.

5.1 Canola

Pakistan is one of the largest importers of edible oil and the world's largest consumer of palm oil. In 1995, around 1.5 million tons of edible oil was imported which cost the national exchequer over Rs 31.00 billion which is more than 70% of the total foreign exchange allocation to import all agricultural commodities and products. Palm oil and soybean oil are the major edible oils imported from Malaysia and USA, respectively. The imported edible oil meets around 70% of the national requirement and the rest is produced in the country (Table 4.1). Cottonseed is the major oilseed crop and accounts for 73% of Pakistan's domestic edible oil production. Rapeseed/mustard is the second most important source of oil and contributes about 16% in domestic production of vegetable oil. Non-conventional oilseed crops (sunflower, soybean and safflower) are only planted on a limited scale and contribute less than 5% in domestic production. Groundnut, sesame, maize and rice husk are other minor sources of edible oil production.

The area under rapeseed and mustard has been declining for the last three decades. In 1970/71, its area was 510 thousand hectares with a production of 269 thousand tons. The area under these crops decreased to 301 thousand hectares with a production to 229 thousand tons in 1994/95, thus registering a 41% decline in area and 15% in production during the last 25 years. The area, production and yield are given in Table 5.1. Rapeseed/mustard crops compete with wheat for area as both are grown in winter. Being a staple food, farmers, especially small ones, prefer to plant wheat and usually inter crop these oilseeds with wheat and fodder. Therefore, these crops never get any respectable place in the prevailing cropping patterns of Pakistan. The average yields of these crops are also low as these are mostly grown on marginal lands.

Rapeseed/mustard are traditional oilseed crops in Pakistan and farmers are very familiar with their husbandry and face no marketing problems. The oil extracted from these crops is mainly used for pickle preservation, hair and body lotions, household cooking and frying, medicinal uses for animals, and as lubricants. However, oil extracted from these crops is not used in the manufacture of vegetable ghee as it contains high levels of erucic acid (40-70%) which is harmful to human health. The indigenous varieties also contain high levels of glucosinolates in the seed tissues, which impart the typical mustard flavor to the product and also inactivate the nickel catalyst used in the hydrogenation process for ghee production. Thus, regular rapeseed is not considered a safe edible oil for human consumption, commercial production and refining (Manzoor and Stringam 1991).

Canola is a special type of rapeseed which provides a premium quality refined edible oil. Its oil is low in erucic acid (5%) and oil-free meal is low in glucosinolates (40 micromolus). Low erucic acid oils are nutritionally rich for human health and similarly, with low glucosinolates, oilseed cake makes a more desirable animal and poultry feed. Also the low glucosinolate level results in less pungent processed oil of canola compared to the traditional rapeseed/mustard oils. In addition to these qualities, canola contains no cholesterol. Compared to soybean meal, canola meal is a better source of calcium, iron, manganese, phosphorus, and selenium. It also contains more choline, biotin, folic acid, riboflavin, and thiamine and has a higher content of the essential amino acid methionine but a lower content of lysine. These qualities make edible oil extracted from the canola type of rapeseed more popular among consumers. On the other hand, the traditional rapeseed/mustard meal has high levels of glucosinolates, can cause goiter and also adversely affects growth and reproduction of animals (Manzoor 1991). Keeping in view all the qualities of canola, the potential exists to replace traditional rapeseed/mustard with canola varieties. It would help to improve the edible oil deficit in Pakistan and would save a considerable amount of foreign exchange.

Table 5.1 Area, production and yield of rapeseed/mustard in Pakistan.

Year	Area (’000 ha)	Production (’000 tons)	Yield (kg/ha)
1970/71	519.9	263.3	526
1975/76	470.1	267.3	569
1980/81	417.0	252.5	606
1985/86	350.6	249.9	713
1986/87	302.8	213.2	701
1987/88	268.9	204.2	759
1988/89	333.6	249.0	746
1989/90	307.1	233.1	759
1990/91	303.5	228.3	752
1991/92	286.5	219.7	767
1992/93	284.6	206.9	727
1993/94	268.5	197.4	735
1994/95	300.6	229.4	763

Source: Agricultural Statistics of Pakistan 1994/95.

Canola is well known in North America and in Europe, where it is called Zero-Zero or Double Zero rapeseed for its low sulfur compounds and non-odorous characteristics. Presently canola is also cultivated in Australia, China, India and USA. The improved varieties of canola were originally developed in Canada, Sweden, Australia and Poland. In Pakistan, these varieties were introduced by the Barani Agricultural Research and Development Project (BARD) of PARC during the late 1980s with the cooperation of the Canadian International Development Agency (CIDA). Initially, these varieties were only planted in rainfed areas around Islamabad and NWFP. Later on these crops were also grown for commercial purposes in irrigated areas of the Punjab. Presently canola type varieties are planted throughout the Punjab and NWFP.

In Pakistan, canola varieties of rapeseed exist in two species, namely *Brassica napus* and *Brassica campestris*. During the first few years of canola introduction, the *Brassica napus* variety, which is a Canadian variety named 'Westar', was very popular and mostly tested and successful in rainfed areas. Later on, an Australian variety, 'Shiralee' (*Brassica campestris*), a short duration variety, was introduced by the BARD program. Compared to Westar, Shiralee is a high yielding variety as tested by the BARD program on various locations. Both these major varieties are successfully grown in both rainfed and irrigated areas. The BARD program has demonstrated on various locations during the last five years that these two varieties are hardy, drought resistance and high yielding compared to traditional varieties, and profitable compared to all competing crops including wheat (Ahmad 1996; BARD 1990; Manzoor and Stringam 1993).

In 1990/91, the area under canola type rapeseed was only 5,000 acres. In 1994, the Economic Coordination Committee of the Cabinet approved a three year development project entitled "Intensive and Extensive Development of canola" to considerably increase the area under canola and to reduce the deficit of edible oil in Pakistan. The project was implemented during the 1995/96 season and a massive campaign was launched throughout the country by the Pakistan Oilseed Development Board (PODB) and BARD Program. The Board claimed that in 1995/96, area under canola increased to 100,000 acres in Pakistan due to their campaign through provincial extension departments, newspapers, radio, TV, etc. The project has also involved the private sector in procurement and processing. The private sector is already procuring the canola crop and extracting edible oil for human consumption. Presently, canola oil is available in various Utility Stores Corporation (USC) stores and other general sales outlets. The oil is getting very popular especially among the health conscious consumers of Islamabad and Rawalpindi. Due to the high quality edible oil and meal, the private sector is very interested in involvement in its procurement and extraction of edible oil for human consumption. The interest and involvement of the private sector in this enterprise is a good sign for promotion of canola production in the country.

It is claimed by PODB and BARD Program that canola was planted on 100,000 acres during 1995/96. It is expected that this landmark development will produce 50,000 to 60,000 tons of canola oilseed (worth around Rs 700 million) and at least 16,000 to 20,000 tons of high quality edible oil (worth around Rs 500 million). In addition, it will also produce 33,000 to 40,000 tons of canola meal (worth around Rs 150 million) for livestock and poultry feed. However, some in private industry believe that the estimates of area under canola during 1995/96 are too optimistic. However, they feel that this year the overall rapeseed/mustard/canola crop was good. Also they fully agreed with the qualities of the edible oil and meal from canola and they are very interested in procuring canola oilseed from the growers. It may be hoped that with these efforts by the public and private sectors during the past few years, the edible oil deficit can be considerably decreased during the next 3 to 4 years.

The available evidence shows that the existing canola type rapeseed varieties in Pakistan can effectively replace conventional varieties. The complete replacement can surely increase the production of edible oil production in the country. The available evidence indicates that this is not a difficult task since proven technology of its cultivation is available; acceptability among consumers is established; the high quality of the edible oil and meal has been determined; there is a visible economic edge over other conventional rapeseed varieties and competing crops; the private sector has willingly accepted it for further processing; the marketing system has been developed; and conventional methods can be used for crushing in the villages to meet the edible oil needs of the rural masses. However, this can only happen if growers of traditional rapeseed/mustard varieties are well informed, motivated and educated through extensive extension services about the available technology and qualities of canola. In addition, to promote canola in Pakistan, farmers also require good quality canola seed, inputs, credit, threshers, ensured marketing, guaranteed prices, etc. Also, authentic and reliable data on acreage and production are required to evaluate its adoption and share in the total domestic production of oilseed in Pakistan. Of course, it also requires a political will and effective research and development in the country to save foreign exchange by reducing the edible oil deficit.

5.2 Strawberry

Strawberry is a highly nutritive, soft and delicious fruit recently introduced at the farm level in Pakistan. During the 1980s, it was demonstrated at various research stations and a few years ago it was adopted by a few innovative growers around Islamabad, Lahore, and Malakand division in NWFP. The main markets of strawberry are only Islamabad and Lahore. However, very little is

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known about its area, supply schedule, volume, price, etc. In Islamabad, the local producers and producers from other areas mainly supply strawberry directly to retail supermarkets, big hotels and to local assemblers-cum-processors. The local wholesale market in Islamabad generally does not deal with such perishable commodities. However, in Lahore, strawberry is traded in the wholesale fruit and vegetable market through commission agents. However, producers also supply directly to retailers and processors. The supply of strawberry starts at the end of January and continues until the end of May each year. The consumers of strawberry are generally rich people, foreigners, processors, hotel kitchens, etc.

Many varieties of strawberries are grown in Pakistan. Toro and Douglas obtained from USA are suitable for southern areas of Pakistan. Tufts, Chandler, Cruz and Pocahontas are recommended for Islamabad. Chandler, Corona, Tufts, Honeyo and Gorella are suitable for Swat (Shah et al. 1989). Strawberry is an early maturing fruit and can be planted around the year; hence, it brings a high and quick economic return to its cultivators. Winter planting is common in Pakistan. However, due to diverse agro-ecological zones in Pakistan, summer, autumn and spring plantings have also been successfully demonstrated by different agricultural research institutes.

In Pakistan, strawberry has a great potential due to the diverse climatic conditions which are conducive to its growth. It can be successfully grown in the central and northern Punjab, and hilly areas of NWFP province, where the plants can be sustained for two to three years. Besides meeting local demand, the fruit can be successfully exported to earn foreign exchange. For the 1995/96 strawberry crop, retail prices were Rs 40 to 70 per kg and farmers on average earned a net income of Rs 75,000 to 110,000 per hectare in Islamabad. Farmers around Islamabad generally plant less than one hectare and get a yield from 2.5 tons to 10 tons per hectare in the first year. With the correct post harvest technology, strawberry can easily be marketed fresh throughout Pakistan and also can be exported to other countries. The introduction of new varieties that have a longer shelf life would increase the potential of this crop.

For strawberries, different types and sizes of packaging material are used. In Islamabad, 250 and 500 gm cardboard boxes and 500 gm cane baskets are usually used. On the other hand, in the Lahore market, the produce is traded in cane baskets containing 8 to 9 kg and also in 250 gm capacity hard paper packets.

Pakistan has only exported around 4 tons of strawberries (worth Rs 1.1) to India in 1993/94. The superior size of the European market indicates that it may be the prime potential market for Pakistani strawberry and it has a sufficient seasonal edge to be a viable competitor (Daines et al. 1991b). In the European market, Germany is the largest single potential market which can absorb approximately 6,000 metric tons of fresh strawberries per week and still maintain prices which would be profitable to a reasonably efficient Pakistani exporter of strawberry. In addition to Germany, UK, France and Japan are other potential markets and all four markets can absorb roughly 10,000 metric tons per week at prices profitable to a Pakistani producer. The market "window of opportunity" for Pakistani exporters in these markets is from July to March. However, quality is the key in penetrating these potential markets. Pakistani strawberry can easily be air freighted to European markets with high efficiency cooling facilities from farm to air transport.

Strawberry is a new emerging commodity in Pakistan. It was only introduced during the 1980s and, except for a few innovative growers, most farmers are not familiar with its husbandry. The consumer base is restricted to those who have been abroad or have a wide exposure to the outside world especially Europe. The other main users of this commodity in Pakistan are processors of ice cream, jam and cake, marmalade and drinks. It is also used in different medicines and cosmetics. It can be used in both fresh and frozen form around the year. Moreover, a growing awareness regarding the nutritional value of strawberry and overall changing tastes and preferences of urban society suggest that it has bright growth prospects. Also, the available evidence shows that due to the low cost of production and conducive agro-climatic conditions in Pakistan, the export potential of strawberry is substantial. Also, it has potential benefits for small farmers in terms of generating rural income and employment.

The major constraint to strawberry export is the lack of post harvest technology in packing, grading standards and cool chain distribution. Refrigerated transport for such fruit is a vital part of any successful marketing operation under the prevailing climatic conditions in Pakistan. Since this is a new commodity for Pakistani farmers, it requires a well planned training programme for farmers regarding husbandry, available technology, and post-harvest technology. In addition, farmers will also require inputs especially good quality runners, credit, ensured marketing, etc. Of course, this can be done though very effective research and development in potential areas of Pakistan. Contract farming is suggested for speedy adoption of existing strawberry technologies and to considerably increase its production. The government should inform private exporters of the opportunity to exploit strawberry. In this regard, the Export Promotion Bureau of Pakistan can play an important role in the identification of potential export markets, the required standards, and the provision of air freight from Pakistan.

5.3 Mushroom

In Pakistan, mushrooms can be widely observed in rural plains during the rainy season growing on manure heaps and damp places with a lot of humus. Also, different species of mushroom can be found in places such as fields, woods, forests, water channels, bunds, grassy grounds, etc. All these types of mushroom belong to a natural group of mushrooms which is found in different parts of Pakistan. In this group, the white umbrella mushroom *Agaricus redamine*, *Folare nigerians* and *Podaxis pistillaris* are most common and they are consumed by the locals. Black morel, a wild variety, is rarely available and it is only supplied for export purposes by some contractors from Kashmir and northern hilly areas. There are about 30 types of mushroom cultivated in Pakistan. However, button and oyster still account for around two-thirds of total production in Pakistan. The other quite successful varieties which have commercial value in Pakistan and the international market are Chinese and Shiitake varieties. However, mushroom in Pakistan is produced on a commercial basis on only a limited scale. Almost all the mushrooms produced in the organized sector are of the white button type. Nature has gifted Pakistan with most suitable environmental conditions of temperature and humidity from sea level to the high mountains. Thus, different kinds of mushroom can be easily grown throughout Pakistan around the year. Apart from this, there is also a lot of crop, livestock, textile, and industrial waste which could be utilized for cultivation of mushroom. Complete and reliable information regarding its total production in Pakistan is not available.

Major markets of mushroom in Pakistan are Karachi, Lahore and Islamabad. The mushroom exporters are also located in these cities. Oyster type mushroom is only supplied in the Islamabad market by small cultivators who generally produce under natural conditions. These producers around Islamabad are not full time organized cultivators but grow mushroom part time for high pay. The button type mushroom is supplied by the National Logistic Cell which is a public sector company and it is produced in a controlled environment. This company supplies all three major markets in fresh form as well as in canned form to meat and vegetable dealers, hotel kitchens, etc. In addition to these producers, different types of mushroom are also produced at different agricultural research stations for research purposes and distributed directly to consumers. Some wild type mushrooms, which grow at different times of the year, are collected by the local people in the hilly areas and they are usually sold to local contractors of different exporters. Mushroom exporters usually collect from these contractors and export to European countries in the processed form as desired by importers. More than 90% of the mushroom export from Pakistan is in the processed form. However, in the local market, it is supplied in the fresh form. During recent years, mushrooms almost occupied the first position amongst fresh vegetables exported from Pakistan.

Mushroom cultivation is a highly profitable enterprise as discussed in many reports (Chaudhry and Young 1989; Hussain 1988; Mirza 1993; Rehman and Ashraf 1995). In Pakistan, a

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lot of crop straw (rice and wheat) is available, which could be utilized to grow mushrooms for local purposes as well as for export. The spent compost would provide additional organic fertilizer to small farmers, which would save expenditure on chemical fertilizers. Also, cultivation of mushroom will diversify the rural economy and will provide new income and employment opportunities in rural areas. It will further increase mushroom exports from Pakistan and it will help bring more foreign exchange into the country.

In 1981/82, only 25.5 tons of mushrooms worth Rs 20 million were exported from Pakistan, but after 1985/86, the export was considerably increased. Mushroom export from Pakistan increased by 241% from 1981/82 to 1993/94 (Table 5.2).

Table 5.2 Mushroom export from Pakistan.

Year	Quantity (tons)	Value (‘000 Rs)	Unit Value (‘000 Rs/ton)
1981/82	25.495	20,059	787
1982/83	37.828	25,965	686
1983/84	42.592	31,245	734
1984/85	52.297	49,282	942
1985/86	55.385	62,597	1,130
1986/87	63.455	94,589	1,491
1987/88	53.247	80,968	1,521
1988/89	66.797	98,691	1,477
1989/90	86.833	132,548	1,526
1990/91	66.879	98,416	1,471
1991/92	75.356	127,630	1,694
1992/93	78.570	142,299	1,811
1993/94	87.035	202,760	2,330

Source: Federal Bureau of Statistics, Islamabad.

Although the natural conditions in Pakistan are ideal for mushroom cultivation, mushroom export from Pakistan is not as high as it should be. This is due to the fact that mushroom production in Pakistan is still a new enterprise and its export is an even more recent development. The major importing countries of Pakistan mushroom are France (73%), Switzerland (17%) and Germany (4%). Other countries including the Netherlands, UK, Finland, Sweden and Singapore imported only a small quantity (Table 5.3).

Table 5.3 Export destination and quantity of mushroom exported from Pakistan in 1992/93 and 1993/94.

Country	1992/93		1993/94	
	Quantity (‘000 tons)	Share (%)	Quantity (‘000 tons)	Share (%)
France	53.102	67.59	63.796	73.28
Germany	2.255	2.87	3.927	4.40
Switzerland	20.303	25.84	15.219	17.48
U.K.	0.060	.08	0.612	0.70
Finland	-	-	0.900	1.03
Austria	0.020	.02	0.120	0.14
Belgium	-	-	0.328	0.38
the Netherlands	-	-	1.560	1.79
Singapore	-	-	0.700	0.80
Czechoslovakia	2.520	3.21	-	-
Sweden	0.310	0.39	-	-
Total	78.570	100	87.062	100

Source: Federal; Bureau of Statistics, Islamabad.

Per capita consumption of mushrooms in developed countries has increased many fold during the last two decades and it is expected to increase more during the 1990s (Table 5.4). Also, with the opening up of the global economy, rapid industrialization, trade liberalization, global improvement in per capita income and living standards, and health consciousness among the people, the demand for nutritionally rich vegetables such as mushroom is likely to improve in developed and underdeveloped countries in the near future. Therefore, it is very important for countries like Pakistan with diverse agro-ecological conditions to know the potential export markets if they are to fully benefit from the trade opportunities and decrease their trade deficits to some extent.

Table 5.4 Consumption of mushrooms (gr/capita/year) in selected developed countries.

Country	1970	1980	1990
USA	560	750	1,600
UK	900	1,000	1,800
Germany	1,000	2,000	2,400
France	970	1,200	2,300
the Netherlands	600	800	2,700
Switzerland	650	850	2,100
Belgium	600	800	2,700
Denmark	1,000	2,000	2,400
Italy	500	700	900

Source: FAO Yearbook 1990.

In addition to creating more export opportunities, mushroom cultivation will also benefit the rural landless and small farmers by:

- improving the present nutritional status of the poor masses, especially the rural poor;
- creating new income and employment opportunities;
- solving the problem of organic wastes by using them as raw material in mushroom cultivation;
- efficiently using crop straw to produce organic fertilizer;
- improving the purchasing power of the rural poor;
- furthermore, mushroom cultivation is ecologically sustainable; highly profitable compared to many other agricultural commodities; and export earnings could be substantially increased.

Based on discussion with mushrooms growers, traders, and researchers, the following suggestions and recommendations for improving the production of mushrooms in Pakistan are proposed:

- create awareness about mushroom uses, benefits, and nutritional value among the rural and urban masses;
- disseminate technical information regarding husbandry and markets among growers through electronic media;
- fund research and development to improve productivity for local as well as for export purposes;
- provide spawn of those varieties for which there is more demand in the foreign markets;
- provide adequate credit facilities to growers;
- train both growers and traders regarding post harvest technology of grading, packaging, etc.;
- create linkages among growers;
- improve extension services;
- arrange cold chains for distribution to urban areas; and
- stimulate the Export Promotion Bureau the look for new foreign markets and disseminate information to its exporters and producers.

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Increasing urbanization, rising per capita income, changing tastes and preferences, high growth rate of the population, nutritional awareness, and developments in the electronic media are surely the indicators of improving local demand for mushrooms. Since mushroom is a rich source of protein, with the changing tastes of urban society, it has a great market growth potential. Therefore, the special attention of both public and private sectors is required to fully benefit from this new emerging enterprise. So far most mushroom production is in the informal sector, except the National Logistic Cell which is a public company, and only the button type mushroom is produced for local consumption. Therefore, there is a dire need to take up mushroom production in the organized sector to boost its production in Pakistan.

6. Successful and Failed Market Attempts

Pakistan lies between the Tropic of Cancer and 38°N, with very high mountains to the north and west. The range of climate conditions includes humid tropics on the southern coasts, arid desert bordering the central plains, dry tropics in central regions, sub-tropics in the mountain foothills and temperate to cold regions at altitude in the north and west. The main agricultural feature of the country is the Indus plain, the main river and its tributaries forming a rich fertile plain with abundant water for irrigation. There is thus a very wide range of agro-climates, allowing the production of a wide range of tropical, sub-tropical and temperate fruits and vegetables.

Pakistan has a long and successful history of growing tropical fruits which could be exploited commercially as export crops. These tropical fruits include mango, guava, banana, lychee, etc. The main sub-tropical fruits include citrus, persimmon, grape, and pomegranate. The deciduous crops include the pip fruit or apple and pear, and stone fruit such as peach and plum. The other group of fruits are the berries which have high export potential in the international market, but can only be exported by air. The berries include strawberry, blueberry, and blackberry which can be successfully grown in selected ecozones in Pakistan. Almost all types of vegetables can be successfully grown in Pakistan including onion, tomato, potato, asparagus, mange tout, fine beans, okra, chili, garlic, cauliflower, musk and sweet type melons, etc. The majority of these vegetables offer little export potential since they are of low value and produced in the same season as many of the importing countries. However, vegetables grown out-of-season in selected ecozones have high export potential. The traditional vegetable crops such as onions and garlic are capable of being produced to full international standards in Pakistan.

Keeping in view the variation in altitude and latitude in Pakistan, it is possible to harvest a long list of fruits and vegetables over a longer period, starting in the south and then moving north. This results in the year-round supply of both fruits and vegetables and shows the export potential of Pakistan. However, a wide and well developed production base such as in Pakistan, is not necessarily a suitable base for export marketing. Generally the domestic market is based on consumers taste and preferences and domestic consumers give little weight to appearance, condition and uniformity which is usually not true for export markets. There is tough competition among the fruit and vegetable exporting countries and all the countries compete for better quality produce in the foreign markets. In this regard, Pakistan has had success with a few exportable agricultural commodities, and with others, Pakistan has made an attempts but has totally or partially failed. In this section, both successful and failed marketing attempts are discussed. Whether or not Pakistan's fresh produce export record is considered a success or failure depends upon the criteria used for judgement. Change over time in the volume of export of fruit and vegetables from Pakistan, value productivity, research and development, government policies, and market structure are general criteria used in this report.

6.1 Successful attempts

6.1.1 Mango

Pakistan is the third largest producer of mango after India and Mexico (FAO Production Year Book 1991). Among the fruits planted in Pakistan, mango occupies the second place in terms of area after citrus. In 1993/94, 16% of the total fruit area in Pakistan was under mango. The total mango area in Pakistan increased from 54.0 thousand hectares in 1975/76 to 883.7 thousand hectares in 1994/95, a rate of 2.6% per year. Total production of mango in Pakistan increased from 595.7 thousand tons in 1975/76 to 88.3 thousand tons in 1994/95 which is an increase of 2.1% per

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year (Table 6.1). The yield of mango in Pakistan is very low compared to the potential yield. The average yield has remained static at around 9.5 tons per hectare, which is far below what other major producing countries such as Venezuela are getting (15 to 20 tons per hectare). However, mango yields vary from one variety to another and from area to area. Also, production of mango given in the statistics includes old and neglected orchards. The increase in production compared to area is low because of many factors, such as the practice of inter-cropping of this exhaustive crop in the orchard, absentee landlordism, lack of technical know-how, improper plant protection measures, poor extension services, improper post harvest technology, etc. (Ali et al. 1989; Hussain et al. 1989a). More than 50% of the total mango area in Pakistan is in Punjab province followed by Sindh (45%), Baluchistan (2%) and NWFP (0.2%). The details of area and production of mango in all four provinces are given in Appendix 8.

Table 6.1 Area, production and yield of mango in Pakistan.

Year	Area (‘000 ha)	Production (‘000 tons)	Yield (tons/ha)
1975/76	54.0	595.7	11.03
1980/81	57.2	546.6	9.56
1985/86	75.3	713.4	9.47
1986/87	77.6	736.6	9.49
1987/88	79.4	712.9	8.98
1988/89	80.2	735.0	9.16
1989/90	82.2	766.0	9.32
1990/91	85.4	776.0	9.09
1991/92	86.0	787.2	9.15
1992/93	83.6	793.7	9.49
1993/94	84.8	839.3	9.90
1994/95	88.3	883.7	10.00

Source: Agricultural Statistics of Pakistan 1994/95.

In Pakistan, mango is known as the "King of the Fruits". There are about 46 local mango cultivars grown throughout Pakistan and many imported cultivars have been planted, mainly the "Florida" types, such as, "Sensation", "Zill", "Haden", "Tommy Atkins", etc. However, for commercial production, particularly for export, around 10 main local varieties are grown.

Early, mid-season, mid-late and late varieties are planted and have proven very profitable and high yielding. The climate of Sindh province gets warmer about one month earlier than Punjab province, therefore early varieties of mango are successfully grown in Sindh province. Similarly, most of the late sown varieties are grown in Punjab province because the climate gets warmer one month later than Sindh province. Therefore, keeping in view the diverse climatic conditions in Pakistan, with promotion and development activities, mangoes could be made available for a longer period which may further improve mango export. Presently, mango in Pakistan is available from mid May to mid September. June to July is the peak mango harvesting period. Major mango varieties and their potential and characteristics are given in Table 6.2. Pakistani Sindhri, Langrah and Chaunsa are well known in the world for their delicious flavor and strong and fragrant aroma. Dusehri, Anwar Ratoool and Gulab Khas are other very delicious varieties high demanded in local and Middle East markets. Besides eating, Pakistani mangoes are also very suitable for jam, jelly, sauce, pickle, juice, mango milk shake, ice cream, and are rich in vitamins A, B and C.

Table 6.2 Mango varieties grown in Pakistan and their characteristics.

Variety	Characteristics
1. Langrah	Skin colour is light green or a combination of yellow and green, weight between 200 and 500 gm. The colour of pulp is yellow and without fibre. Approximately 100 to 120 kg of mango can be obtained from one tree. Available throughout Punjab.
2. .Malda	Also known as Soroli. The green mango is smaller than Langrah. Its pulp is reddish yellow. Cultivated south of Punjab.
3. Dusehri	The mango is longer in size; skin colour is whitish with an inner pulp of yellow. One tree produces 50 to 100 kg of mango. Production in the Punjab is of a better quality.
4. Sindhri	Large, long, and slightly curved, yellow, not as sweet as Langrah or Malda but a specialty of Sindh Province.
5. Anwar Ratol	Small mango in the shape of semi circle with greenish colour and red inner pulp. Tasty and sweet smelling. Production of a tree is 50 to 100 kg in Punjab.
6. Bagon Pali	Produced in Sindh province A mixture of green and yellow colour. Sweet and tasty with a light yellow inner pulp. Large with a small stone. Average production is 80 kg per tree. Grown successfully in Karachi and Hyderabad division.
7. Alfeanso	Grown south of Sindh including Hyderabad division. An oval shaped medium size mango, reddish yellow colour with a small stone, sweet smelling and excellent for preparing mango juice.
8. Khasa	Oval shaped, medium size produced in Hyderabad. Off-white with red spots. Inner pulp red. Very sweet. Production of a tree is 120 to 140 kg.
9. Swarnarika	Produced in Hyderabad. Oval shape large in size, dark yellow in colour. Off-white inner pulp but not as sweet as other mangoes. The stone is thinner. Average production of a tree is 220 kg.
10. Chunsa	Produced in Punjab. Big size, yellow colour, dark yellow pulp. Thin seed. Sweet smell. Average production is 150 kg/tree. Long season, fibre-less pulp, fragrant aroma. Most superior mango of Punjab.
11. Samar Bahishtti	Produced in Punjab. Almost round in shape, small size, green colour. Pulp is off-white. Sweet smelling, medium size stone, and second best after Chunsa. Average production is 100 kg.
12. Fajri Clann	Big in size and produced in Punjab, colour is reddish yellow. Taste is not as good as other mangoes. Late season variety.

Source: Export Promotion Bureau.

Although mango is a very important fruit in Pakistan it is not yet cultivated scientifically. Many growers still follow old traditional practices and are not familiar with new techniques of cultivation. Many growers have old orchards which need to be replaced. Also, most of the growers, specially the small ones, are not familiar with post-harvest technology and export standards, and have poor know-how about the husbandry of mango. Generally, large orchards are owned by absentee landlords and they lease their orchards or sell to pre-harvest contractors which have contacts with commission agents in the big wholesale markets in Karachi, Lahore, Multan and other big cities. Some mango growers also prefer self-marketing. However, the common practice in Pakistan is to sell to pre-harvest contractors. These pre-harvesters generally pay in part before the harvest and pay the rest at harvest time. In this case, all the risk of a bad crop is born by the contractor. The owner of the orchard must apply all the inputs and the contractor is responsible for harvesting and looking after the crop. It is a common observation that these pre-harvest contractors exploit the growers by delayed payments, which results in low profit and a poor crop in the following year. Pre-harvest contractors and growers generally bring their produce to the wholesale market and commission agents sell their produce through auction in the market and charge commission of 5 to 7%. All the retailers buy from these wholesale markets in open auction. The pre-harvest contractors and farmers who self-market their produce do all the packing operations at their farms. Some of the commission agents are also pre-harvest contractors and owners of orchards. The mango exporters generally procure in the wholesale markets in Lahore and Karachi and then repack at the exporters' packing area. These exporters select export quality mangoes and resell the lower grade fruit in the wholesale market. Some of the exporters own orchards within the family and procure directly from their farms or through their relatives and local friends. Several mango exporters procure from the wholesale markets and supplement purchases from the pre-harvest contractors. Repacking by the mango exporters in their packing areas is done manually and this usually reduces the shelf life of mangoes considerably. Therefore, to avoid unnecessary time

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delay, to improve shelf life, save on repacking labour charges and packing material, export standard grading and packing should be done at the farm level. However, this needs extensive training of the picking labour regarding post harvest technology and strict supervision during grading and packing. From Lahore, almost all of the mango export is air-freighted to Europe and the Middle East. From Karachi, mangoes are exported by air and sea to Europe and the Middle East.

In Karachi mango exporters rent large (40 feet) and small (20 feet) containers (subject to the availability) for export by sea. The small container can carry 768 wooden boxes and the large container can accept 1,558 wooden boxes of mango. Each box of mango weighs 15 to 17 kg. The exporters consider that sea freighted mango exports return a high profit compared to air-freight export.

The exporters do not treat mangoes with any chemicals for export purposes. A few large growers-cum-exporters give a pre-cooling treatment to increase shelf life by dipping mangoes into water with chilling temperature below 12°C just after picking from trees. However, this is not a common practice. Most of the exporters lack market information and totally rely on their own sources and personal contacts in the importing countries.

Pakistan exports a considerable quantity of mango every year, mainly to the Middle East and also to Europe. In 1993/94, total export of Pakistani fruit was 127.5 thousand tons (worth Rs 1.324 billion) and 12% of the total export quantity were mango (7% of total value of fruit export). The quantity and value of mango exported from Pakistan during 1981/82 to 1994/95 fluctuate but there is an increasing trend in the quantity of export which grew at an annual rate of 6.7%. The export of mango increased during the 1990s. The unit value in rupees shows little increase over time but in dollars it actually declined due to devaluation of the Pakistani rupee against the US dollar. (Table 6 3). The available data on mango export and production show that Pakistan exports less than 2% of the total mangoes produced in the country. The main export markets of Pakistani mangoes are the Middle East countries where around 95% of mangoes are exported.

Table 6.3 Export of mangoes from Pakistan.

Year	Quantity (tons)	Total Value (‘000 Rs)	Unit Value (Rs/ton)
1981/82	6,810.2	39,996	5,873
1982/83	13,331.2	81,566	6,118
1983/84	9,864.7	58,182	5,898
1984/85	6,710.0	39,165	5,836
1985/86	7,683.0	48,066	6,256
1986/87	10,288.3	57,869	5,625
1987/88	11,002.9	65,441	5,948
1988/89	10,684.8	69,087	6,466
1989/90	14,769.5	85,895	5,816
1990/91	10,585.2	68,254	6,448
1991/92	17,716.1	112,017	6,323
1992/93	18,770.6	110,553	5,890
1993/94	14,830.1	88,309	5,955

Source: Federal Bureau of Statistics, Islamabad.

The main importer of Pakistani mangoes is Dubai followed by Saudi Arabia and the UK (Table 6.4). Most of the mango export is sea-freighted to Dubai. The increase in mango export from Pakistan is mainly due to the lower prices of mango in dollar terms. With the promotion of advanced post harvest technology including hot water treatment against fruit fly in the mango growing areas, and further promotion of Pakistani mangoes in the importing countries, improvement of exports procedures, better air port facilities, mango export can be considerably increased.

Table 6.4 Export destinations and quantities of mango exported from Pakistan, 1993/94.

Country	Quantity (tons)	Percent of Total
Abu Dhabi	44.83	0.30
Afghanistan	67.50	0.46
Austria	17.98	0.12
Bahrain	97.82	0.66
Cyprus	39.00	0.26
Dubai	13,538.11	91.29
Germany	31.10	0.21
France	15.88	0.11
Hong Kong	9.50	0.06
India	30.00	0.20
Japan	7.20	0.05
Kuwait	44.60	0.30
The Netherlands	87.66	0.59
Norway	26.40	0.18
Uzbekistan	19.75	0.13
Saudi Arabia	344.16	2.32
Singapore	43.84	0.30
Oman	10.21	0.07
USA	68.78	0.46
UK	248.34	1.68
Others*	37.43	0.25
Total	14,830.09	100

Source: Federal Bureau of Statistics, Islamabad.

* Including Bangladesh, Belgium, Canada, Czechoslovakia, Denmark, Greece, Iran, Italy, Kenya, Malaysia, Maldives, Qatar, Sri Lanka, Sweden, Switzerland, Tanzania, and Thailand.

The mango export to European countries is only a few tons. This may be due to the fact that export promotion campaign in these countries is not as effective as it should be. A study conducted by Daines et al. (1991) shows that mango markets are quite large and expanding in most west European countries and Japan. The three largest mango import markets are the UK, Japan and France and all of the mango supply in these countries is imported. The Pakistani window is open during the entire year with a total demand of approximately 36 million tons. The UK market is fairly stable and shows the same pattern of supply and demand each year. Presently, Venezuela and Pakistan are the largest suppliers of mango in the UK market. Venezuela supplies during April to June and Pakistan follows by supplying the market from June to August. Pakistan can easily supply at lower price and can make greater profit by increasing the supply to the UK. In Japan, the demand for mango is around 600 tons/week and Pakistan could get a share in this market by improving the post harvest processing and handling as required by Japanese consumers. Japan accepts only mangoes that have been vapor heat treated. This treatment which raises the internal temperature of the fruit to kill the fruit fly is a fairly time consuming process.

Reasons for success of mango marketing

- There has been a significant increase in area and production of mango in Pakistan. However, there was little increase in mango yield. The production base of mango in Pakistan clearly indicates that with a little more effort (though the Export Promotion Bureau and other government policies), export of mango can be considerably increased.

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- In Pakistan, mango is grown in a climate which is very suitable for its cultivation. Due to the diversity of agro-climatic conditions in Pakistan, the mango harvest season is considerably longer than in many other mango growing countries.
- More than 46 mango varieties are successfully grown in various ecozones of Pakistan. These cultivars include early, mid-season, and late varieties. Many of these cultivars are well known for their delicious flavor, fragrant aroma, attractive appearance, various sizes, export quality, etc., in local and international markets.
- The quantity of mango export is also increasing, especially to the Middle East countries. Also, per unit value of mango exports improved during the last few years.
- Mangoes can be exported by sea and air to Europe and the Middle East. Pakistan International Airlines is well established and connects with all potential importing countries. Similarly, Karachi port is also well established and can be used to export in bulk in containers, especially to the Middle East.
- Due to low labour costs, Pakistan has a competitive edge in terms of price over many other competing countries in the international market, especially in Europe.
- The private sector is well established to export mango anywhere in the world.
- Post harvest technology in the case of mango is also improving.

These factors, favourable government policies in the recent past, and the wide natural resource base in Pakistan have resulted in success of Pakistani mangoes in local and international markets.

6.1.2 Citrus fruit

Citrus is the most popular and most commercial fruit of Pakistan and Pakistan is one of the major producing countries in the world. During the last two decades, citrus has attained a very important position in the fruit industry, which has introduced many products including juices, jams, ice cream, etc. This industry and citrus production play a pivotal role in development of the agricultural economy of Pakistan. Among all the fruits grown in Pakistan, citrus occupies the first place in terms of area and production. During 1994/95, 34% of the total fruit area in Pakistan was under citrus. The area under citrus increased from 63.1 thousand hectares in 1975/76 to 190.7 thousand hectares in 1994/95, with an annual growth rate of 6%. The total production of citrus during the same period increased by 188%. However, the yield of citrus remained stagnant at around 10 tons which is very low compared to other citrus producing countries where average yield is around 15 tons/ha. The stagnant citrus yield during the last twenty years shows that most of the increase in production was due to increase in area under citrus which increased by around 202% during this time (Table 6.5). Production of citrus is mainly concentrated in Punjab province which has about 95% of total acreage followed by NWFP, Sindh and Baluchistan (Appendix 9). The seasons also follow the same pattern: Punjab province produce comes earlier in the market than the NWFP citrus.

There are many cultivars available throughout Pakistan and some are at the experimental stage. A wide range of commercial citrus cultivars and species has been imported over many years and trialed on research and experimental stations. There are four major commercial varieties widely grown in Pakistan.

Table 6.5 Area, production and yield of citrus in Pakistan.

Year	Area (⁰ 000 ha)	Production (⁰ 000 tons)	Yield (tons/ha)
1979/80	63.1	671.1	10.6
1980/81	94.5	926.2	9.8
1985/86	149.7	1,434.4	9.6
1986/87	153.5	1,467.1	9.6
1987/88	158.8	1,411.3	8.9
1988/89	170.2	1,565.1	9.2
1989/90	171.1	1,576.3	9.2
1990/91	173.3	1,609.1	9.3
1991/92	176.2	1,629.8	9.2
1992/93	176.2	1,665.3	9.4
1993/94	185.0	1,849.4	10.0
1994/95	190.7	1,932.8	10.1

Source: Agricultural Statistics of Pakistan 1994/95.

Mandarin/tangerine or *Kinnow*: Kinnow is a variety of citrus similar to the mandarin. This is an easy peel variety and has a very good distinctive flavor. It is the most widely grown commercial citrus variety in Punjab province, especially in Sargodha and Faisalabad divisions. Despite its exceedingly high seed count, it is widely liked by local and foreign consumers. Satsuma and Clementine, other varieties which are closely related to seedless mandarins, are currently being evaluated at different research stations. Pakistani Kinnow has high demand in the Far and Middle East and European countries. Juice of Kinnow is also exported in concentrate form. This is also most suitable for marmalade, jam, jelly and squashes.

Orange: In this group, red fleshed cultivars of orange are popular in Pakistan. The variety called Malta has a high juice content, is high yielding and is favored by consumers and industry for its bright red colour. The thick skin is yellow while the slices are reddish and full of juice. Mosambi is another very sweet tasting variety with yellow easily removable skin. This variety is mainly grown in NWFP province. If this variety were promoted widely in foreign markets, it would have great export potential.

Early Fruiter: This is a unique variety of citrus produced in Pakistan and is available at the start of the citrus season (November and December) so it is called Early Fruiter. It is very sweet, easy peeling and has beautiful red colour.

Grapefruit: Ruby and Marsh varieties are successfully grown in Pakistan. The quality of Ruby, as reported by the exporters and researchers, is the same as the best grapefruit seen in international markets. Grapefruit is successfully grown in Sindh province. Local demand for grapefruit is not great but it has high export potential for European and Gulf markets. Along with grapefruit, lemon and lime are also grown throughout Pakistan.

The Kinnow variety of citrus covers the major area among all the citrus cultivars. Around 70% of the total citrus area is under this variety which is mainly grown in Punjab province. Kinnow mandarin is also popular because of its high yield and high economic return. It is equally liked at home and in the international market. Kinnow constitutes the major component of Pakistani citrus export. Due to the diverse climatic conditions in Pakistan, the citrus season lasts about five months, which can be extended with proper research and development, post harvest technology and with the availability of proper cold storage at various production points. The availability of citrus for a long period shows the good potential of citrus export from Pakistan. Kinnow is available in the market from mid November to mid February with peak months in December and January. Oranges are marketed from mid December to the last week of March from Punjab, and from Frontier province, oranges are available in the market only during March and April. Grapefruit is available in Punjab and Sindh from January to April.

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Production of citrus fruits is a well established horticultural industry. There are many well organized citrus fruit plantations spread over extensive areas in Punjab. They use the latest planting techniques and technology. They produce high quality Kinnow and Malta and they are labelled and finally packed for selective consumers in domestic and foreign markets. Traditionally, citrus marketing is based on contractors who purchase the standing crop and supply to local and other major wholesale markets. Owners of the citrus orchards also supply wholesale markets. Both contractors and owner-growers pack the produce in wooden crates lined with old newspapers and transport it by local trucks and trolleys to wholesale markets. The growers also supply the citrus produce in open trucks without any protection. Picking of the citrus is in the hands of middlemen who have groups of labourers moving from one orchard to another to pick fruit. The handling of fruit is generally very poor. The pickers are more interested in the quantity picked rather than preventing damage to the fruit. Bruising and skin damage are common complaints by exporters and wholesalers. All the retailers buy citrus fruit from these wholesale markets in open auction. The processors of citrus fruit also buy from these wholesale markets for their food industries.

Most of the citrus exporters are based in the wholesale markets. They repack the export quality produce at their own packing area before supplying the foreign markets. These exporters sell the low quality citrus in the same wholesale market where they are based. Some exporters have their own orchards within the family so they procure directly from the farm and supplement this by purchase from the wholesale markets and by buying from pre-harvest contractors. A few big citrus exporters have their own waxing, grading, washing and packing plants in the Kinnow producing areas in Sargodha, Punjab. These exporters directly procure from the orchards and bring the produce into their processing plants. Also, they have their own cold storage which also helps to enhance the shelf-life of citrus. After waxing, grading, and packing, these exporters directly transport the produce to Lahore and Karachi in their cold storage for export purposes. The exporters ship by air and a large quantity is exported by sea in refrigerated containers. With the installation of these wax packing plants in the production areas in the recent past, the quality and quantity of citrus fruit export has improved. The installation of these plants has also considerably reduced wastage and facilitates the regular supply of good quality produce meeting the strict international standards for export. Exporters have direct control over the supply which helps to avoid unnecessary delays and to achieve better control over the raw material supplied. In addition to these waxing and packing plants, two major orange juice extraction plants have been set up in the major Kinnow producing area of Sargodha, Punjab.

Kinnow has extensive export potential despite of its high seed count. Its other characteristics, especially the sweetness, size, easy peeling and appearance, make this fruit the "king" of citrus. The quality of production can be readily improved and seedless mandarin cultivars can be developed to extend the season of availability in foreign markets. Kinnow for export needs to be cooled at the packaging place and shipped in refrigerated containers to overseas markets.

Pakistan mainly exports Kinnow to the Middle East and Europe. The export of Malta, mandarin, oranges and grapefruit is minor in terms of quantity and value. During the last five years, export of Kinnow was around 30 thousand tons and both quantity and value of export fluctuated during the last ten years (Table 6.6). The unit value realization in rupees appears to have increased during the last few years, which is mainly due to devaluation of the rupee against the dollar.

Table 6.6 Export of citrus* fruit from Pakistan.

Year	Quantity (tons)	Value (‘000 Rs)	Unit Value (Rs/ton)
1984/85	32,650	75,098	2,300
1985/86	29,327	60,806	2,073
1986/87	28,377	57,896	2,040
1987/88	19,689	45,670	1,320
1988/89	24,875	52,009	2,091
1989/90	21,049	54,230	2,576
1990/91	24,668	77,756	3,152
1991/92	30,918	104,023	3,364
1992/93	34,470	104,351	3,027
1993/94	28,031	124,411	4,438

Source: Federal Bureau of Statistics, Islamabad.

* Citrus includes only Kinnow and Malta; export of mandarin, lemon and grapefruit is not included.

The main importer of Pakistani Kinnow is Dubai, followed by Indonesia, Singapore, Hong Kong, Saudi Arabia and other countries (Table 6.7). Citrus is mainly exported by sea to the Middle East countries and to by air. European countries. The Middle East countries and Gulf states are important markets for Pakistani citrus. These markets are expanding very rapidly and it is expected that consumption of citrus fruits will also increase many fold. The importance of these markets lies not only in their size but also in their geographic proximity and the close relationship which Pakistan has with these countries. Presently, Pakistan exports Kinnow mainly to these countries, however, potential also exists for the export of other citrus varieties, such as grapefruit, lemon, red blood Malta and Mosambi oranges which have not yet fully exploited these markets. There is a need for extensive export promotion efforts by public and private sectors for citrus varieties in light of consumer preferences in local and foreign markets. Also, the adoption of production led and post harvest technologies could be very effective in further increasing the export of citrus fruit from Pakistan.

Table 6.7 Destination of citrus exports from Pakistan in 1993/94.

Country	Kinnow		Oranges		Musambi		Mandarin		Lemons	Grapefruit
	Quantity (tons)	Share (%)	Quantity (tons)	Share (%)	Quantity (tons)	Share (%)	Quantity (tons)	Share (%)	Quantity (tons)	Quantity (tons)
Afghanistan	1,064	3.80								
Bangladesh	371	1.33								38.90
Canada	186	0.66								
Cyprus	103	0.37								
Dubai	17,010	60.78	1.6	1.37	24.4	54.95	51.0	4.20		
Hong Kong	2,143	7.66					68.3	5.62		
Indonesia	2,776	9.92					765.3	62.96		
Kuwait	156	0.56								
Malaysia	94	0.33								
The Netherlands	1,082	3.87			20.0	45.05				
Saudi Arabia	2,151	7.69								
Singapore	191	0.68					330.9	27.22	7.2	
Sri Lanka	101	0.36	108.5	93.05						
USA	132	0.47								
Others	278	0.99								
Total	127,887	100	116.6	100	44.4	100	1,215.5	100	7.2	38.90

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Reasons for success of citrus marketing

- Citrus occupies the first place in terms of area and production of all fruits grown in Pakistan. More than one-third of total fruit area in Pakistan is under citrus. Both area and production increased considerably during the last two decades. The domestic fruit industry is also growing very rapidly.
- Due to diverse climatic conditions among the provinces, the harvesting season of citrus is quite long.
- There are many citrus cultivars successfully planted in Pakistan. Among the commercial varieties, Kinnow (an easy peeling variety with good distinctive flavor) is mainly grown in Punjab province and widely liked in international and domestic markets. Kinnow constitutes the major component of Pakistani citrus export markets, especially in the Far East, Middle East, and European countries.
- The available citrus post harvest technology in Pakistan, is better than that for other fruits. During the last couple decades, a few large citrus exporters/producers have established waxing, grading, washing and packing plants in the major citrus growing areas of Punjab and they provide export quality citrus. These exporters/producers also have their own cold storage facilities. In addition to these waxing plants, a few juice extraction plants have also been established in citrus producing areas.
- Export of citrus from Pakistan has increased. A large quantity of citrus is exported in refrigerated containers by sea mainly to the Middle East. Also, it is exported by air to both the Middle East and European countries. The production base of citrus in Pakistan shows that its export can be further increased with better export promotion efforts and government policies.

6.1.3 Molasses

Molasses is a sugar containing by-product produced during the extraction of sugar from sugarcane, sugarbeet and other sugar containing commodities. During the sugar making process, a stage is reached when further crystallization of sugar from juices is assumed uneconomical and the liquid remaining at this stage is molasses. There are different sources of molasses in the world but in Pakistan, more than 98% of the total production of molasses is obtained from sugarcane. In addition to sugarcane molasses, other small sources include beet molasses, citrus molasses, maize molasses, wood molasses, and sorghum molasses.

Sugar is one of Pakistan's largest industries, and it is based mainly on sugarcane, with sugarbeet contributing only 2% of the sugar output (Government of Pakistan 1988). The area under sugarcane increased from 699.8 thousand hectares in 1975/76 to 1,009 thousand hectares in 1994/95, an increase of 44%. During the same period, production increased by almost 85%. However, yield increased by only 28% (Table 6.8), so the increase in production was mainly due to increase in area and partially to modern technology adoption. In 1994/95, 65% of the total area under sugarcane was planted in Punjab province followed by Sindh (25%), NWFP (10%) and Baluchistan (less than 1%). Province-wise area, production and yield of sugarcane are given in Appendix 10.

In 1994/95, there were 67 sugar mills in Pakistan which produce sugar, molasses and bagasse (used as fuel and as input in the paper industry). The average crushing capacity of all these mills is around 2,800 tons per day (Pakistan Sugar Mills Association). With the installation of new sugar mills in Pakistan, the production of sugar and molasses has increased considerably. In just a few years, the production of sugar in Pakistan increased from 1,781 thousand tons in 1987/88 to 3,002 thousand tons in 1994/95. Similarly, the production of molasses increased from 670 thousand tons to 2,060 thousand tons in the same period. (Table 6.9) Around one thousand tons of molasses is also obtained from sugarbeet in NWFP.

Table 6.8 Sugarcane area, production and yield in Pakistan.

Year	Area (‘000 ha)	Production (‘000 tons)	Yield (tons/ha)
1975/76	699.8	25,546.7	36.5
1980/81	824.7	32,359.4	39.2
1985/86	779.8	27,856.3	35.7
1986/87	762.0	29,925.8	39.6
1987/88	841.6	33,028.8	39.2
1988/89	876.9	36,975.7	42.2
1989/90	854.3	35,493.6	41.5
1990/91	883.8	35,988.7	40.7
1991/92	896.1	38,864.9	43.4
1992/93	884.6	38,058.9	43.0
1993/94	962.8	44,427.0	46.1
1994/95	1,009.0	47,168.4	46.7

Source: Agricultural Statistics of Pakistan 1994/95.

The harvesting of sugarcane in Pakistan begins in November and at the same time most of the sugar mills also start crushing sugarcane. All the sugar mills continue crushing up to June which means production of molasses continues for about seven months. However, some of the sugar mills are unable to crush continuously due to irregular supply of sugarcane. This generally happens in Punjab province where there is more than one sugar mill competing for procurement during the season in a few sugarcane producing areas.

Table 6.9 Crushed sugarcane, sugar and molasses production in Pakistan.

Year	Number of Mills	Crushed Cane (million tons)	Sugar Output (‘000 tons)	Molasses (‘000 tons)
1987/88	44	20.33	1,781	670
1988/89	45	21.71	1,850	1,101
1989/90	48	20.84	1,855	890
1990/91	51	22.60	1,932	1,120
1991/92	54	24.80	2,326	1,168
1992/93	62	27.28	2,377	1,330
1993/94	65	34.19	2,922	1,665
1994/95	67	34.19	3,002	2,060

Source: Agricultural Statistics of Pakistan 1994/95; Pakistan Sugar Mills Association’s Annual Reports.

The recovery of molasses from sugarcane depends mostly on the variety of sugarcane, maturity stage, freshness, period of harvesting, etc. The percentage recovery is generally used as a criteria to estimate the production of molasses in a particular year in a country. This recovery percent is multiplied with the total crushed sugarcane by a particular sugar mill in a season. The recovery of molasses in Pakistan during the last five years is less than 5% (Pakistan Sugar Mills Association). However this percentage varies from variety to variety and from one zone to another cropping zone in Pakistan. The recovery percentage is high in Sindh compared to Punjab province. However, the recovery is lower in NWFP compared to both provinces.

Asia is the biggest producer of molasses in the world, contributing around one-third of the total production of molasses (Table 6.10). The main producers of molasses in Asia are India, Thailand, Pakistan, Indonesia, Philippines and Iran. India is the biggest producer of molasses in Asia followed by Thailand and Pakistan. The share of Pakistan in the Asian market is about 11% and 4% in the world market. Variation in the price of molasses has little impact on its production. On the other hand, variation in sugar and sugarcane prices has a considerable effect on molasses production in Pakistan.

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Table 6.10 World molasses production.

Region	1987/88	1988/89	1989/90	1990/91	1991/92
Asian countries	8,564	8,468	9,749	10,784	10,913
Western Europe	5,182	5,169	5,516	5,737	4,985
North and Central America	4,850	4,710	4,729	4,716	4,764
East Europe	4,715	4,533	4,816	4,726	3,894
Africa	2,184	2,221	2,044	2,097	2,207
Oceania	860	904	894	880	765
Total	32,412	31,929	33,019	34,186	33,134

Source: FAO Year Books.

Molasses is generally utilized in animal feed, for industrial purposes and in human food products. The main use of molasses is as a raw material for animal feed. In the USA and European countries, it is widely used as animal feed. The second largest use of molasses is in industry for various products. The main products in which it is utilized as a major component are food yeast, pharmaceuticals, distilled spirits, rum, acids, fertilizers, etc. Another use is in human foods, especially in the baking industry.

In Pakistan, molasses is mainly utilized in distilleries, manufacturing of acetate rayon yarn, polyethylene granules, tobacco curing, etc. However, compared to developed countries, a small percentage of molasses is used in animal feed in Pakistan. This is due to the fact that the use of formulated animal feed in Pakistan is very limited. Farmers prefer to use fodder for their animals. Therefore, Pakistan is self-sufficient in molasses and in fact more than 70% of the total output of molasses was exported in the past. The high production of molasses is also due to high production of sugarcane and sugar in Pakistan. Pakistan used to import sugar until the early 1980s; however, Pakistan is presently self-sufficient in sugar and in a position to export a small quantity of sugar to other countries.

Despite tough competition from other sugar producing countries of Asia, Pakistan exported molasses mainly to European countries. Total export of molasses from Pakistan has more than doubled from 1988/89 to 1994/95 (Table 6.11). The unit value of molasses has also increased from \$ 40/ton to \$ 53/ton during this period. The Netherlands is a major importer of molasses from Pakistan, followed by Spain, UK and Italy in 1994/95 (Table 6.12). Domestic consumption of molasses is around 2 million tons per year which is less than 20% of the total production in the country and the rest is available for export.

Table 6.11 Export of molasses from Pakistan.

Year	Quantity (tons)	Value ('000 US\$)	Ave. Unit Price (\$/tons)	Value (million Rs)
1988/89	753,000	30,110	39.99	576.7
1989/90	11,66,000	39,070	33.51	1,046.4
1990/91	776,071	36,813	47.44	823.6
1991/92	947,000	54,208	57.24	1,351.8
1992/93	992,618	53,158	53.55	1,396.1
1993/94	1,729,921	82,563	47.73	2,396.0
1994/95	1,709,045	90,090	52.71	2,784.4

Source: Federal Bureau of Statistics, Islamabad.

There is a need to promote utilization of molasses in the country through further research and development. Its use in industry should also be promoted through special incentives to industries. Presently the demand for poultry feed is very high and the poultry industry is expanding very rapidly. On the same line, the use of animal feed should also be promoted. This will not only increase the country's milk and meat production but also increase productivity per animal. As a result, the use of feed will also further increase the local consumption of molasses.

Table 6.12 Value ('000 US dollars) and destination of exports of molasses from Pakistan.

Country	1994/95	1993/94	1992/93
Australia	-	1,026	248
Belgium	1,055	550	335
Czechoslovakia	-	835	2,808
Dubai	208	299	119
France	-	-	1,559
Finland	-	-	2,154
Germany	86	945	1,027
Italy	4,529	7,514	1,965
Japan	1242	7	-
The Netherlands	57,664	55,226	38,449
Norway	-	1,482	-
Saudi Arabia	149	136	249
Spain	13,818	5,896	439
Sweden	-	661	-
Switzerland	-	383	950
Singapore	602	-	-
South Korea	974	-	-
UK	6,404	5730	2,799
USA	359	-	-
Other countries	3,000	1874	57
Total	90,090	82,563	53,158

Source: Federal Bureau of Statistics, Islamabad; Export Promotion Bureau.

Presently around three-fourths of the total production of molasses is exportable surplus which is further expected to increase due to increased production of sugar in the country. Therefore, export promotion of molasses needs more attention of the concerned authorities to increase the export of molasses. More than 80% of molasses from Pakistan is exported to European countries, which indicates that sugar mills in Pakistan have maintained the export quality desired by these importing countries. It is expected that production of molasses in Pakistan will further increase due to recent adoption of improved technology by the sugar industry, which is clear from the fact that production has increased considerably during the last decade. Therefore export promotion of molasses needs to be evaluated to make a more meaningful increase in its exports. The sugar industry has already demanded relief from the many taxes on molasses. Presently, this industry is paying many taxes on molasses exports and is under a dual taxation strain, and it needs relief from the government to further improve its exports. The industry is presently paying export duty, levy on import by European countries, sales tax, district council taxes and octroi charges during transportation to Karachi for export. The sugar industry claims that the average cost of molasses including all these taxes is very high and the industry is not making any significant profit from molasses. The average net profit from molasses is around \$ 3 per ton which is very low compared to the investment required (Pakistan Sugar Mills Association). With the installation of new sugar mills in the country, competition among the mills is very high and the sugar industry is already under economic pressure due to the high cost of sugar production. Export of molasses by the industry is considered a subsistence support to the industry. Therefore, this industry needs special relief from the dual taxes. This will also further improve the export of molasses from Pakistan. Another main complaint of the molasses exporters is berthing delays at port for which the molasses exporters have to pay a heavy payment of demurrage. This also needs the special attention of the Export Promotion Bureau and the concerned government agencies at the port. Another major problem of the exporters of molasses is the lengthy procedures for molasses export which considerably delays molasses consignments causing exporters have to bear more expenses.

Reasons for success of molasses marketing

- Sugar is one of Pakistan’s largest industries, and it is mainly based on sugarcane. The area and production of sugarcane increased considerably during the last two decades, and thus production of molasses also increased significantly. The number of sugar mills also increased from just 44 in 1987/88 to 67 in 1994/95.
- Pakistan, as one of the leading sugar producing country, offers a substantial surplus of molasses in the international market. So far, local industry has not progressed much towards commercial exploitation of molasses in country. The domestic utilization of molasses in industry is very limited (mainly as raw feed for cattle), so more than 80% of total produce is exported, mainly to European countries.
- Prices in the local market are much lower than the international market prices which is another reason for exports to other countries.
- More than 80% of total export of molasses from Pakistan goes to European countries which indicates that sugar mills in Pakistan have maintained the export quality desired by these quality conscious countries.

6.2 Failed market promotion attempts

6.2.1 Apple

In Pakistan, apple has long been planted as commercial fruit in Baluchistan and NWFP provinces because of high economic returns. There are both large and small sized apple orchards in both provinces. Pakistan produced about 533.1 thousand tons of apple from 40 thousand hectares in 1994/95. The area under apple increased by around 405% from 1975/76 to 1994/95 and production has increased by more than 698% during the same period. The yield of apple has also increased from 8 tons to 13 tons per hectare during the last 20 years, which is still quite low compared to other apple producing countries. Area, production and yield of apple in Pakistan are given in Table 6.13. In 1994/95, 80% of the total area under apple was in Baluchistan province followed by NWFP (20%), and less than 1% in both Punjab and Sindh provinces (Appendix 11).

Presently, there are more than 100 apple cultivars under evaluation on different research stations in NWFP and Baluchistan. These cultivars include most of the high quality apples planted in other countries, such as Spur Red and Royal Gala. Pakistani local varieties planted in apple growing areas include Mashadi, Amri and Kulu. However, most of the apple orchard owners currently have new plantings of Red Delicious and Golden Delicious varieties.

Table 6.13 Area, production and yield of apples in Pakistan.

Year	Area (’000 ha)	Production (’000 tons)	Yield (tons/ha)
1975/76	8.0	66.8	8.35
1980/81	11.4	107.4	9.42
1985/86	17.3	166.0	9.60
1986/87	18.5	195.6	10.57
1987/88	19.1	212.0	11.10
1988/89	21.8	215.1	9.87
1989/90	22.4	232.4	10.38
1990/91	22.8	243.0	10.66
1991/92	27.8	295.3	10.62
1992/93	31.4	339.0	10.80
1993/94	39.5	442.4	11.20
1994/95	40.4	533.1	13.20

Source: Agricultural Statistics of Pakistan, 1994/95.

The apple season in Pakistan starts at the end of August and finishes in February. The supply of apple in the market first arrives from NWFP at the end of August followed by Baluchistan at the end of September. The season of apple from NWFP ends in December but apple from Baluchistan is available up to February. October to December are the peak apple supply months. The major market for apple is Lahore and the supply to other markets in Pakistan is also mainly from this market. The other major market is Karachi especially for the apple from Baluchistan.

The traditional market channel for apple is pre-harvest contractors-commission agents in wholesale markets-wholesalers-retailers-consumers. Apple wholesalers and commission agents also have their own cold storage in major fruit and vegetable markets. More than 90% of apple growers in the country sell the right of usage of their orchards in advance to pre-harvest contractors. Typically these contractors are responsible for all the processes related to taking the produce to the market, i.e. spraying, picking, grading, packing, transportation and marketing. Some of these pre-harvest contractors are agents of large commission agents in wholesale markets. They have also contacts with food processing industries. The commission agents in wholesale markets charge from 6 to 7% commission on the total value of the produce. Small growers usually sell their produce to local middlemen due to the high transportation cost up to the wholesale market. These middlemen from the local area or from other areas generally buy a sufficient quantity of apple to supply wholesale markets. Sometimes these middlemen, called Beoparies, also provide inputs of credit to small farmers and in return farmers sell their produce to these middlemen and pay a commission. A few apple exporters and food industries also buy from nearby wholesale fruit and vegetable markets. A few large apple growers have their own cold storage. If there is a glut and a resultant low price, these growers usually store their produce in cold storage facilities. Small farmers generally sell their entire produce immediately after harvest or even earlier in the season to make money for their needs. Also, these resource poor farmers face lack of storage space, packaging material and have almost no market information (Haefliger and Khan 1993).

Pakistan is not a big exporter of apple compared to other competing countries. During the 1990s, Pakistan exported only a few tons of apple to Sri Lanka, the Maldives and Singapore (Table 6.14).

Table 6.14 Export of apple from Pakistan.

Country	1989/90	1990/91	1991/92	1992/93	1993/94
Sri Lanka					
Quantity (tons)	-	-	-	46.2	11.08
Value ('000 Rs)	-	-	-	390	81
Unit Value (Rs/ton)	-	-	-	8,441	7,310
Maldiv Island					
Quantity (tons)	-	0.95	4.805	-	-
Value ('000 Rs.)	-	7	48	-	-
Unit Value (Rs/ton)	-	7,368	9,990	-	-
Singapore					
Quantity (tons)	3.158	-	-	-	-
Value ('000 Rs)	32	-	-	-	-
Unit Value (Rs/ton)	10,133	-	-	-	-

Source: Federal Bureau of Statistics, Islamabad.

Pakistan was not successful in the export of apple because it has its own large market and consumption of apple in Pakistan is increasing due to increase in per capita income and awareness regarding its nutritional value. Also, the fruit industry in Pakistan is expanding and demand of apple in the industry is increasing considerably. Although the area under apple and production are increasing very rapidly, the quality of the apple is not acceptable to the highly competitive and oversupplied world market. There is a need to introduce export oriented apple varieties to exploit the

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potential export market. Also, long term improvements need to be carried out especially in the adoption of post-harvest technology to get the full benefit of this expanding farm enterprise.

The apple crop also faces certain production problems which need to be solved through further research. A high frost risk in Baluchistan and, in NWFP, severe outbreaks of phytophthora root rot and neglected pruning are the major problems which certainly effect the quality of the produce. Also due to poor post-harvest technology, around 20-30% of the total produce is spoiled from tree to the consumer (Farooqi and Iqbal 1996). Generally, the labour used to pick apples does not care about the quality but only cares about the quantity collected.

Much of the apple produce is stored in cold storage, but, because of lack of knowledge on picking, time for storage, and correct temperature and humidity, much of apple produce seen in stores and markets appears to be in very poor condition. The time of picking, handling, grading, packaging, and transportation are important functions in maintaining the quality of apple and this information needs to be promoted among the growers, middlemen, pre-harvest contractors, owners of the cold storage, etc. Most of the cold storage facilities are far from the apple producing areas and are not within the approach of apple growers.

The choice of variety also has a major effect on quality, shelf life, appearance, size and shape. For example, Golden Delicious apple bruises easily and is prone to russetting and bitter pit, a physiological disorder not manifest until after prolonged storage. On the other hand, Red Delicious is less susceptible to these disorders and is very resistant to internal breakdown in store. However, it is very susceptible to superficial scald (Agricultural Research Station, Swat). Due to poor extension services, farmers are generally unaware about such characteristics of apple varieties.

From the available evidence, it can be concluded that this farm enterprise is expanding very quickly. However the growers are not very aware about post-harvest technology, resulting in low quality produce for consumers and low returns to farmers. The quality of some of the fruit is up to export standards, but the packaging and quality grading are totally unacceptable internationally. The international market for apple is highly competitive and oversupplied. Pakistan was able to export only a few tons of apple to Sri Lanka which is not a very quality conscious country compared to Europe and the Middle East. It appears that Pakistan will not be in position to make any further progress in expanding apple export in the near future. Therefore, Pakistan needs to concentrate on expanding the large domestic market. The lack of export quality apple and varieties has hindered the growth of apple exports from Pakistan.

Reasons for failure of apple exports

- Despite the large production base of apple in Pakistan, its export to the international market has been minimal. Pakistani exporters were unable to compete in the international market due to lack of a surplus of export quality apples. Prices of available export quality apples were higher in the domestic market compared to the international market. Therefore, more effort should be made to expand the domestic market.
- Pakistan lacks a surplus of export quality varieties of apple for the international market.
- Due to inappropriate cold storage facilities in apple producing areas, poor transportation services, poor post-harvest technology, etc., apple generally losses its quality during long distance transportation and is unable to meet export quality standards.
- Apple growers in Pakistan are unaware about the international market potential and still grow local varieties. Farmers are not familiar with post-harvest technology, and they still use simple and crude packing which effects the apple quality.
- There is no organized private or public agency involved in expanding the export of apple from Pakistan. Even enforcement of prescribed grades and standards is very poor

6.2.2 Onion

After potato, onion is the second major vegetable crop of Pakistan. Onion is an essential part of every meal in Pakistan and it is used as a vegetable, a condiment and a spice. Around one-third of the total vegetable area (excluding potato) in Pakistan is grown under onion. The total area under onion increased by more than 143% from 1975/76 to 1994/95. The production of onion increased around 214% during this period and yield of onion also increased by about 29%. Average onion yields have recently remained static between 10 and 13 tons per hectare, comparing most unfavorably with the expected yield of over 35 tons/ha grown in major onion producing countries such as UK and Holland. Most of the increase in production of onion is due to the high increase in area. The increasing area under onion shows the expansion of this farm enterprise in Pakistan. The area, production and yield of onion are given in Table 6.15. Onions are grown all over the country both for commercial and domestic purposes. During 1994/95, 41% of the total area under onion was planted in Sindh province, followed by Punjab (26%), Baluchistan (24%) and NWFP (9%) provinces. The province-wise area, production and yield are given in Appendix 12. Onion yields are around 20 tons per hectare in Baluchistan, 14 tons/ha in NWFP, 12 tons/ha in Sindh and 10 tons/ha in the Punjab. The area under onion in Sindh is almost double that in Baluchistan but production in both the provinces is almost the same. Onion yields in provinces other than Sindh provinces could easily be doubled with proper husbandry.

Traditionally, farmers use two basic onion producing methods. Basin irrigated onion fields can be seen all over Baluchistan and NWFP, and furrow irrigated fields are found in the Punjab and Sindh. For good quality onion, dry warm weather is very important at harvesting time, and a wet soil surface during bulbing and development results in severe post-harvest losses, disease and soil contamination of the bulb and scales. Therefore, procurement of onion, especially for export, from traditional basin irrigated farms of Sindh is ideal, particularly from the Hyderabad division of Sindh. Given the climate and soils of Sindh, the productivity of high quality export standard onion in Pakistan can be increased significantly. Based on the skin colour of onion, red, white and yellow types are grown in Pakistan. However, red onion is grown extensively throughout the country and widely preferred by consumers. The other two types are grown on a limited scale and are favored less by consumers. The main varieties of onion grown in Pakistan are Karachi Red, Desi White, Giza-6 and Early Grano. Due to the diverse agro-ecological conditions in Pakistan, a year-round supply of onion is possible from various parts of Pakistan. In Punjab province, the harvesting season of onion starts during the second week of April and ends at the end of July. The supply of onion from NWFP also continues from early April to mid August. In October, onion from Baluchistan arrives in the market and remains available up to December. Supply of onion in the market from Sindh province starts in early December and ends during the second week of July. April to July are the peak supply months of onion in Pakistan.

Table 6.15 Area, production and yield of onion in Pakistan.

Year	Area (⁰ 000 ha)	Production (⁰ 000 tons)	Yield (tons/ha)
1975/76	30.8	322.7	10.5
1980/81	43.2	447.6	10.4
1985/86	49.4	558.5	10.6
1986/87	51.1	576.8	11.3
1987/88	55.4	633.1	11.4
1988/89	57.8	707.0	12.2
1989/90	58.6	712.9	12.2
1990/91	58.6	702.4	12.0
1991/92	64.0	808.9	12.6
1992/93	67.6	853.7	12.6
1993/94	70.3	911.5	13.0
1994/95	74.8	1,013.1	13.5

Source: Agricultural Statistics of Pakistan 1994/95.

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The most common market channel for onion is growers - middlemen - commission agents in wholesale markets - wholesalers - retailers - consumers. Onion wholesalers and commission agents in wholesale markets also own cold storage facilities. The onion growers, especially small growers, also sell directly in nearby fruit and vegetable markets through commission agents. Most of the onion produce is usually sold just after harvest to the Beoparies. These Beoparies generally buy from onion from growers in 80-100 kg jute bags and then transport it to different markets according to their experience, market information, contacts with different commission agents and knowledge about demand of onion in different markets. Generally, farmers pack onion at the farm in 70 to 100 kg lots; usually farmers do not grade their produce, and they mix together small and large sized onion. Some of the middlemen also own cold storage and can store the produce for a few months to get higher prices. Onion is transported in open trucks from the farm to market and on to other markets. Onion exporters are usually based in the wholesale markets. These exporters purchase onion from the market, grade and repack it in 5 to 10 kg bags as desired by the importing country. The exporters noted that the quality of onion is usually not up to the required export standard. The produce from the market is generally available in irregular size, poorly graded and accompanied by a high percent of waste which results in poor export performance of onion from Pakistan.

Although area and production of onion have increased many fold, export of onion from Pakistan is minimal. For example, Pakistan exported only 1% of the total production of onion in 1994/95. Export of onion from Pakistan fluctuated between 1,800 and 8,200 tons from 1984/85 to 1994/95. The quantity, value and average unit price of exported onion are given in Table 6.16. The major market for Pakistani onion is Dubai in the Middle East (Table 6.17).

Table 6.16 Export of onion from Pakistan.

Year	Quantity (tons)	Value (‘000 Rs)	Ave. Unit Price (Rs/ton)
1984/85	25,124	36,579	1,456
1985/86	66,254	85,693	1,293
1986/87	48,941	55,719	1,138
1987/88	63,155	79,591	1,260
1988/89	27,059	59,827	2,211
1989/90	82,495	153,321	1,858
1990/91	5,494	18,984	3,455
1991/92	12,191	25,370	2,081
1992/93	1,821	3,991	2,192
1993/94	28,829	120,269	4,172
1994/95	2,600	21,700	3,875

Source: Federal Bureau of Statistics, Islamabad.

Despite the fact that production of onion has increased considerably, the export of onion is slight. Pakistan has a wide agro-climatic range which allows the production of onion virtually all-year-round. The quality of the onion is far from the accepted world market standard. Pakistani onions are usually irregular in size, poorly graded with a high percent of waste as admitted by many vegetable exporters. In the Middle East, demand is for graded onion over 50 mm riddle and packed in attractive and airy bags. It is clear from the Table 6.16, that the unit price of Pakistani onion in most of the years is low, which is a clear indicator of low quality onion. There is no agency in Pakistan which can procure, grade, pack and promote onion export from Pakistan. There is a need for such a public or semi public agency which can promote the policy of "Grow for Export" in Pakistan.

Table 6.17 Destinations of onion exports from Pakistan in 1992/93 and 1993/94.

Country	1993/94		1992/93	
	Quantity (tons)	Value (‘000 Rs)	Quantity (tons)	Value (‘000 Rs)
Abu Dhabi	84.00	504	-	-
Afghanistan	8.98	23	25.15	111
Bahrain	92.00	552	-	-
Dubai	25,859.32	107,291	1,045.64	2,379
Iran	440.44	1,321	-	-
Malaysia	650.40	2,601	-	-
Singapore	222.00	666	-	-
Sri Lanka	1,309.76	6,510	750.00	1,500
Syria	123.85	569	-	-
USA	38.50	231	-	-
Total	28,829.25	120,269	1,821.14	3,990

Source: Federal Bureau of Statistics, Islamabad.

There is no clear cut government policy regarding export of onion and other vegetables. Presently, there is no organized marketing organization involved in the export of onion. Also, appropriate post-harvest methods are almost totally lacking in Pakistan and farmers are not growing suitable varieties for export. Growers are not aware about the post-harvest procedures to get high quality export standard onion.

There are certainly many constraints at the post-harvest level, but the production scene is also not favourable. The average yield of onion is far below the potential compared to other onion producing countries. Such low productivity means that unit production costs are very high, making exports difficult in the highly competitive export market of onion.

Reasons of failure of onion exports

- In the past, the government generally adopted the attitude that onion export should only be allowed after domestic demand had been fully satisfied. This is not a viable approach to successful export of onion. The exporters were unable to ship on a consistent basis and the export of onion could not be improved much in spite of the large year round production base.
- The policy of only exporting the surplus resulted in a low volume of onion export from Pakistan. This is not a viable policy because the quality of onion available in Pakistan is not necessarily consistent with that required in the international market. Onion exporters are unable to make commitments for a regular supply to importers.
- There is no agency in the country that encourages farmers to grow for export purposes, provides storage and grading facilities, and searches for export markets.
- Due to poor post harvest technology, Pakistani onion is usually irregular in size, poorly graded and packed, with a high percent of waste, and kept in inappropriate cold storage facilities. Private onion exporters also lack facilities for quick grading and packing.

6.2.3 Tomato

Tomato is one of the most popular vegetables in Pakistan and it is widely used in salads as well as in cooked dishes. It is also utilized as a raw material in processing industries. Tomato ketchup is the most popular product of tomato and is mainly used in cities. The popularity of tomato and its products continues to rise.

Area, production and yield of tomato in Pakistan increased during the last two decades (Table 6.18). The area under tomato increased from 7.5 thousand hectares in 1975/76 to 25.6 thousand hectares in 1994/95, at an annual growth rate of 6.7%. Production of tomato increased at

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an annual growth rate of 9% during the same period. However, the increase in production from 53.7 thousand tons to 275.8 thousand tons during this period is mainly due to increase in area. Tomato yield increased from 7.1 tons per hectare in 1975/76 to 10.7 tons per hectare in 1994/95. Average yields have remained static around 10 tons per hectare during the last 10 years and are far below the potential. Tomato yield increased at an annual growth rate of only 2.2%.

Table 6.18 Area, production and yield of tomato in Pakistan.

Year	Area (ha)	Production (tons)	Yield (kg/ha)
1975/76	7,524	53,687	7.135
1980/81	11,571	92,098	7.959
1985/86	15,770	149,962	9.509
1986/87	15,768	147,972	9.384
1987/88	16,925	161,566	9.546
1988/89	18,384	178,831	9.728
1989/90	19,339	193,772	10.020
1990/91	20,835	213,534	10.249
1991/92	22,502	237,859	10.571
1992/93	23,075	243,256	10.542
1993/94	24,260	252,466	10.481
1994/95	25,653	275,811	10.752

Source: Agricultural Statistics of Pakistan 1994/95.

Tomato is planted all over the country in almost all agro-climatic regions of Pakistan. In 1994/95, 39% of the total area under tomato was in NWFP province, followed by Sindh (23%), Baluchistan (21%), and the Punjab (17%). Province-wise area, production and yield of tomato are given in Appendix 13. Tomato yields are very variable, ranging from 5 tons/ha in the difficult marginal areas of Sindh to around 15 tons/ha in more climatically favoured areas of Baluchistan. In 1994/95, tomato yield was around 15.6 tons/ha in Baluchistan, 9.9 tons/ha in NWFP, 14.5 tons/ha in the Punjab and 5.9 tons/ha in Sindh. The area under tomato in Sindh province was almost the same as that in Baluchistan but production in Baluchistan was far greater due to higher yields. There is tremendous scope to further increase the productivity of tomato in all four provinces of Pakistan. This could be done through suitable extension services, good quality seed, and proper husbandry of tomato cultivation.

The main varieties of tomato grown in Pakistan are Roma, Heerson, Margloge, and Sanmarzano. This highly perishable vegetable is virtually available year round in Pakistan. In Punjab province, supply of tomato begins during the third week of October and continues almost up to the last week of March. Supply of tomato from Sindh province starts about two weeks earlier compared to the Punjab and ends at the same time. The supply of tomato from NWFP starts in the first week of April (mainly from the plains) and ends at the end of July. At the end of April, tomato from Baluchistan arrives in the market and remains available up to mid August. Summer is the main peak supply season of tomato in Pakistan. Supply during the monsoon season is interrupted until the NWFP hill crop comes into the market.

Traditionally, the tomato marketing channel includes growers-middlemen-commission agents in wholesale markets-wholesalers-retailers-consumers. Tomato growers also supply directly to nearby fruit and vegetable wholesale markets and sell through commission agents in open auction. Tomato growers and Beoparies usually pack tomato in wooden boxes weighing 8-12 kg. Small growers normally pick tomato in the field and supply it to the wholesale market in a big open bamboo basket. Also, the local Beoparies buy in bulk from different farmers at their farms, pack in wooden boxes and transport the tomato to distant wholesale markets in trucks according to their market window experience, market information, and contacts with different commission agents in the large wholesale fruit and vegetable markets. Retailers and small wholesalers buy in open auction in the wholesale market. Commission agents charge 6 to 7% commission. Generally farmers and

Beoparies, do not grade the produce while packing at the farm and mix all sizes and qualities. Poor grading, packing, and quality are the main complaints of wholesalers and retailers.

Although area and production of tomato considerably increased, export of tomato from Pakistan is minimal. Due to the low quality of tomato available in the market, Pakistan only exported a few tons of tomato to Afghanistan in 1991/92 and 1993/94. In 1991/92, Pakistan only exported 10.76 tons worth Rs 34 thousand to Afghanistan. The maximum export to Afghanistan was 51 tons in 1982/83.

In spite of the diverse agro-ecological zones in Pakistan and the all-year-round availability of and tomato, the quality of tomato is far below the accepted world market standard. Due to poor quality of available tomato and poor infrastructure, Pakistan is unable to compete in the international market, and export of tomato is almost zero. Tomato growers are not aware about post-harvest procedures to get high quality.

There are many problems at the post-harvest level, but there are also many problems at the production level resulting in low productivity and poor quality. Poor crop rotation and monocropping are the major problems discussed in the literature, and these result in low yield and increase the risk of disease. Generally, the quality of tomato available in the market is very poor and the fruit shows the effects of virus infection and poor nutrition.

Reasons for the failure of tomato marketing

- Area and production of tomato in Pakistan increased considerably during the last two decades, However, farmers generally grow only those varieties of tomato which have a short shelf life. Seed of long shelf life tomato varieties is not available. Also, hybrid tomato seed is not available at the farm level. Hybrid seed is only available for experimental purposes at research stations. There is no private, government or semi-government agency that supplies seed of high-yielding and long shelf life varieties of tomato. The limited supply of seed is only supplied by a few experimental stations for local growers, mostly for home gardening.
- Limited research and development work has been done on tomato in Pakistan.
- The cost of tomato production is generally very low and farmers/wholesale traders spend very little on packaging and grading. Grading for quality and size is left to the retailers who sort and grade tomato before sale. This process results in low quality tomato and significantly decreases the shelf life.
- Commercial processing of tomato is also very limited and a considerable quantity of tomato is wasted, especially during the peak season. The processing industry is mostly limited to manufacturing of tomato ketchup and very little effort is made for extraction of tomato juice. These processing units are not mostly located in the major producing areas of tomato, which results, in a high cost of processed tomato in local markets.
- Tomato is highly perishable and, due to poor post-harvest technology and poor infrastructure, Pakistan could not make any headway in the export of tomato. Pakistan only exports a few tons of tomato to neighbouring countries such as Afghanistan.

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7. Conclusions and Policy Implications

7.1 Summary

- Upland crops (coarse grains, pulses, roots and tubers) are generally planted on marginal land and have remained neglected in Pakistan. All these crops are victims of the green revolution in wheat and rice since efforts were mostly made to ensure self-sufficiency in these crops. On the other hand, production, area, and yield of upland crops witnessed a continuous decline. The major reasons include low demand of UCPs, consumers' preferences for wheat and rice, the processing required before consumption, high prices, and relatively few alternative uses.
- In Pakistan, recent changes in the economic scenario, structural changes, and global trade reforms are expected to bring quantitative as well as qualitative changes in the demand for agricultural commodities and their products, including UCPs. This study on the market prospects of UCPs and policy implications in Pakistan gives an overview of policy measures implemented in the agricultural sector of Pakistan, examines past trends in demand of UCPs and present market potential, and predicts demand for these products. Also, the study suggests measures for improving marketing and trade of UCPs.
- The government of Pakistan has implemented many policy measures to transform the agricultural economy during the last two decades. These measures include different kinds of subsidies, procurement of agricultural commodities, supply of inputs and credit on easy terms and conditions, research and development, guaranteed minimum support prices of many agricultural commodities to farmers, establishment of many institutions, etc. In addition to these policy measures, the government has also reformulated and restructured trade policies in the light of changes in the global economic scenario. Fertilizer subsidies have been eliminated, a privatization policy has been established, restrictions on agricultural exports were removed, the private sector has been permitted to export/import, etc.
- Food consumption patterns in Pakistan are changing over time because of rising per capita income, urbanization, changes in tastes and preferences, declining real prices of food items, introduction of new products, etc. Due to these factors, the per capita intake of cereals has decreased, and there is a structural change in consumption pattern in favour of livestock products, edible oils, fruits and vegetables. Similarly, expenditure on cereals is decreasing and increasing for fruits, vegetables and livestock products. Changes in consumption patterns were also observed in terms of calorie intake and protein. Food consumption patterns among rural and urban areas, and across different expenditure groups, varied considerably but showed the same pattern of declining intake of cereals. However, with the high growth rate of the poultry industry, the use of coarse cereals as feed is increasing significantly. These rapidly changing food consumption patterns in Pakistan indicate increasing demand of fruits and vegetables and livestock products (in other words, demand for feed). Also, the changing pattern of food consumption and expenditure in Pakistan shows that improvement has been made in food security, which is a national goal and the basic objective of an agricultural economy.
- The supply of feed is projected to rise from 6 million tons in 1996 to 9 million tons in the year 2000. Cotton seed oilcakes are a major source of feed for cattle and contribute around one-third of total feed. The other oilcakes are from rapeseed/mustard, sunflower, soybean, safflower and linseed, and constitute around 5% of total feed. Cereals are another major source of feed, including wheat, rice, maize, barley, sorghum, etc. Pakistan is a net

importer of meal (mainly soy meal for poultry) and exports very little oilcake/meal. In Pakistan, feed is mainly consumed by the poultry sector and cattle feed is used on a very limited scale. However, oilcakes are used as a feed supplement for cattle mainly during milking periods. Livestock production generally depends on green fodder, dry roughage, and rangelands and pastures.

- Pakistan is a major importer of edible oil and domestic production is very low. Both traditional and non-traditional oilseed crops contributed around one-fourth of the domestic demand and the rest was imported during the last ten years. Both palm oil and soybean edible oils are imported to substitute for the local cotton seed oil. In 1994/95, around 83% of the total import of edible oil was palm oil and the rest was soybean oil. Palm oil is mostly imported from Malaysia and Indonesia, and soybean oil from USA and Brazil. Pakistan also imported a considerable quantity of soybean meal mainly from India during the last few years.
- In Pakistan, soybean cultivation was started during the early 1970s and since then its planting has not made a significant contribution in the total production of all non-traditional oilseed crops. Planting of soybean is confined to only a few areas of NWFP. In 1993/94, it was cultivated on just 6.2 thousand hectares which was the maximum area since 1970/71. Yield of soybean was also very poor at around 1,000 kg/ha during the last five years. The main factors of low popularity of soybean in Pakistan include lack of marketing, lack of high yielding and early maturing varieties, lack of proper extension and research efforts, lack of good quality seed, and government policies, unawareness about its nutritional value, low returns compared to competing crops (such as maize), lack of any promotional or incentive schemes, etc. So far, soybean in Pakistan is mainly planted on a limited area for seed and research purposes, and only a few farmers grow soybean as a commercial crop. Procurement of soybean is mainly handled by government agencies (such as PO DB) and the private sector is involved only in the oilseed processing industry and is not playing any role at any level of crop production. Utilization of soybean in Pakistan is limited only to extraction of oil for human consumption and soy meal as a main protein source for poultry feed. Soy products are not used as human food in Pakistan. It is estimated that demand of soybean meal from domestic sources will increase from 4.79 thousand tons in 1996/97 to 5.67 thousand tons in the year 2000. It is expected that import of soybean meal will increase to around 12 thousand tons by the year 2000. The demand for soybean meal is expected to grow further in the future because of the high growth rate of the poultry industry in Pakistan. There is a need on the part of government to promote the cultivation of this protein rich crop through research and extension efforts. The private sector may be encouraged to get involved in production, procurement, and processing of this crop. Also, this sector may be encouraged to introduce uses of soybean as soya milk, soya meat, soya nuts, soysauce, etc. This will also help in significantly improving the cultivation of soybean in Pakistan.
- Potato in Pakistan is consumed as a vegetable and farmers consider this crop an important cash crop. Potato is grown in the autumn, spring and summer over a wide range of agro-ecological zones and it is readily available all-year-round. It is estimated that less than 2% of total production of potato is used by industry, 10% is wasted and around 12% is kept as seed. The per capita consumption of potato in Pakistan almost doubled from 1971 to 1993. Area, production, and yield of potato also increased significantly during the last two decades. Potato markets generally operate in a competitive environment due to a large number of buyers and sellers. Potato traders generally sell potato in wholesale markets through commission agents. In these wholesale fruit and vegetable markets, sale is mainly by auction and both retailers and wholesalers take part in the auction. Some wholesalers purchase potato for keeping in cold storage and resale at higher prices. Support prices of potato are fixed by APCo m to protect growers against any sharp fall in prices. Pakistan

also exports potato, mainly to Afghanistan, Dubai and Iran. However, export of potato remained below 7 thousand tons during the last fifteen years, with the exception of 1979/80 and 1989/90 when more than 40 thousand tons and 20 thousand tons of potato were exported. The share of export in total production of potato was not more than 1%. The potato export can easily be increased to 50 thousand tons every year. However, due to poor export performance in terms of quality, packaging, inadequate shipping facilities, government policies and irregular supply in the past, the exportable surplus had to be consumed in the country. In the year 2000, based on HIES data, potato demand is expected to be around 2.3 million tons. Income elasticity of potato in Pakistan is inelastic.

- Maize is the third most important cereal crop of Pakistan after wheat and rice. Area and production of maize in Pakistan increased but its yield is considerably below the potential that could be achieved using improved production technology. The maize crop is very popular among small farmers who plant it as a multi-purpose food, as a cash crop and forage crop. A large number of farmers plant local varieties of maize but maize hybrid seed is also becoming popular, especially among the larger farmers who grow maize as a commercial crop. In addition to research stations, private seed companies also produce hybrid maize seed and sell it to maize growers. There are only a few maize processing industries in Pakistan which utilize around 20% of the total maize production. More than half of this share is used by the wet-milling industry to produce starch, sweeteners, corn oil, glucose, custard powder, gluten, etc. Another half of industry's share is consumed by the poultry industry for manufacturing feed. However, the price of maize has remained high compared to the prices of other cereals, such as wheat and rice. The use of wheat and broken rice as a substitute for maize in poultry feed is increasing. It is expected that the maize demand for human consumption will increase to 841 thousand tons in the year 2000. Industry and feed demand for maize is expected to be 508 thousand tons and around 65 thousand tons will be required for seed, and other uses. Maize is not a major export commodity of Pakistan and the pattern of maize export has been very irregular with only a few tons of maize exported in the past. Pakistan also imported a few thousand tons of maize, mainly for industry.
- Rice is the second largest staple food in Pakistan after wheat and it is also a major export commodity. In terms of cropped area in Pakistan, rice is the third most important crop after wheat and cotton, occupying about 10% of the total cropped area and 17% of the total area under food grains in the country. Also, it contributes around 16% in food grain production and 12% of the total value added by the major crops. More than 50% of the total rice area is under Basmati type rice which is mainly grown in the Punjab and is a fine, non-glutinous, long grain and aromatic variety. Pakistan earns a considerable amount of foreign exchange from the export of Basmati rice and it fetches a premium price in the international market. Around 44% of rice area is under IRRI type rice which is mainly planted in Sindh and Pakistan also exports this type to many countries. Pakistan's share in the rice world trade was around 10% in 1992. RECP, a government organization, enjoyed a monopoly in export of rice until August 1987; however afterwards, export of both Basmati and IRRI types was allowed in the private sector. Due to these liberal government policies, it is expected that export of rice will significantly improve in the future.
- Around 90% of the rice available in the market is processed by traditional sheller type mills. Therefore, rice milling in Pakistan needs to be more efficient in reducing the percentage of broken rice, and to provide the export standard rice to compete in the international market. Rice has many milling by-products, such as husk, bran, rice germ and polishings, and these products have many uses as food, feed and pharmaceuticals. In the year 2000, the projected demand of rice for direct human consumption, industry uses, and seed is 3.1 million tons. As expected, income elasticity of rice is inelastic in Pakistan. Because of liberal government rice export policies, it is expected that the exportable

surplus will improve and Pakistan will be able to earn more foreign exchange from rice exports. However, there is a dire need to update rice milling in Pakistan to improve the quality of rice which is a prerequisite for exploiting potential export markets. The main markets of Pakistani Basmati rice are Saudi Arabia, Kuwait, Oman, Dubai, Qatar, Bahrain, Iran, Mauritius, Malaysia, UK, USA and Canada. The major competitor of Pakistani Basmati rice in the international market is India. The demand for IRRI type rice mainly comes from African countries.

- Pakistan is gifted with diverse agro-climatic conditions and a large natural resource base. A long list of crops, fruits and vegetables can be successfully planted all over the country. Increasing incomes, changing tastes and preferences, urbanization, rapidly increasing population, and a changing economic scenario have improved the demand for fruits and vegetables. The food consumption pattern and the demand for food have considerably changed over time. These changes offer ample opportunities for emerging new products and markets. Many new products and markets have emerged in Pakistan. Among these products and markets, canola, strawberry and mushroom are commodities which have export potential and may create new opportunities in terms of income and employment generation in rural areas.
- Canola is a special type of rapeseed that provides a premium quality refined edible oil. Its oil is low in erucic acid and is nutritionally rich for human health. Similarly, its meal is low in glucosinolates, which is more desirable for animal and poultry feed. In Pakistan, canola was introduced by the BARD Project of PARC with the cooperation of CIDA during the late 1980s. Presently canola type varieties are planted for commercial purposes and are successfully grown in both rainfed and irrigated areas. The area under these varieties has also increased considerably during the last five years. With the involvement of the private sector in procurement and processing, the government is promoting canola production in the country through an extensive campaign. With the present momentum of continuous efforts by the public and private sectors to promote canola in Pakistan, the edible oil deficit should decrease considerably during the next few years. The edible oil of canola is becoming very popular, especially among health conscious people, and it is available in USC stores and a few other outlets. Due to its acceptability by consumers, its visible economic edge over other competing crops, and its acceptability by the private sector for processing, this new product and its market are developing very rapidly in Pakistan.
- Strawberry is another new product in Pakistan and its market is establishing steadily in large cities. During the 1980s, it was successfully demonstrated at various research stations and a few years later it was adopted by a few innovative growers around Islamabad, Lahore and in the Swat valley of NWFP. Its market is still not well developed and producers generally supply directly to retail supermarkets, major hotels and to local assemblers-cum-processors. In the Lahore fruit and vegetable wholesale market, it is also traded through commission agents. The consumers of strawberry are mainly rich people, foreigners, processors, hotel kitchens, etc. Because of the diverse climatic conditions which are conducive to its growth, strawberry has a great potential in local and international markets. In the retail market, its prices were very high during the last few years and farmers made big earnings from this enterprise. With proper post-harvest technology, strawberry can be successfully marketed all over Pakistan and also it has a great export potential. The superior size of the European market makes it the prime potential market for Pakistani strawberry, which has a sufficient seasonal edge to be a viable competitor. It is observed that the market window of opportunity for Pakistani exporters in this market is from July to March. However, quality is the key in penetrating these potential markets. Due to low cost of production in Pakistan, the export potential of strawberry is substantial and also it has potential benefits for small farmers in terms of generating rural income and employment.

Conclusions and Policy Implications

- Mushroom is also a new product in Pakistan, and its market, while expanding over time, is still very limited. On a commercial basis, mushroom is produced on a limited scale in Pakistan. Nature has gifted Pakistan with most suitable environmental conditions of temperature and humidity from sea level to high mountains. Thus different kinds of mushrooms can be easily produced throughout Pakistan around the year. However, complete and reliable information regarding its total production in Pakistan is not available. Export of mushroom from Pakistan has increased considerably during the last decade. Keeping in view the natural conditions in Pakistan for mushroom cultivation and low cost of production compared to many other competing countries, Pakistan should diversify its export market and take full advantage by increasing its mushroom export. Presently, France, Switzerland and Germany are the major international markets for Pakistani mushroom. In addition to creating more export opportunities, mushroom cultivation may also benefit the rural landless and resource poor small farmers in Pakistan.
- Pakistan has a wide and well developed production base of many fruits and vegetables and export of a few fruits and vegetables has improved during recent years. This increase is mainly the result of recent government liberalization of trade policies. However, the list of exportable fruit and vegetables is still very limited and the country is exporting less than 3% of the total production of fruits and vegetables. Pakistan has made a successful attempt in international and domestic markets in the case of mango, citrus fruit and molasses. However, due to many technical factors and poor post-harvest technology, Pakistan's efforts were not successful in international and domestic markets in the case of apple, onion and tomato.
- Pakistan is one of the main producers of mango in the world. Among the fruits grown in Pakistan, mango occupies the second place in terms of area after citrus. In Pakistan, mangoes are grown in a climate which is considered most suitable for its cultivation. More than 40 varieties of mango are successfully cultivated in Pakistan and mango is available in the market from mid May to mid September. Pakistan exports a considerable quantity of mango every year, mainly to the Middle East (more than 90%) and to Europe. Mango exports from Pakistan have grown at an annual rate of 7%, and, due to liberalized export policies, mango export is expected to grow further in the near future.
- Citrus is the most popular and the most commercial fruit of Pakistan, and Pakistan is one of the major producing countries in the world. The citrus industry is expanding in the country and this industry has introduced many products, including juice, jam, ice cream, etc. Citrus occupies the first place in terms of area and production among all the fruits produced in Pakistan. There are many cultivars successfully planted in Pakistan. Among them, mandarin/tangerine or Kinnow is an easy peeling variety which has a very good distinctive flavour. This variety covers the major area among all the citrus cultivars and is equally liked in domestic and international markets. Despite its high seed count, Kinnow has extensive export potential. Pakistan exports Kinnow mainly to the Middle East and Europe and the total export is around 30 thousand tons during the last five years. Citrus is exported by sea to Middle East countries and by air to European countries. The adoption of production led and post-harvest technologies could be very effective in further increasing the export of citrus from Pakistan. Also, potential exists for the export of other citrus varieties, such as grapefruit, lemon, red blood Malta and Mosambi oranges which have not yet been fully exploited in the international market.
- Molasses is a sugar containing by-product and more than 90% of the total production of molasses is obtained from sugarcane in Pakistan. Sugar is one of Pakistan's largest industries and is based mainly on sugarcane. India is the biggest producer of molasses in Asia followed by Thailand and then Pakistan. The share of Pakistan in the Asian market is around 11% and in the world market about 4%. Presently Pakistan exports more than 75% of the total production of molasses, which is further expected to increase due to increased

production of sugar in the country. More than 80% of the molasses from Pakistan is exported to European countries which shows that sugar mills in Pakistan have maintained the export quality desired by these European countries. The total export of molasses from Pakistan has more than doubled from 1989 to 1995. The Netherlands is a major importer of molasses from Pakistan, followed by Spain, UK and Italy. Domestic consumption of molasses is around 2 million tons per year which is less than 20% of the total production in the country and the rest is available for export.

- In Pakistan, apples have long been grown as commercial fruit because of high economic returns. Production of apple was 533 thousand tons from 40 thousand hectares in 1994/95. However, due to a large domestic market for apple, Pakistan could not make any headway in international marketing. In 1993/94, Pakistan only exported around 11 tons of apple to a neighbouring country, Sri Lanka, which is not a very quality conscious country compared to Europe and the Middle East. The lack of export quality apple and varieties hindered the growth of exports from Pakistan. Also, the price of apple in the domestic market is quite high compared to the possible international markets for Pakistan. It is expected that Pakistan will not be able to expand its apple export from a few tons in the near future.
- After potato, onion is the second largest vegetable crop of Pakistan and it is widely available all-year-round throughout the country. Total production of onion is around 1.01 million tons from about 75 thousand hectares. Onions are grown both for commercial and domestic purposes. Despite of a large production base of onion in Pakistan, the onion export was less than 1% of the total production in 1994/95. The major market for Pakistani onion is Dubai in the Middle East. The export of onion from Pakistan fluctuated between 1,800 to 8,200 tons from 1985 to 1994/95, which indicates that Pakistan has not been successful in the export of onions and its contribution to world trade is very little. Although Pakistan exports onion to more than 10 countries, it can not get its due share in the international market. The major factor is that there is no clear cut policy of government regarding export of onion and presently no marketing agency is involved in the export of onion and other vegetables. The quality of onion is far below the accepted world market standard. Also, the average yield of Pakistani onions is far below the potential compared to other onion producing countries. Such low productivity of onion in Pakistan results in a high cost of production making exports difficult on the highly competitive world export market.
- Tomato is one of the most important vegetables in Pakistan. Area and production of tomato in Pakistan have increased many fold. The area under tomato increased at an annual growth rate of 7% during the last 20 years. Similarly, production of tomato increased at an annual growth rate of 9% during the same period. In 1994/95, the production of tomato in Pakistan was 276 thousand tons. The average yield of tomato has remained static around 10 tons per hectare which is far below the potential. Tomato yields vary from 5 to 15 tons/ha in different ecozones of Pakistan, so there is tremendous scope to further increase the productivity of tomato through suitable extension, new varieties, and proper husbandry of tomato cultivation. Tomato is grown successfully in almost all agro-climatic zones all over the country. Export of tomato is limited to only a few tons to a neighbouring country, Afghanistan. The major factors concerning its failure in the export market and in domestic markets include its short shelf-life, low quality, traditional varieties, poor quality seed, lack of hybrid seed, and poor infrastructure and post-harvest technology, and poor crop rotations. Commercial processing is also very limited and confined to large cities. Due to its high perishability, a considerable quantity of tomato is wasted, especially during the peak season. The price of tomato varies over the year from Rs 2.00/kg to Rs 50.00/kg in various retail markets of Pakistan.

7.2 Major factors in the success of products/markets

- Pakistan has a wide range of agro-climatic zones which allow the production of a variety of tropical and temperate crops, many with extended seasons. For example, the harvesting season of mango is extended by Sindh province being three weeks earlier than Punjab province. Similarly in case of citrus, Punjab province is earlier than NWFP province.
- There is a considerable production base for fruits and vegetables in Pakistan. The production of almost all fruits and vegetables has increased considerably in Pakistan but the country is exporting less than 3% of the total production of fruits and less than 1% of total production of vegetables. This proportion is far below other competing countries, such as Turkey, which export more than 50% of their total production of fruits and vegetables. Export of mangoes and citrus is well developed but the full export potential is not exploited.
- There is a large natural resource base in the country, for example enough irrigation water is available in many areas, which can be more efficiently utilized to increase the productivity of fruits and vegetables.
- Local transport costs are low and most of the major markets are connected by air, road, and train. Air and sea freight charges are also competitive compared to other countries. Pakistan International Airlines is well established and connects with all potential importing countries of the world. Similarly, Karachi port is also well established and could handle more exports of fruits and vegetables.
- There are many cold storage facilities in the major fruit and vegetable markets which should be utilized more efficiently.
- There is a wide network of provincial and federal agricultural research institutes all over the country, which have conducted a lot of research in terms of technology development of fruits and vegetables. These research institutions have developed many high-yielding fruit and vegetable varieties and contributed significantly to increasing production in the four provinces of Pakistan. These institutions have also introduced many new emerging agricultural commodities, such as mushrooms, strawberry, asparagus, canola, etc.
- The private sector is well established to export fruit and vegetables from Pakistan. These private exporters have their own connections in importing countries and this sector is very enthusiastic to further increase export of fruit and vegetables from Pakistan, provided the government gives them due encouragement. Most of these fruit and vegetable exporters are located in Karachi and Lahore which are the main fruit and vegetable markets. Some of the mango and citrus exporters have their own orchards and produce export quality produce.
- A good engineering base exists in the country, which can develop packaging material, transport equipment, hydrocoolers, packing station equipment, etc.

7.3 Major factors in the failure of products/markets

- There is almost a complete lack of understanding regarding the appropriate management, marketing methods and business systems required to achieve successful entry into export markets. For example, most of the fruits and vegetables are harvested by pre-harvest contractors who transport the produce fruit and vegetable markets in the traditional manner. The exporters procure the produce in the market, grade and repack for export. This repacking process damages the quality of fruits and vegetables and reduces their shelf life. In fact, production, procurement, pre-cooling, grading, packing and cool chain distribution to foreign markets should be organized as a continuous process to get export quality produce able to compete in the international market.
- No appropriate public, semi-public or private business organization presently exists in the horticultural export sector capable of promoting the export of fresh produce according to international standards.
- At the farm level, growers of horticultural crops face many production problems regarding the planting material, irrigation methods, agronomic practices, diseases and pest control. These farm level constraints need to be controlled in order to get export standard produce. The extension services are generally very poor and linkage between researchers and extension is very poor.
- Growers, pre-harvest contractors and middlemen are generally not familiar with the post harvest technology of fruits and vegetables. There are severe problems at harvesting time, with farm level packing, transportation of the produce, procurement methods, cooling systems, grading facilities, acceptable packaging, refrigerated transport within the country, airport and seaport facilities to handle fresh produce, and poor enforcement of grading inspection methods. There are no cold storage facilities at any of the international airports or within a reasonable traveling distance. Only limited covered areas are available and in peak seasons of mango and citrus, the produce is left exposed to the sun and rain. The airlines do not take any responsibility for the damage. The exporters complaint that during the mango export season, which coincides with the monsoon season in Pakistan, they face serious damage to the produce.
- Air freight space is seriously insufficient in certain periods and pre-booking appears to be very difficult. Refrigerated sea freight needs to be further exploited to boost the export of fresh produce. Presently most sea freighting is on launches where produce is poorly handled and chances of damage increased. The use of sea freight facilities needs to be streamlined through an organization of fruit and vegetable exporters. Frequent delays in departure are general problem at the sea port. The routine checking and handling at ports is fairly rough and a damages the fresh fruits and vegetables. This is basically due to the lack of supervisions, trained staff and a cool environment. The major complaint of exporters is the off-loading at the airports which results in huge losses to the exporters.
- Most of the exporters use their own sources and export through their relatives and friends. They lack international market information and information regarding internationally accepted standards of packing and grading. The Export Promotion Bureau of Pakistan is unable to provide the required market information.
- Export procedures are very complicated and many agencies are involved with the export of produce which delays consignments and increases costs. Government gives little support to private fruit and vegetable exporters and exporters complaint about the bureaucratic system which results in unnecessary delays and severe damage to the reputation of the exporters abroad.

7.4 Policy implications

- It can be concluded from the changes in food consumption patterns that the demand for fruits and vegetables and livestock products will increase considerably. Therefore, efforts must be made to increase the productivity of these products through greater investment in the related infrastructure, research, development, and extension on a priority basis in the country.
- Inefficient and inadequate marketing, low prices, and poor research, extension, and product promotion efforts are the key factors limiting the adoption of soybean in Pakistan. Therefore, future strategies to promote soybean must strengthen the linkages between production, procurement and processing. The private sector must be encouraged to get involved at all stages from crop production to processing. Through a country wide campaign, the private sector must also be encouraged to introduce new uses of soybean as soya milk, soya meat, soya nuts, and other products. This will also help in promoting the cultivation of this protein rich crop in the country.
- Given the negative income elasticity of maize demand as direct human consumption, demand for maize in industry and poultry feed will surely increase considerably in the future. Therefore more investment must be made in maize research, development and extension to further increase the present low yield of maize in the country.
- The yield estimation procedure of potato needs to be improved to get the actual production of potato in Pakistan. Provision of improved seed of export quality potato and post-harvest technology of grading, packaging and storage must be improved to enhance the export of potato from Pakistan.
- To compete in the international rice market, Pakistan must improve the quality of rice through improving its present traditional milling technology. By increasing private sector facilities and simplifying rice export procedures, this sector may considerably increase rice exports from Pakistan. Presently rice is a highly competitive commodity in the export market; therefore, more research and development efforts are needed for quality improvement of Basmati and IRRI types of rice in Pakistan. Also, infrastructure facilities, such as transport, ports, equipment for quality control, bulk storage and handling facilities at procurement centres and railway sheds, etc., should be improved through increased private investment.
- The yields of almost all crops, fruits and vegetables are considerably below their potential in Pakistan. Therefore, efforts must be made through extension to promote improved cultural and intensive management practices to increase the present productivity levels. In addition, high quality seed and planting material, especially for fruits and vegetables, should also be provided to farmers.
- Export promotion of almost all commodities, especially by the private sector, is almost negligible. In the present competitive international market scenario, sales promotion efforts are very important for expanding markets and market shares of a particular product.
- The government should promote the grow-for-export policy among fruit and vegetable growers to increase the export of fresh fruit and vegetables from Pakistan. The production of fruits and vegetables has increased over time, but less than 3% of total production is exported. This low share of produce exported is mainly due to the fact that fruits and vegetables are not grown specifically for export purposes and quality, product type and varieties are not export standard. The choice of type of fruit, vegetable and variety should be market led and should be based on demand in local and export markets. In the presence of tough competition among the fruit and vegetable growing countries in the international market, the present government policy of exporting the surplus will totally fail. The international markets only accept produce of specified quality levels available on a

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consistent basis. Therefore a public, semi-public or private organization is required to promote the export of fruits and vegetables from Pakistan according to international standards and also to integrate production, harvesting, grading, packing, and procurement for export purposes. The government should encourage private exporters to promote the export of fresh produce by providing the sector with the required facilities at ports, and other back-up support at all levels so that they can compete in international markets.

- To avoid unnecessary delay due cumbersome export procedures, a 'one window export zone' should be established where all formalities and paper work can be completed instead of to ensure a the present system of visiting many offices in different areas. This would considerably improve the standard and volume of exports. Also it would help to decrease the costs of export and consistent supply to importers.
- Substantial improvements are required in research and development activities. Research on fruit and vegetables should be market oriented and should be according to the requirements of export markets, especially research on increasing shelf-life. More cost-effective technology and storage management should be introduced.
- Strong extension services are required in the promotion of post-harvest technology of fruits and vegetables. Also improved planting material, seed, improved agronomic practices, irrigation practices, fertilizer application, pest and disease control are required by the farmers.
- The grading, packing and procurement system for export purposes needs to be totally improved. Only internationally accepted standards of fruits and vegetables should be allowed, which will help to increase the per unit value of exported produce and reduce losses. Uniform grades of produce and quality control prior to export should be implemented.
- The primitive and inadequate transportation system which causes delays and wastage of vegetables during transit needs to be changed. Appropriate measures need to be taken to maintain the quality of the produce, including the provision of cold storage and refrigerated trucks and ships. Airport and seaport facilities need to be improved.
- Similar to the industrial export zones, fruit, vegetables and other agricultural commodity zones should be established to grow export standard produce.
- The Export Promotion Bureau should arrange exhibitions and fairs abroad in potential export markets and involve the fruit and vegetable exporters, rice exporters and representatives of growers.
- The government should declare fruit and vegetables as an industry and provide all the incentives given to other industries, such as textiles. This will help in the installation of industrial units for processing, canning and packaging of fruit and vegetables. Also, exporters of fruit and vegetables should be given financial incentives as is the case for exporters of other industries.
- The wholesale market infrastructure must be developed, including sheds for exporters, commission agents, growers, etc. Also, emphasis must be given to the improvement of other facilities in the fruit and vegetable wholesale markets, such as cleaning, good drainage systems, strict phyto-sanitary inspection measures, etc.

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Chapter 8

Appendices

Appendix 1 Explanation of Ushr and Zakat.

Ushr is one of the main Islamic fiscal tools made operative from the 1982/83 winter crop. The prime objective of this system is to assist the needy, the indigent and the poor with a view to securing their well-being and also to help them stand on their own feet and become useful members of society.

On June 20, 1980 the President of Pakistan promulgated the Zakat and Ushr ordinance 1980 enforced with effect from 15th March, 1983. Main features of the law relating to Ushr are:

1. Ushr is to be charged and collected, on a compulsory basis, from the produce of land of landowner, grantee, allottee, lessee, lease-holder or land-holder @5% of his share of the produce.
2. Ushr is payable only if the produce accruing to a person is 5 Wasqs (948 kgs) of wheat or its equivalent in value in case of other crops.
3. Ushr liability is to be assessed primarily by the Ushr-Guzar himself.
4. Such self-assessment, as a rule, is to be accepted by a Local Zakat Committee.
5. Where the Ushr-Guzar does not file his self-assessment or the Local Zakat Committee finds it manifestly unacceptable, it can make its own assessment based on information from revenue records or any other source deemed relevant by Local Zakat Committee. (LZC)
6. If an Ushr-Guzar is dissatisfied with such revisions, he can deposit 50% of the assessed Ushr and apply to Tehsil Zakat Committee (TZC) for revision of the assessment.
7. TZC's decision, if it does undertake revision, is to be final.
8. Land revenue and development cess is not chargeable in respect of land on whose produce Ushr has been charged and recovered on a compulsory basis.
9. Ushr is the first charge on the produce.
10. Ushr is collectable in cash, at the option of the Provincial Zakat Council. Ushr may be collected in kind where the produce is wheat or paddy.
11. Where compulsory realizable Ushr falls in arrears, it is recoverable as arrears of land revenue.
12. Ushr is not chargeable and collectable on a compulsory basis in respect of the produce of the following:
 - i. Non-Muslims;
 - ii. Non-Pakistanis;
 - iii. Persons excluded from the definition 'Sahib-e-nisab'.
13. Ushr is payable under the Shariah but is not recoverable on a compulsory basis under the Ordinance on:
 - i. Tenant's share of the produce;
 - ii. 5% of the produce from barani areas;
 - iii. 1/3rd of the produce from land irrigated by tube-well or other diesel/electricity operated machines and 1/4 of the produce in other cases. (This reduction is allowed as estimation relief);
 - iv. Persons whose produce from the crop of a season is less than 498 kgs of wheat or other crops of equivalent value;
 - v. If a plot of land is used principally for growing a crop and a small portion thereof (not exceeding 1/4 acre) is used for growing another crop, the produce of that small portion;
 - vi. Person who filed declaration with LAC to the effect that he is a follower of a recognized fiqh and that faith and fiqh do not oblige him to pay Ushr in the manner laid down in the Ordinance.

Appendix 2 Per capita consumption of major food items in Pakistan 1991, 1993.

Food Item	1991			1993		
	Rural	Urban	All	Rural	Urban	All
Wheat & Wheat Flour (kg)	10.74	8.73	10.1	11.11	8.57	10.38
Rice & Rice Flour (kg)	1.33	1.16	1.28	1.39	1.19	1.34
Biscuits (gm)	40.72	45.51	42.24	41.45	53.15	44.78
Gram (kg)	0.25	0.23	0.25	0.33	0.38	0.34
Mash (kg)	0.12	0.11	0.12	0.1	0.11	0.1
Mung (kg)	0.12	0.11	0.11	0.1	0.14	0.11
Masoor (kg)	0.08	0.10	0.09	0.07	0.09	0.08
Other Pulses (kg)	0.03	0.02	0.03	0.04	0.03	0.04
Milk F & B (ltr)	7.44	5.71	6.88	8.25	6.15	7.66
Milk Dry (gm)	1.91	1.83	1.89	2.45	18.74	7.08
Butter (gm)	58.05	14.41	44.13	73.36	10.33	55.45
Ghee Desi (kg)	0.10	0.03	0.08	0.12	0.02	0.09
Yoghurt (kg)	0.33	0.38	0.34	0.34	0.41	0.36
Vegetable Ghee (kg)	0.67	0.74	0.69	0.82	1.07	0.89
Mustard Oil (ltr)	0.0	0.01	0.01	0	0.03	0.01
Mutton (kg)	0.09	0.16	0.11	0.09	0.2	0.12
Beef (kg)	0.37	0.54	0.42	0.38	0.48	0.41
Fish (kg)	0.06	0.09	0.07	0.05	0.08	0.06
Chicken (kg)	0.07	0.11	0.08	0.07	0.11	0.08
Eggs (no.)	1.55	2.37	1.81	1.25	2.45	1.59
Banana (no.)	2.07	3.31	2.46	0.65	1.83	0.98
Mosambi, Malta (no.)	1.53	1.65	1.57	2.15	2.82	2.34
Apples (kg)	0.05	0.10	0.07	0.1	0.27	0.15
Dry Fruit (kg)	24.76	31.82	27.01	38.82	30.94	36.58
Other Fruits (kg)	0.68	0.76	0.71	0.51	0.68	0.56
Potato (kg)	0.81	0.78	0.8	0.8	0.91	0.83
Tomato (kg)	0.24	0.28	0.25	0.56	0.43	0.52
Onion (kg)	0.69	0.70	0.69	0.76	0.79	0.77
Other Vegetables (kg)	2.20	2.23	2.21	3.23	3.57	3.33
Chili (gm)	74.49	69.78	72.99	68.00	64.3	66.95
Sugar Mill (kg)	0.96	0.99	0.97	1.23	1.07	1.19
Sugar Desi (kg)	0.01	0.0	0.01	0.01	0.0	0.0
Gur & Shakkar (kg)	0.36	0.05	0.26	0.39	0.04	0.29
Tea, Black & Green (gm)	57.07	61.77	58.57	67.61	69.96	68.28

Source: Federal Bureau of Statistics, HIES data.

Appendix 3 Daily per capita calorie consumption of major food items in Pakistan.

Food Item	1979	1985	1986 (calories per day)	1987	1991	1993
Rural Pakistan						
Cereals	1,611	1,525	1,561	1,516	1,429	1,479
Pulses	76	67	59	62	70	76
Milk & Products	193	208	230	221	227	364
Edible Oils	40	43	42	46	46	246
Meat, Fish & Chicken	42	48	54	52	66	46
Fruits	111	162	159	174	201	25
Vegetables	11	16	20	22	29	89
Sweeteners	149	146	158	154	167	245
Others (tea + chili)	17	13	13	13	14	13
Total	2,250	2,228	2,296	2,260	2,249	2,583
Urban Pakistan						
Cereals	1,249	1,153	1,168	1,153	1,171	1,157
Pulses	74	65	62	63	66	89
Milk & Products	126	152	157	167	164	248
Edible Oils	72	77	75	72	70	327
Meat, Fish & Chicken	48	59	63	61	67	69
Fruits	228	231	231	231	222	36
Vegetables	21	28	29	34	36	97
Sweeteners	148	125	139	135	134	143
Others (tea + chili)	20	14	13	14	13	13
Total	1,986	1,904	1,937	1,930	1,943	2,179
All Pakistan						
Cereals	1,468	1,414	1,444	1,401	1,347	1,387
Pulses	78	66	61	62	70	79
Milk & Products	169	192	206	202	208	377
Edible Oils	53	53	52	54	54	270
Meat, Fish & Chicken	44	51	56	55	66	52
Fruits	162	183	183	195	210	28
Vegetables	15	20	24	26	32	91
Sweeteners	149	141	152	147	157	187
Others (tea + chili)	19	14	13	13	12	12
Total	2,157	2,134	2,191	2,155	2,156	2,483

Source: Federal Bureau of Statistics, HIES data.

Appendix 4 Daily per capita protein consumption of major food items in Pakistan.

Food Item	1979	1985	1986	1987	1991	1993
	(grams per day)					
Rural Pakistan						
Cereals	46.44	43.92	44.71	43.69	41.06	42.47
Pulses	4.68	4.13	3.59	3.81	4.35	4.44
Milk & Products	6.55	7.74	8.48	8.35	8.88	14.04
Meat, Fish & Chicken	3.37	3.67	3.57	3.92	3.96	3.93
Fruits & Vegetables	1.26	1.48	1.67	1.63	2.09	2.95
Tea	0.49	0.35	0.42	0.42	0.35	0.49
Total	62.79	61.27	62.44	61.82	60.69	68.30
Urban Pakistan						
Cereals	36.03	33.15	33.53	33.16	33.60	33.10
Pulses	4.66	4.08	3.83	3.90	4.14	5.20
Milk & Products	5.14	6.29	6.67	6.98	6.97	10.79
Meat, Fish & Chicken	6.06	6.45	6.33	6.07	6.05	5.89
Fruits & Vegetables	1.52	1.89	2.00	2.00	2.17	3.26
Tea	0.63	0.42	0.42	0.49	0.42	0.49
Total	54.03	52.28	52.78	52.59	53.35	58.73
All Pakistan						
Cereals	42.30	40.72	41.56	40.37	39.60	39.79
Pulses	4.86	4.14	3.75	3.81	4.35	4.65
Milk & Products	6.00	7.31	7.94	7.91	8.29	13.12
Meat, Fish & Chicken	4.45	4.48	4.38	4.62	4.60	4.49
Fruits & Vegetables	1.37	1.59	1.78	1.75	2.11	3.03
Tea	0.56	0.42	0.42	0.42	0.41	0.44
Total	59.54	58.66	59.84	58.87	59.36	65.52

Source: Federal Bureau of Statistics, HIES data.

Appendix 5 Soybean utilization in Pakistan.

Year	Area (^{'000} ha)	Production (^{'000} tons)	Seed (^{'000} tons)	Waste (^{'000} tons)	Industry Use (^{'000} tons)
1980/81	3.16	1.34	0.316	0.067	0.957
1981/82	3.69	1.54	0.369	0.077	1.094
1982/83	4.91	2.09	0.491	0.1045	1.4945
1983/84	4.47	1.57	0.447	0.0785	1.0445
1984/85	4.46	1.6	0.446	0.08	1.074
1985/86	5.45	2.59	0.545	0.1295	1.9155
1986/87	5.98	3.78	0.598	0.189	2.993
1987/88	2.76	1.53	0.276	0.0765	1.1775
1988/89	2.27	1.17	0.227	0.0585	0.8845
1989/90	2.37	2.5	0.237	0.125	2.138
1990/91	3.32	5.02	0.332	0.251	4.437
1991/92	4.23	6.13	0.423	0.3065	5.4005
1992/93	5.17	6.16	0.517	0.308	5.335
1993/94	6.2	7.2	0.62	0.36	6.22

Source: NODP 1995.

Appendix 6 Explanation of Iqra tax.

Under the Finance Act of 1985, the following provision in regard to imposition of the Iqra Surcharge with effect from 1-7-1985 on imported goods was made:

“There will be levied and collected an additional customs duty as Iqra Surcharge on the importation of the goods specified in the first schedule to the Custom's Act 1969 (IV of 1969) at the rate of five percent of the value of the said goods as determined under Section 25 of the said Act”.

The levy of Iqra surcharge was part of the import tariff. Under Article 78 of the 1973 Constitution of the Islamic Republic of Pakistan, all receipts form part of the Federal Consolidated Funds. The Iqra Surcharge was therefore a component of the Federal Consolidated Fund. To be more specific, Iqra Surcharges as general revenue, formed part of the overall balance in the Federal Consolidated Fund from which expenditure is authorized by the National Assembly.

Appendix 7 Potato area, production, consumption, export, import and waste in Pakistan.

Year	Area (‘000 ha)	Production	Seed	Waste (‘000 tons)	Export	Import	Availability	Availability
								(kg/capita)
1980/81	38.0	394.3	45	40	4.9	2	306.4	3.67
1981/82	45.3	476.6	52	48	3.2	4	377.4	4.36
1982/83	51.5	518.1	50	52	7.4	2	410.7	4.60
1983/84	49.6	509.8	55	51	3.5	2	402.3	4.37
1984/85	54.5	543.3	63	55	2.7	4	426.6	4.50
1985/86	62.9	618.4	61	62	1.3	5	499.1	5.11
1986/87	60.5	594.3	58	60	2.5	1	474.8	4.71
1987/88	58.1	563.2	64	57	0.02	2	444.2	4.27
1988/89	63.90	644.8	80	65	1	5	503.8	4.70
1989/90	80.0	830.9	72	83	20.3	1	656.6	5.94
1990/91	72.0	751.3	76	75	2.4	2	599.9	5.27
1991/92	75.60	859.8	80	87	5.6	7	694.2	5.91
1992/93	760	932.8	81	93	4.6	1	755.2	6.25
1993/94	79.3	1,056.2	84	106	3.5	4	866.7	6.96

Source: FAO Food Balance Sheet.

Appendix 8 Province-wise area and production of mango in Pakistan.

Year	Punjab		Sindh		NWFP		Baluchistan_	
	Area	Production	Area	Production	Area	Production	Area	Production
1975/76	21.8	350.7	31.7	241.7	0.1	0.6	0.4	2.7
1976/77	23.0	318.3	33.6	256.5	0.1	1.3	0.5	2.8
1977/78	28.4	302.2	33.3	254.3	0.1	1.3	0.5	3.3
1978/79	25.0	273.8	33.7	259.8	0.1	1.3	0.5	3.5
1979/80	22.9	282.3	33.9	262.9	0.1	1.4	0.5	3.6
1980/81	22.2	273.9	34.4	267.4	0.1	1.5	0.5	3.8
1981/82	31.6	378.9	33.2	258.7	0.1	1.3	0.5	3.8
1982/83	33.9	417.3	33.2	259.6	0.1	1.4	0.6	4.3
1983/84	37.0	407.0	33.3	260.3	0.1	1.4	0.6	4.4
1984/85	38.8	429.0	33.4	257.1	0.1	1.5	0.7	4.3
1985/86	41.0	450.6	33.5	257.2	0.1	1.5	0.7	4.1
1986/87	42.9	470.3	33.8	260.3	0.2	1.6	0.7	4.4
1987/88	44.7	446.8	33.8	259.1	0.2	1.7	0.7	5.3
1988/89	45.3	467.6	33.9	260.2	0.2	1.7	0.8	5.5
1989/90	47.2	493.1	34.5	265.4	0.2	1.8	0.8	5.7
1990/91	47.7	501.0	36.7	267.1	0.2	1.9	0.8	6.0
1991/92	47.5	507.6	37.2	269.2	0.2	1.9	1.1	8.5
1992/93	44.7	510.1	37.4	270.9	0.2	2.0	1.3	10.7
1993/94	45.3	550.2	37.8	274.4	0.2	2.0	1.5	12.7
1994/95	47.8	581.4	38.7	285.3	0.2	2.1	1.6	14.9

Area in '000 ha; Production in '000 tons.

Appendix 9 Province-wise area, production and yield of citrus fruit in Pakistan.

Year	Punjab			Sindh			NWFP			Baluchistan		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1975/76	58.4	625.7	10.71	2.1	25.1	11.95	2.4	19.4	8.08	0.2	0.9	4.50
1976/77	69.5	662.8	9.56	2.2	27.3	12.41	2.5	20.2	8.08	0.2	1.0	5.00
1977/78	73.9	565.0	7.65	2.9	34.5	11.89	2.7	22.5	8.33	0.3	1.1	3.66
1978/79	65.9	677.5	10.28	3.0	33.7	11.23	3.0	24.8	8.26	0.3	1.1	3.66
1979/80	80.3	810.0	10.08	3.1	34.0	10.96	3.0	25.5	8.5	0.3	1.1	3.66
1980/81	87.7	864.3	9.85	3.3	34.3	10.39	3.1	26.3	8.48	0.4	1.3	3.25
1981/82	110.9	1,097.5	9.89	3.5	34.0	9.71	3.2	27.0	8.22	0.4	1.3	3.25
1982/83	117.5	1,181.3	10.05	3.5	34.5	9.86	3.3	27.3	8.27	0.4	2.0	5.00
1983/84	128.6	1,236.0	9.61	3.7	34.0	9.18	3.4	28.0	8.24	0.5	2.3	4.60
1984/85	136.4	1,307.8	9.58	3.8	34.1	8.97	3.4	28.3	8.32	0.6	2.8	4.66
1985/86	141.9	1,368.8	9.65	3.8	34.2	9.00	3.4	28.6	8.41	0.6	2.8	4.66
1986/87	145.6	1,400.4	9.62	3.8	34.4	9.05	3.5	29.0	8.28	0.6	3.3	5.50
1987/88	150.6	1,342.7	9.82	3.8	34.7	9.13	3.7	30.4	8.22	0.7	3.5	5.00
1988/89	161.9	1,494.6	9.23	4.0	36.0	9.00	3.6	30.4	8.44	0.7	4.1	5.86
1989/90	162.8	1,506.7	9.25	4.0	34.7	8.67	3.6	30.4	8.44	0.7	4.5	6.43
1990/91	164.8	1,538.5	9.33	4.1	34.8	8.48	3.7	31.1	8.41	0.7	4.7	6.72
1991/92	167.2	1,554.2	9.29	4.1	35.3	8.60	3.8	32.7	8.61	1.1	7.6	6.91
1992/93	166.8	1,585.9	9.51	4.2	35.8	8.52	3.9	33.3	8.54	1.3	10.3	7.92
1993/94	175.2	1,766.7	10.08	4.1	35.3	8.60	4.0	34.3	8.57	1.7	13.1	7.71
1994/95	180.7	1,847.3	10.22	4.1	35.2	8.58	4.1	34.6	8.43	1.8	15.7	8.72

Area in '000 ha; Production in '000 tons; Yield in tons/ha.

Appendix 10 Province-wise area, production and yield of sugarcane in Pakistan.

Year	Punjab			Sindh			NWFP			Baluchistan		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1975/76	449.8	18,267.6	36.6	105.6	3,586.4	34.0	94.3	3,690.6	39.1	0.1	2.1	21.0
1976/77	574.6	21,788.3	37.9	118.8	4,037.0	34.0	94.3	3,695.4	39.2	0.1	2.3	23.0
1977/78	607.0	22,095.7	36.4	120.3	4,260.4	35.4	95.1	3,718.8	39.1	0.1	1.7	17.0
1978/79	536.6	19,343.9	36.0	120.8	4,373.8	36.2	95.0	3,606.1	38.0	0.1	1.7	17.0
1979/80	501.4	19,413.5	38.7	129.9	4,664.4	35.9	87.1	3,417.0	39.2	0.1	2.8	28.0
1980/81	597.5	23,733.0	39.7	136.0	5,007.3	36.8	90.5	3,598.0	39.8	0.7	21.1	30.1
1981/82	670.2	25,021.0	37.3	174.0	7,462.7	42.9	101.2	4,057.2	40.1	1.3	38.8	29.8
1982/83	628.3	20,882.4	33.2	180.6	7,545.7	41.8	100.3	4,017.6	40.1	2.5	87.8	35.1
1983/84	613.7	22,835.9	37.2	177.3	7,357.1	41.5	104.7	4,065.3	38.8	0.8	29.0	36.3
1984/85	626.1	20,959.0	33.5	180.7	7,427.9	41.1	95.9	3,722.4	38.8	0.9	30.3	33.7
1985/86	510.6	16,755.1	32.8	177.4	7,533.2	42.5	91.4	3,553.1	38.9	0.4	14.9	37.3
1986/87	487.2	18,477.7	37.9	182.7	7,906.1	43.3	91.6	3,518.5	38.4	0.5	23.5	47.0
1987/88	535.3	19,406.2	36.3	207.1	9,574.8	46.2	98.7	4,020.5	40.6	0.5	27.3	54.6
1988/89	529.6	19,493.7	36.8	247.9	13,110.5	52.9	98.9	4,349.0	44.0	0.5	22.5	45.0
1989/90	501.0	18,682.9	37.3	250.7	12,360.0	49.3	102.1	4,427.3	43.4	0.5	23.4	46.8
1990/91	525.6	19,633.4	37.4	253.1	11,815.6	46.7	104.6	4,516.1	43.2	0.5	23.6	47.2
1991/92	536.2	20,026.8	37.3	255.3	14,240.5	55.8	104.0	4,568.9	43.9	0.6	28.7	47.8
1992/93	536.1	20,044.8	37.4	248.0	13,556.8	54.7	99.9	4,428.4	44.3	0.6	28.9	48.2
1993/94	596.2	24,510.8	41.1	265.8	15,421.0	58.0	100.3	4,470.1	44.6	0.5	25.1	50.2
1994/95	656.7	28,263.0	43.0	249.7	14,310.0	57.3	102.1	4,562.2	44.7	0.5	27.9	55.8

Area in '000 ha; Production in '000 tons; Yield in tons/ha.

Appendix 11 Province-wise area and production of apple in Pakistan.

Year	Punjab		Sindh		NWFP		Baluchistan	
	Area	Production	Area	Production	Area	Production	Area	Production
1975/76	0.6	3.4	0.1	0.2	2.5	30.7	4.8	32.5
1976/77	0.4	2.8	0.1	0.2	3.2	36.5	5.1	35.3
1977/78	0.5	3.1	0.1	0.2	3.6	42.1	5.5	42.3
1978/79	0.5	3.2	0.1	0.2	3.8	43.7	5.9	46.6
1979/80	0.4	3.0	0.1	0.2	3.9	45.6	6.4	50.4
1980/81	0.5	3.2	0.1	0.2	4.1	48.2	6.7	55.8
1981/82	0.4	2.7	0.1	0.2	4.4	51.6	7.0	59.6
1982/83	0.6	4.0	0.1	0.2	4.6	55.1	7.6	69.3
1983/84	0.6	4.0	0.1	0.2	4.2	50.9	8.4	73.0
1984/85	0.6	4.0	0.1	0.2	5.0	59.0	9.1	79.4
1985/88	1.1	7.8	0.1	0.2	6.4	72.9	9.7	85.1
1986/87	1.2	8.0	0.1	0.2	6.5	95.7	10.7	91.7
1987/88	1.2	8.1	0.1	0.2	6.6	98.4	11.2	105.3
1988/89	1.2	8.6	0.1	0.2	6.7	95.6	13.8	110.7
1989/90	1.2	9.1	0.1	0.2	7.0	98.4	14.1	124.7
1990/91	1.2	9.7	0.1	0.2	7.2	96.6	14.3	136.5
1991/92	0.2	2.0	0.1	0.2	7.6	81.8	19.9	211.3
1992/93	0.2	2.0	0.1	0.2	7.8	83.4	23.3	253.4
1993/94	0.2	2.0	0.1	0.2	8.0	84.0	31.2	356.2
1994/95	0.2	2.2	0.1	0.2	8.0	84.6	32.1	446.1

Area in '000 ha; Production in '000 tons.

Appendix 12 Province-wise area, production and yield of onion in Pakistan.

Year	Punjab			Sindh			NWFP			Baluchistan		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1975/76	9.7	118.3	12.2	16.0	135.6	8.5	2.5	31.8	12.5	2.6	37.0	14.6
1976/77	8.8	107.9	12.2	14.9	129.9	8.7	2.6	32.1	12.3	3.9	61.6	16.1
1977/78	8.9	107.9	12.2	18.3	159.8	8.7	2.7	32.6	12.1	1.9	25.1	13.1
1978/79	10.7	130.5	12.2	23.4	201.2	8.6	2.1	25.8	12.3	2.5	32.2	13.0
1979/80	12.0	144.5	12.0	23.4	203.5	8.7	2.6	31.4	12.1	3.9	54.6	14.0
1980/81	12.2	140.2	11.5	23.5	206.1	8.8	2.4	29.2	12.2	5.1	72.1	14.0
1981/82	12.3	143.2	11.6	23.9	212.4	8.9	2.6	30.9	11.9	4.6	65.3	14.3
1982/83	12.7	145.4	11.4	24.4	217.7	8.9	2.3	28.3	12.4	5.9	83.4	14.3
1983/84	12.9	149.5	11.6	24.8	220.9	8.9	2.7	32.8	12.4	7.0	100.2	14.3
1984/85	13.2	151.7	11.5	24.8	221.0	8.9	2.9	36.4	12.3	7.3	105.5	14.6
1985/88	14.1	163.3	11.5	26.1	270.4	9.1	3.0	38.0	12.7	6.2	86.8	14.0
1986/87	14.3	157.8	11.0	26.4	241.4	9.1	3.9	50.8	13.0	6.5	126.8	19.6
1987/88	15.6	161.2	10.3	26.6	242.5	9.2	4.7	65.9	14.0	8.5	163.5	19.2
1988/89	16.7	185.3	11.1	25.6	255.1	10.0	5.9	83.4	14.2	9.6	183.2	19.1
1989/90	14.8	143.9	9.7	26.5	270.4	10.2	5.2	64.2	12.3	12.1	234.4	19.4
1990/91	16.1	157.9	9.8	26.1	270.4	10.4	5.8	68.4	11.8	10.6	205.7	19.4
1991/92	16.1	158.1	9.8	27.8	299.7	10.9	6.1	77.2	12.6	14.0	273.9	19.6
1992/93	17.8	171.8	9.7	28.1	303.6	10.8	6.6	88.3	13.4	15.1	290.0	19.3
1993/94	18.4	182.9	10.0	29.2	322.4	11.0	6.7	93.2	13.8	16.0	313.0	19.5
1994/95	19.7	205.2	10.4	30.3	354.7	11.7	6.6	90.1	13.6	18.2	363.1	20.0

Area in '000 ha; Production in '000 tons; Yield in tons/ha.

Appendix 13 Province-wise area, production and yield of tomato in Pakistan.

Year	Punjab			Sindh			NWFP			Baluchistan		
	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield	Area	Prod.	Yield
1975/76	1,022	13,369	13,081	3,375	9,588	2,841	2,656	25,342	9,541	471	5,388	11,439
1976/77	1,000	13,559	13,559	3,777	10,716	2,837	2,640	27,412	10,383	744	8,779	11,800
1977/78	1,099	14,298	13,010	3,528	10,340	2,931	2,629	27,427	10,432	958	11,367	11,865
1978/79	1,258	16,529	13,139	3,851	13,353	3,467	3,592	36,783	10,240	1,066	12,680	11,895
1979/80	1,051	13,758	13,090	4,752	18,328	3,857	4,057	40,358	9,948	1,131	14,005	12,383
1980/81	1,457	18,979	13,026	5,345	22,399	4,191	3,569	35,920	10,064	1,200	14,800	12,333
1981/82	1,266	16,957	13,394	5,496	22,177	4,110	4,090	42,174	10,311	1,405	17,800	12,669
1982/83	1,608	20,369	12,667	5,705	23,475	4,115	4,380	44,815	10,232	2,218	29,690	13,386
1983/84	1,560	20,495	13,138	5,597	23,814	4,255	4,355	47,057	10,805	2,622	35,840	13,669
1984/85	1,157	15,321	13,242	5,621	24,788	4,410	4,535	48,482	10,691	2,859	41,390	14,477
1985/86	1,320	15,833	11,995	5,962	27,408	4,597	4,668	51,391	11,009	3,820	55,330	14,484
1986/87	1,554	18,361	11,815	6,200	28,607	4,614	4,741	53,074	11,195	3,273	47,930	14,644
1987/88	1,668	19,773	11,854	6,081	28,263	4,648	5,635	61,310	10,880	3,541	52,220	14,747
1988/89	2,059	26,212	12,730	5,698	26,935	4,727	6,941	70,953	10,222	3,686	54,731	14,848
1989/90	2,290	29,311	12,800	5,678	27,076	4,769	7,067	71,985	10,186	4,304	65,400	15,195
1990/91	3,455	49,563	14,345	5,820	28,277	4,859	7,683	76,724	9,986	3,877	58,970	15,210
1991/92	3,831	54,054	14,371	5,889	29,261	4,968	8,077	81,864	10,135	4,705	71,680	15,234
1992/93	3,773	55,646	14,748	5,911	30,000	5,075	8,576	83,900	9,783	4,815	73,710	15,308
1993/94	4,145	57,673	13,914	5,891	29,641	5,032	9,248	90,452	9,781	4,976	76,500	15,374
1994/95	4,261	61,633	14,464	5,867	29,826	5,084	10,172	101,072	9,936	5,353	83,280	15,558

Area in '000 ha; Production in '000 tons; Yield in tons/ha.

