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CONTRIBUTIONS AND INTERLINKAGES OF THE FOOD AND FIBER SYSTEM IN PAKISTAN'S ECONOMY

Special Report Series
No. 12

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PREFACE

This Special Report is one of three major EAN studies to support an improved understanding of the role of the food and fiber system in Pakistan's economy using an input-output model. Earlier, in 1988, John Mckean described the basic input-output analytical technique with special reference to the PIDE model (EAN Special Report No. 3, A Guide to Interindustry Analysis of the Pakistan Economy). While the present analysis was being done, Abdul Qayyum Khan was testing three procedures of updating the PIDE input-output model (EAN Special Report No. 13, Development of Updating Procedures for an Analysis of Pakistan Interindustry Relationships). The present study applies an updating procedure which is close to the RAS method, and which proved to be a superior updating technique in Khan's study. The PIDE model is condensed to 20 sectors and is updated for the year 1984/85. However, the main emphasis of this study is not on testing the updating methods. The report focuses on studying the contributions and interlinkages of the food and fiber system in Pakistan's economy.

This study will be useful in understanding the role of different sectors of the food and fiber system in the national economy. More importantly, the study portrays how different sectors of the food and fiber system are interlinked with each other and with the rest of the economy, and evaluates the input requirements of each sector for its expansion. The study will help in assessing interindustry bottlenecks and opportunities for business development.

In 1988, the EAN Project trained a core group of analysts in the Federal Bureau of Statistics in basic input-output methods. From time to time the project, through its analytical capability in input-output modeling, has helped the government in making important policy decisions such as increasing the energy prices after testing the sensitivity of the general price index on energy prices.

During 1989/90, the EAN project will use studies related to the input-output model (Special Report Nos. 3, 12 and 13) to assist the Ministry of Food, Agriculture and Cooperatives in strengthening the economic and policy analysis capabilities of its newly formed Economic Wing. The Economic Wing will use these studies to help the government in making important macro policy decisions related to the food and fiber system of the economy.

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1. INTRODUCTION

The Pakistan economy, to a large extent, can be characterized as a transitional agricultural economy that is gradually developing a more complex food and fiber system and a larger industrial sector. Recently, during 1984/85, the food and fiber system accounted for one half of gross domestic product (GDP) and farm production itself accounted for half that amount. This is down from an earlier 1975/76 period when the food and fiber system accounted for 54 percent of the GDP and farming was almost two thirds of that percentage. The food and fiber system, in some years, contributes as much as three quarters of the merchandise exports. Viewed from another perspective, more than two thirds of all the employed labor force is involved in the food and fiber system. Further, in relation to business development and expansion, a major part of national capital formation occurs within the food and fiber system.

The food and fiber system (FFS) is the scheme of economic activities involved in farming and agricultural business. Farming is made up of the production of crops and livestock and livestock products. In Pakistan wheat, cotton, rice, sugar cane and maize are the major crops. The major livestock product is milk. Wheat and milk account for nearly two thirds of all food consumed as shown by the most recent Household Income and Expenditure survey. Agricultural business includes the manufacture and distribution of farm inputs and food and fiber products. Manufacture refers to the making and processing of farm inputs as feed, seed, machinery and fertilizer, and food and fiber products as sugar, bread and yogurt. Distribution involves storage, transportation, wholesaling and retailing services.

In Pakistan, the food and fiber system is a major force in economic development. Due to its historic origin, as the basis of the economy, it is now the source of labor for other industrial sectors, capital for new business, revenue for the federal and provincial government, and exports that balance the imports required by other developing sectors. These key and important functions, along with its size, make the food and fiber system the dominate force in the national economy. It interacts with all other sectors using the resources of most other sectors and often providing the raw material for other sectors as well as food and fiber for the household.

Because of the perceived importance of the food and fiber system and its role in economic development this technical report was undertaken as a means to estimate the contribution of the food and fiber system to the total economy and its interlinkages to the rest of the economy. This analysis was made using methodologies and concepts similar to those used in studies by Schluter, Lee and Edmondson (1986). The conceptualization of a food and fiber system

Edmondson (1986). The conceptualization of a food and fiber system as the agribusiness sector and its interlinkages with the rest of the economy was originally shown by Davis and Goldberg (1957).

Earlier, Saleem, Parveen, Mahmood and Qasim (1985) have completed a 118 sector input/output model (PIDE model) for the 1975/76 Pakistan economy. This analysis has condensed the 118 sector model to a working model (EAN working model) with 20 sectors which correspond to the sectors used in the national accounts. Published information for the 20 sectors was used to update the input/output transactions table to 1984/85. Additional information provided by the Federal Bureau of Statistics was used to develop resource requirement matrices for energy and employment. Finally, for presentational purposes, the transactions matrix was collapsed further to 15 sectors (EAN operational model).

While the EAN model was being completed and used to deal with selected policy issues, Khan (1988) was testing procedures for updating the PIDE input/output table with sectors similar to the EAN model. Khan tested three updating methods including the RAS method, updating by revising final demand estimates, and updating by proportionalizing transactions to value added. His general conclusions were that input/output matrices updated using the RAS method were more accurate forecasters of total output.

The procedure for updating the EAN model included condensing the 118 sector 1975/76 PIDE model down to 20 sectors that are consistent with the national accounts. The national accounts were then used to update estimates of primary inputs and final demands to 1984/85. Primary inputs in the EAN model consist of household wages, electricity, gas, imports, taxes and subsidies, and self employment, rent and savings. Final demands are made up of household income, exports and investments. Shifts in the size of the food and fiber system were largely based on shifts in value of production by industry. Transactions among sectors were proportionalized to value added by sector with individual transactions adjustments based on industry costs by major industry group. Where comparisons are available, the model developed by Khan using the RAS method does not appear importantly different from the EAN model.

The EAN model was used in this report to estimate the contribution of the FFS to total income, employment, energy utilization, import requirements, foreign exchange earnings, and consumption share during 1975/76 and 1984/85. Technologies in the FFS are compared with the "rest of the economy" in terms of direct and indirect requirements per rupee of output for different types of energy, levels of employment, and amounts of primary inputs used. Overtime, technological changes in the direct and indirect requirements are highlighted. Finally, the EAN input-output model is used to trace the interaction of the FFS with the "rest of the economy."

2. SECTORAL CLASSIFICATION

The input/output transactions in the EAN working model are based on 14 industry sectors, 6 types of primary inputs and 3 types of final demands. The transactions table for the EAN working model is given in Appendix 1 and primary inputs and resource requirements for each sector of the model are reported in Appendices 2 and 3, respectively. These sectors, with some adjustments, are consistent with the National Accounts of Pakistan, 1984/85. Transactions, total sales, and value added are recorded by the Federal Bureau of Statistics using this classification. The sectors for the EAN working model are shown in the following table.

TABLE 2.1

SECTORS IN THE EAN WORKING MODEL

Food And Fiber System:

1. Manufacture-farm input
2. Farming
3. Manufacture-food & fiber
4. Transportation, Storage, and Communications-food & fiber
5. Wholesale & Retail trade-food & fiber

Rest of the Economy:

1. Manufacture-other
2. Transportation, Storage, and Communications-other
3. Wholesale & Retail trade-other
4. Mining and Quarrying
5. Construction
6. Banking
7. Ownership and Dwellings
8. Public Administration and Defense
9. Services

Primary Inputs

1. Households
2. Imports
3. Electricity
4. Gas
5. Taxes-Subsidies
6. Self Employment Rent and Savings

Final Demands

1. Households
2. Exports
3. Investment and Discrepancy

The 1975/76 transactions matrix is constructed by condensing the 1975/76 PIDE model transactions matrix to the sectors shown above. The classification of the 119 sectors of the PIDE model for purposes of condensing are shown in Appendix 4. The condensed 1975/76 transactions matrix was then updated, as described earlier, to 1984/85. For presentational purposes, the EAN operational model used throughout this report further condenses the EAN working model as follows.

TABLE 2.2

SECTORS IN THE EAN OPERATIONAL MODEL

Food and Fiber System:

1. Manufacture-farm input
2. Farming
3. Manufacture-food & fiber
4. Transportation, Storage,
and Communications-food & fiber
5. Wholesale & Retail trade-
food & fiber

Rest of the Economy:

1. Manufacture-other
2. Trade Services¹
3. Construction related²
4. General Services³

Primary Inputs:

1. Households
2. Imports
3. Electricity
4. Gas
5. Taxes-Subsidies
6. Self Employment Rent and Savings

The sectors for the food and fiber system in the EAN operational model are defined to show the general flow of business activity from the farm inputs industries through farming, transportation, storage, manufacturing, wholesaling and retailing. The "rest of the economy" is defined to characterize the economy in Pakistan where

¹ Includes, transportation, storage, communications and wholesale and retail trade.

² Includes, construction, mining & quarry and ownership of dwellings.

³ Includes banking, public administration and defense and services.

manufacturing and trade services are relatively underdeveloped and a relatively small portion of the total economy. The economy as a whole is divided into industrial sectors, primary inputs, and final demands to apply an input-output model.

3. ESTIMATION PROCEDURE

After dividing the economy into sectors, the inter-industry transactions, popularly known as the "transactions matrix", are developed. The transactions matrix shows the purchases of individual sectors from other sectors and from primary inputs. The rows show the sales of the sector to the other sectors and to final demands. The transactions matrix for the year 1975/76 was updated to 1984/85 using value added as an expansion factor with a proportional adjustment for the food and fiber sector based on the 1983/84 industrial cost statistics by major industry group. Estimates for final demand and primary inputs (RIM) were updated using the national accounts data.

The following analysis of multipliers⁴ is developed to show the inter-linkages of the food and fiber system with other sectors of the economy for the years 1975/76 and 1984/85.

3.1. Inter-industry Linkages

Linkages of a sector with other sectors of the economy depend on the transactions a sector is making with other sectors of the economy and the extent of leakages to primary inputs. Leakages are defined as the proportion of total expenditure on primary inputs. The higher the proportion of total expenditure on primary inputs, the lower will be the output multiplier. As a measure the output multiplier is the total (direct and indirect) increase in output in a sector in response to a unit increase in the final demand of that sector. Similarly, higher transactions of a sector with other sectors result in larger multipliers. This implies dependence of these sectors, on each other, for expansion in output. The output multipliers which indicate the level of interlinkages among sectors are calculated as follows:

$$O = (I - A)^{-1} \quad [1]$$

Where

A = an (n x n) direct requirement or technical coefficient matrix. Each element of matrix A (a_{ij}) describes the purchases from sector (i) (in rupees) to produce one rupee of output in sector (j).

⁴ The multiplier section is derived from Miller and Blair (1985).

O = an $(n \times n)$ output multipliers matrix. Each element of the O matrix (O_{ij}) shows the total (direct and indirect) increase in the output of the i -th sector by one rupee increase in the final demand of the j -th sector. This also shows the dependence of the j -th sector on the i -th sector for its expansion. Sum over all the (i) rows in column (j) shows the total increase in output of all the sectors by one rupee increase in the final demand of the j -th sector.

3.2. Primary Input Multipliers

Primary inputs consist of the expenditures on value added i.e., income of the basic factors of production as labor, land, capital and management and other inputs in this analysis including imports, electricity and gas, and taxes and subsidies. Further, the direct requirement for the i -th primary input is defined as use of the primary input per rupee worth of the j -th sector output. It is calculated using equation [2].

Where $v_{ij} = V_{ij}/TR_j$ [2]

v_{ij} = the value of the i -th primary input per rupee worth of the j -th sector total output;

TR_j = the value of total output of the j -th sector;

V_{ij} = the value of the i -th primary input used in producing the total output of the j -th sector.

Value added is a subset of the primary inputs and in this analysis includes two sectors; households and self employment, rent and savings. The sum of value added over all the industry sectors is Gross National Product (GNP) as follows:

$$GNP = \sum_i G_{ij} \quad [3]$$

where

G_{ij} = the value added in the i -th rows of primary inputs over the j -th industry sectors due to transactions by the basic factors of production: land, labor, capital and management.

Under an I/O structure, primary inputs are a fixed proportion of output. The primary input requirements of each sector of the economy increase proportionate to the expansion of the sector. The total direct and indirect requirements of a primary input for the expansion of a sector is defined as the primary input multiplier for that sector and is calculated using equation [4]:

$$\text{Where } I = v \times O = v (1 - A)^{-1} \quad [4]$$

I = the $(k \times n)$ matrix, k is the number of rows of primary inputs and n is the number of columns of industries. I_{ij} shows the i -th primary input requirements (both direct and indirect) when final demand of the j -th sector is increased by one rupee.

v = the $(k \times n)$ matrix of primary input requirements.

A, O = as defined in [1]

Since income of any sector is equal to the value added in that sector, the value added multiplier of a sector represents its income generation capacity due to expansion through export, investment or consumption.

3.3. Resource Multipliers

Employment (the labor force in millions) and aggregate energy (total oil equivalents [TOE] of various forms of energy), are the resources considered in this analysis. The direct requirement for the i -th resource is defined as the use of that resource per rupee of the j -th sector output. It is estimated as:

$$\text{Where } r_{ij} = R_{ij}/TR_j \quad [5]$$

r_{ij} = the quantity of the i -th resources per rupee of the j -th sector total output;

TR_j = as defined in [2]

R_{ij} = the total quantity of the i -th resources used in producing total output of the j -th sector.

Similar to the primary input requirements, resource requirements increase proportionate to the expansion of a sector. The total of direct and indirect resource requirements for expansion of a sector is called the resource multiplier. The resource multiplier is calculated as:

$$\text{where } S = r \times O = r (1 - A)^{-1} \quad [6]$$

S = a $(z \times n)$ matrix, z is the number of rows for resources and n is the number of columns for sectors. S_{ij} shows the total (direct and indirect) requirement (in physical quantity terms) for the i -th resource when the j -th sector final demand is increased by one rupee.

r = a $(z \times n)$ matrix. r_{ij} shows the direct requirement for the i -th resources (in physical quantity terms) per rupee of the j -th sector output.

It is necessary to adjust for inflation when comparing the technical requirements and resource multipliers during 1975/76 with those for 1984/85⁵. For this purpose, the transactions matrix of 1984/85 was converted to 1975/76 rupee equivalents. Two resource multipliers were calculated. One was computed in nominal terms where multipliers and technical resource requirements for both years were expressed in the years' nominal values. The other was estimated in real terms in which multipliers and technical resource requirements for 1975/76 and 1984/85 are expressed in 1975/76 rupee equivalents.

3.4. Price Multipliers

The price multiplier is defined as the percentage increase in the prices of a sector output if price of a primary inputs is increased by 1 percent. Price multipliers can be calculated as follows:

$$P = v^t \times O^t = [(1 - A)^{-1}]^t v^t \quad [7]$$

Where

P = the $(n \times k)$ matrix, n is the number of rows for industry and k is the number of columns of primary inputs. P_{ij} is defined as total percentage (direct and indirect) increase in the prices of i -th row sector output by one percent increase in the prices of j -th primary inputs.

O, A, v = as defined in [1] and [2].

Since prices of the economy, in an I/O model, are driven by primary inputs only, doubling the prices of all the primary inputs for one (or all) the sectors will double the prices of that (or all) the sectors' output.

The price increase of a sector can be used to show its influence on the general price index when it is weighted by the percentage share of the sector output in the total output of the economy. The price increase of a sector weighted by percentage output share of that sector in the total output is termed here as "a weighted price multiplier" (P_{wij}) and is calculated using [8].

⁵ Such inflationary effect will be taken care off automatically if resources are expressed in value terms like incase of primary input requirements because both numerator and denominator in calculating the technical coefficients are suppose to have same inflationary effects.

Where $P_{wij} = P_{ij} * W_i$

[8]

$W_i = Y_i / Y$; where Y is the total output of the whole economy and Y_i is the output of i -th row sector.

Summation of the weighted price multipliers over all the row sectors will indicate the increase in the general price index of the economy by one percent increase in the price of a primary input.

3.5. Forward Linkages

The forward linkages show the amounts that the outputs of different sectors of the economy change with a change in the primary input supply. It is assumed that newly generated supplies of a primary input will be passed forward through the economy to be converted to output. The forward linkage analysis rests on supply driven output. To some extent, the assumption used in the I/O model is that of Say's law; supply generates its own demand. The multiplier in a supply driven model is calculated as:

Where
$$\bar{O} = (I - \bar{A})^{-1}$$
 [9]

\bar{A} = an $(n \times n)$ sales coefficient matrix. Each element of matrix \bar{A} (\bar{a}_{ij}) describes the share of sales from the i -th row sector (in rupees) going to the j -th column sector per rupee of output in sector (i).

\bar{O} = an $(n \times n)$ forward linked output multiplier matrix. Each element of the \bar{O} matrix (\bar{O}_{ij}) shows the total (direct and indirect) increase in the output of the j -th column sector by one rupee increase in the supply of primary inputs in the i -th row sector. This also shows the dependence of the j -th sector output, for its expansion, on the supply of i -th sector primary inputs. The sum over all the (j) columns in i -th row shows the total increase in output of all the sectors by one rupee increase in the supply of primary inputs in the i -th sector.

4. CONTRIBUTIONS OF THE FOOD AND FIBER SYSTEM TO THE ECONOMY

This section discusses the relative contribution of the food and fiber system in the economy in terms of exports, imports, value added, employment, energy used, household consumption provided, and investment for 1975/76 and 1984/85. Contributions to the economy, made by the food and fiber system, describe, to some extent, the importance of the food and fiber system to the national economy and how it advances economic development. An overview of FFS contributions also provides a description of the economy as one that is largely "agricultural" with a slowly developing industrial base.

4.1. Exports

The Pakistan economy has had an unusually large increase in services provided overseas which are technically considered as exports. This largely consists of wages returned by overseas workers. In addition, Pakistan has been acquiring international loans which are treated in the input/output framework as exports. In order to adequately account for wages returned by overseas workers and international loans all exports are examined in this case. In contrast, merchandise exports are the most common considered measure of exports. Table 4.1 shows the relative contribution of the food and fiber system to total exports including remittances from abroad.

One of the most significant factors in the growth of the Pakistan economy has been the growth in services which largely consists of repatriated wages. During 1975/76, service exports amounted to around 10 percent of total exports; by 1984/85 they have grown to 43 percent of total exports. This phenomenal growth has largely overshadowed the growth in exports from the food and fiber system. With the decline in mid-ast oil economies, continued growth in overseas services is not expected and export growth will depend on products produced by the food and fiber system and the rest of the economy.

When total exports are considered, including the exports of services and international loans, the share of the food and fiber sector has declined from 37 percent during 1975/76 to 33 percent during 1984/85. The share of farm commodities declined from 20 percent to 13 percent during the same period while the share of food and fiber manufacturing increased from 16 percent during 1975/76 to 18 percent during 1984/85. The share of "rest of the economy" decreased substantially from 52 percent in the base period to 24 percent in 1984/85.

TABLE 4.1

THE CONTRIBUTION OF THE FOOD AND FIBER SYSTEM TO EXPORTS
(IN MILLION RUPEES), 1984/85 AND 1975/76

Food and Fiber System:	1984/85		1975/76	
	Value	%Share	Value	%Share
Manufacturing Farm Inputs	937	1.0%	157	0.7%
Farming	12084	13.5%	4561	20.0%
Manufacturing Food and Fiber	16586	18.5%	3731	16.3%
Transport, Storage and Comm.	0	0.0%	0	0.0%
Wholesale & Retail Trade	0	0.0%	0	0.0%
Subtotal	29607	33.0%	8449	37.0%
Rest of the Economy	21237	23.7%	11952	52.3%
Services	38311	42.7%	2267	9.9%
Re-export	458	0.5%	167	0.7%
Subtotal	60006	66.9%	14386	63.0%
TOTAL	89613	100.0%	22835	100.0%

Source: Economic Survey, 1987-88, PP.121-26.

In contrast when only merchandise exports are considered, the food and fiber system contributes more than half of the exports. Food and fiber manufacturing sector has claimed a substantial higher share in the merchandise exports with an increase from 18 percent during 1975/76 to 32 percent in 1984/85. The share of "rest of the economy" decreased from 58 percent in 1975/76 to 41 percent in 1984/85. The share of farming and other sectors related to the food and fiber system in merchandise exports is almost constant during the period considered here.

Finally, there has been a substantial increase in the absolute level of exports during the 1975/76 to 1984/85 period. Food and fiber sector exports grew by an annual average of 15 percent per year between 1975/76 and 1984/85. The growth in the export of manufactured food and fiber products was even larger at 18 percent per annum. The growth in manufactured farm inputs was largely an anomaly since most was accounted for by growth in fertilizer exports which occurred in 1984/85.

In summary, exports from the food and fiber sector have been overshadowed by the development of overseas services in the form of repatriated wages. The development of this services sector has also been a significant addition to the total economy, accounting for a substantial portion of the total economic growth. However,

exports from the food and fiber sector are a growing share of merchandise exports. Overall, exports are playing a larger role in the Pakistan economy, accounting for additional tax revenues and business activity.

4.2. Imports

Table 4.2 shows imports by sector in each study period. The food and fiber system as a whole as well as by individual sectors became relatively more import demanding during the nine year period from 1975/76 to 1984/85. This is probably due to the growth in the food and fiber system and the economic development in Pakistan.

TABLE 4.2

THE CONTRIBUTION OF THE FOOD AND FIBER SYSTEM TO IMPORTS
(IN MILLION RUPEES), 1984/85 AND 1975/76

	1984/85		1975/76	
	Value	% Share	Value	% Share
Food and Fiber System:				
Manufacturing Farm Inputs	2193	2.6%	270	0.7%
Farming	5137	6.0%	726	2.0%
Manufacturing Food and Fiber	17517	20.3%	4807	13.0%
Transport, Storage and Comm.	12245	14.2%	3157	8.5%
Wholesale & Retail Trade	95	0.1%	0	0.0%
Subtotal	37187	43.2%	8960	24.2%
Rest of the Economy	34277	39.8%	11934	32.3%
Consumer Goods	14682	17.0%	16076	43.5%
Subtotal	48959	56.8%	28010	75.8%
TOTAL	86146	100.0%	36970	100.0%

Source: Imports during 1985/86 are derived from Foreign Trade, Vol.12, No. 11, May 1985, while imports during 1975/76 are taken from PIDE model.

The share of imports used by the food and fiber system increased from 24 percent in 1975/76 to 43 percent in 1985-86 indicating that the food and fiber system became more commercialized and mechanized during this period. The highest increase in the relative share of imports is in those used by food and fiber manufacturing and transportation. The farming and farm input sectors also became more import demanding.

The share of the "rest of the economy" in imports increased from 32 percent to 40 percent and will become more so as the industrial

sector builds. The share of consumption in total imports declined from 43 percent to 17 percent during the reference period. The decline in the proportion of consumer items is related to import taxes levied against consumer goods, and the increasing demand for improved technology in the industrial sector. This is contrary to the current popular belief that demand for imported consumer items are shooting.

In short, Pakistan is now importing more of the items used in production, manufacturing and hauling of the food and fiber commodities rather than importing consumer items. This is happening as the economy is becoming more mechanized and uses more fuel which is largely imported. In addition, the growing sub-sectors of the food and fiber systems consume a larger proportion of imports. In fact, growth in the entire economy is heavily dependent on imported fuel and technology.

It is important to note that farming is a net exporter, that is the farming sector is exporting more than it imports. For example, in 1984/85 farm exports amounted to Rs. 12,084 million while imports used in the farm sector amounted to Rs. 5,137 million. However, the overall food and fiber system is a net importer. In 1984/85 food and fiber sector exports amounted to Rs. 29,607 million while imports used by the food and fiber system amounted to Rs. 37,187 million. In addition, fuel which is used heavily in the transport, storage and communication subsector is a major import and helps make the food and fiber system, as a whole, a net importer.

In summary, the food and fiber system is very much dependent on imports and will probably be more so in future as modernization and development continue. In fact, the food and fiber system as a whole is a net importer. The farming sector, which continues to be a net exporter, is the exception. The rest of the economy, like the food and fiber system, has become more import dependent. Most of the imports and growth in imports consists of production related items. This conflicts with the popular notion that most imports are consumer items.

4.3. Value added (GDP)

Table 4.3 shows the contribution to value added by each subsector of the food and fiber system in each study year. Overall, the contribution to value added during the 1975/76 to 1984/85 period depicts the Pakistan economy as an agricultural economy in a slow transition to a more industrialized economy. The contribution of the food and fiber system has declined from 54.3% of total value added during 1975/76 to 48.6% during 1984/85, while the "rest of the economy" has gained the same proportionate amount.

TABLE 4.3

THE CONTRIBUTION OF THE FOOD AND FIBRE SYSTEM TO VALUE ADDED
(IN MILLION RUPEES), 1984/85 AND 1975/76

	1984/85		1975/76	
	Value	%Share	Value	%Share
Food and Fiber System:				
Manufacturing Farm Inputs	1471	0.3%	379	0.3%
Farming	108873	25.0%	39727	34.0%
Manufacturing Food and Fiber	40465	9.3%	7971	6.8%
Transport, Storage and Comm.	19832	4.6%	4732	4.1%
Wholesale & Retail Trade	40973	9.4%	10597	9.1%
Subtotal	211614	48.6%	63406	54.3%
Rest of the Economy	223401	51.4%	51692	45.7%
Subtotal	223401	51.4%	51692	45.7%
TOTAL	435015	100.0%	115098	100.0%

Source: Value added for 1984/85 is from Economic Survey, 1987-88, PP.20,, and value added for 1975/76 is from PIDE model.

The details of the shift of the economy from agriculture to non-agricultural sources include a substantial decline in the proportion of value added by farming activities from 34% in 1975/76 to 25% in 1984/85. Other sectors of the food and fiber system gained share. These shifts indicate the "marketization" of the food and fiber system. A larger portion of the food and fiber system is being concentrated on processing, transportation, storage and trade and a smaller proportion on the actual production of the food or fiber commodity.

4.4. Employment

The food and fiber system is the largest source of employment in Pakistan in both of the years under study and will probably continue so in near future. This is largely due to the disproportionate amount of labor involved in farming. As shown in Table 4.4 over 50 percent of the labor force of Pakistan is involved in farming.

The labor force in farming increased from 11.6 million in 1975/76 to 13.6 million in 1984/85. The compound growth rate of farming labor was 1.85 percent as against 2.96 percent of civilian labor force during the last nine years. Therefore, share of farming in

TABLE 4.4

THE CONTRIBUTION OF THE FOOD AND FIBRE SYSTEM TO EMPLOYMENT
(IN MILLION EMPLOYEES), 1984/85 AND 1975/76

Food and Fiber System:	1984/85		1975/76	
	Employees	%Share	Employees	%Share
Manufacturing Farm Inputs	0.063	0.2%	0.051	0.2%
Farming	13.629	50.9%	11.552	55.1%
Manufacturing Food and Fiber	2.485	9.3%	1.985	9.5%
Transport, Storage and Comm.	0.581	2.2%	0.623	3.0%
Wholesale & Retail Trade	1.718	6.4%	1.198	5.7%
Subtotal	18.476	69.0%	15.409	73.5%
Rest of the Economy	8.489	31.0%	5.669	26.5%
Subtotal	8.489	31.0%	5.669	26.5%
TOTAL	26.965	100.0%	20.078	100.0%

Source: Employment by major categories are taken from *Economic Survey*, 1987-88, pp. 10. This was further desegregated into above subcategories proportionate to their total output. Total output is taken from the transactions table for 1975/76 and 1984/85 (see section 4.2).

employment is decreasing. The decline is rather slow, from 55 percent to 51 percent of total employment during the 1975/76 to 1984/85 period. It is generally perceived that farming is the employer of last resort for a substantial portion of labor in farming.

The other food and fiber sectors have maintained a rather stable share of total employment. The share of the "rest of the economy" has increased from 27 percent to 31 percent during the study period. This shift in proportionate employment, like the shifts in proportion of value added, support the slow transformation of an agriculturally dominant economy to a broader, more industrial based economy.

In summary, the structural shift in the economy that supports the movement of labor in farming to other parts of the economy has been slow and not enough to importantly reduce the disguised unemployment in the farming sector. Most likely, a major part of the growth in employment in the "rest of the economy" has been in the informal part of the economy through household employment in cottage industries. Although a significant proportion of labor has moved overseas, the movement has not brought about a significant change in the proportion of the labor force engaged in the farming sector. Most of the labor moving overseas is professional, skilled and

semi-skilled. Due to the rapid population growth, the lack of vocational training and non-availability of other jobs, farm labor continues to grow. A much faster growing industrial and informal economy base will need to be established to absorb one million or more new laborers each year.

4.5. Energy

Energy consumption in Total Oil Equivalent (TOE) by sectors of the economy in each of the study years is shown in Table 4.5. The food and fiber system consumes 41 percent of all the energy consumed in Pakistan.

TABLE 4.5

THE CONTRIBUTION OF THE FOOD AND FIBER SYSTEM TO ENERGY
(IN TOTAL OIL EQUIVALENT), 1984/85 AND 1975/76

	1984/85		1975/76	
	TOE	%Share	TOE	%Share
Food and Fiber System:				
Manufacturing Farm Inputs	2072056	13.0%	759288	9.9%
Farming	891139	5.6%	588795	7.6%
Manufacturing Food and Fiber	2118203	13.3%	1029911	13.4%
Transport, Storage and Comm.	1389722	8.7%	968643	12.6%
Wholesale & Retail Trade	64454	0.4%	28319	0.4%
Subtotal	6535574	41.0%	3374956	43.9%
Rest of the Economy	6539552	41.0%	3393188	44.0%
Household	2861842	18.0%	943306	12.2%
Subtotal	9401394	59.0%	4336494	56.2%
TOTAL	15936968	100.0%	7711450	100.0%

Source: Energy consumption for the major categories is reported in various issues of Energy Year Book. Energy consumption in subcategories was allocated proportionate to their output.

Energy consumed by the food and fiber sector is more than twice the level of the amount consumed by the household. Manufacturing farm inputs, manufacturing food and fiber products and transportation and storage are the subsectors of the system that consume a large proportion of energy. Farming does not appear to be a heavy user of energy.

Total energy consumption has doubled from 7.7 million TOE in 1975/76 to 15.9 million TOE in 1984/85. This implies an average annual growth rate of 8.4 percent from 1975/76 to 1984/85. Energy consumption has been growing very rapidly for the household and

farm inputs manufacturing sectors. Energy requirements almost tripled in these two sectors where it grew at the rate of approximately 13 percent per annum over the period of study. The more than proportionate increase in the household sector is probably due to relatively low energy prices, especially of gas and electricity, and the high income increase due to remittances from abroad. It is thought that the price elasticity of energy is low and the income elasticity is high. The non-proportionate increase of energy consumption in manufacturing farm inputs is associated with the rapid expansion of the sector during 1975/76 to 1984/85 period (see Appendices 5 and 6).

The non-proportionate increase in energy consumption in household and manufacturing farm inputs sectors decreased the relative share of all the other sectors. For example, the share of farming in energy consumption has decreased from 8 percent to 6 percent and the share of transportation of food and fiber products decreased from 12.6 percent to 8.7 percent while the share of the "rest of the economy" decreased from 44 percent at the beginning of the period to 41 percent in 1984/85.

4.6. Consumption

The sector-wise consumption and budget share in each of the study periods is shown in Table 4.6. The pattern of consumption shares follow, to some extent, those of value added and demonstrate the declining role of farming and the increasing role of agricultural business and the rest of the economy. Also, as noted earlier, imports are a declining portion of total consumption which is partially due to industrial development and in part due to growing import restrictions on consumer items. Import of consumable items is not an accurate estimate because Pakistan is bordered by tribal areas that are not subject to Federal regulations. The tribal areas appear to be developing a growing business of importing unreported and untaxed consumer items.

The commodities or services related to the food and fiber system have a major share (more than 50 percent) in overall consumption. The share of the food and fiber system in consumption is rather constant from 1975/76 to 1984/85 although there is a shift within subcategories of the system. For example, the share of farming in consumption plummeted from 20 percent to only 12 percent while the share of food and fiber manufacturing increased from 25 percent to 30 percent during the study period. Similarly, the consumption share for the purchase of services used for transporting the food and fiber items declined from 5 percent to only 1 percent while the budget share spent on the services used in wholesale and retail trade increased from 5 percent to 10 percent during 1974/84.

TABLE 4.6

THE CONTRIBUTION OF THE FOOD AND FIBRE SYSTEM TO CONSUMPTION
(IN MILLION RUPEES), 1984/85 AND 1975/76

	1984/85		1975/76	
	Values	%Share	Values	Share
Food and Fiber System:				
Manufacturing Farm Inputs	0	0.0%	0	0.0%
Farming	42617	11.8%	27407	20.4%
Manufacturing Food and Fiber	107910	29.8%	32947	24.6%
Transport, Storage and Comm.	5332	1.5%	6648	5.0%
Wholesale & Retail Trade	36404	10.1%	6264	4.7%
Subtotal	192263	53.2%	73266	54.7%
Rest of the Economy				
Imports	14204	3.9%	15909	11.9%
Primary Inputs	41282	11.4%	11809	8.8%
Tax and Subsidies	7000	1.9%	0	0.0%
Subtotal	169436	46.8%	60673	45.3%
TOTAL	361699	100.0%	133939	100.0%

Source: Consumption for the year 1975/76 is taken from the PIDE transactions table. The consumption proportion for each sector is derived from the Household and consumption Survey, 1984/85 and consumption values are calculated by multiplying the proportion of each sector with the total consumption. The total consumption during 1984/85 is taken from National Income Account, 1983/84 to 1986/87, PP.44.

The expenditure share on imported items reduced from 12 percent during 1975/76 to only 4 percent during 1984/85. The budget share spent on commodities related to other than food and fiber system increased from 24.6 percent to 29.6 percent and budget share of primary inputs is almost constant.

4.7. Investment

Investment is an important gauge to the relative importance of different sectors of the economy and to their growth or decline. Table 4.7 shows sector-wise investment in each of the study years.

Only one third of total investment is going to the food and fiber system although it contributed 50 percent in value added. The sector share is declining due to the smaller proportion of investment being made in farming. Other areas in the food and fiber sector are absorbing a larger share of investment or remaining relatively stable. Overall, the reduced share of investment signals slower growth in the farming sector.

TABLE 4.7

THE CONTRIBUTION OF THE FOOD AND FIBRE SYSTEM TO INVESTMENT
(IN MILLION RUPEES), 1984/85 AND 1975/76

	1984/85		1975/76	
	Values	%Share	Values	%Share
Food and Fiber System:				
Manufacturing Farm Inputs	219	0.3%	89	0.01%
Farming	9188	14.5%	4943	23.6%
Manufacturing Food and Fiber	8723	13.8%	3437	16.5%
Transport, Storage and Comm.	2352	3.7%	642	3.1%
Wholesale & Retail Trade	2352	3.7%	771	3.7%
Subtotal	22834	36.0%	9871	47.3%
Rest of the Economy				
Construction	9577	15.1%	2884	13.8%
Services & Public Adm.	10822	17.1%	1934	9.3%
	20184	31.8%	6182	29.6%
Subtotal	40583	64.0%	11000	52.7%
TOTAL	63417	100.0%	20871	100.0%

Source: The investment by major sectors of the economy is reported in various issues of National Income Account. The investment in subsectors was calculated proportionate to the respective sector output. It should be noted that the investment figure in this table are not the same as reported in the transactions tables. The investment in the transactions table is the residual and includes change in inventory.

Growth in sector share has largely occurred in the construction sector which is a growing industry in Pakistan. The construction industry is using investments from the usual domestic sources as well as workers' remittances from abroad and donor funds.

4.8. Summary

As described in the discussion of the relative contributions of the food and fiber system, the sector plays a pivotal role in foreign exchange earning, income generation, employment absorption, and in investment opportunities. In addition, it consumes a major share of energy and supplies a major share of consumer goods to both rural and urban households.

Generally, the Pakistan economy is described as an agriculturally based economy in transition to a more complex, commercial and industrialized economy. The definite changes in the structure of the economy have occurred during 1975/76 to 1984/85 periods of study. The relative size of the food and fiber system has decreased while the relative share of the "rest of the economy" has ex-

panded as indicated by relative shares in value added, employment, energy, and investment during 1975/76 to 1984/85 periods. Within the food and fiber system, the share of farming has generally declined while the share of agricultural business has increased.

For the most part, growth in the rest of the economy and agricultural business is based on an increased share of imports for production versus consumption and on an increasing share of investment in the two areas as compared to share of investment in farming. In short, imports and investments appear to be supporting mechanization and modernization of the rest of the economy and agricultural business.

Finally, growth in the rest of the economy and in the agricultural business appears to be based on a growing demand for processed foods and fiber as well as other industrial products.

5. THE TRANSACTIONS TABLE

One way of looking at the interaction of the food and fiber system with other sectors of the economy is to construct a four quadrant transactions matrix. The first quadrant of the matrix shows the requirements of purchasing sectors (column headings) from the producing sectors (row headings). To maintain a double entry accounting framework, the n number of purchasing sectors are the same n number of producing sectors. The second quadrant accounts for the exogenous demand of goods and services made to the producing sectors. The third quadrant accounts for the purchases of inputs from industries outside the region and for money flows to the sectors which are not included as producing sector. The third quadrant is usually termed as "primary inputs" which shows the leakages out of the economy to savings, imports, or taxes. The fourth quadrant records the primary inputs purchased directly by the sectors of final demand.

The transactions table for the year 1975/76 and 1984/85 is shown in Appendices 5 and 6. A striking feature of the transactions table is that the food and fiber system purchases and sells to almost all the sectors of the economy. It is interesting to note that the farming sector does not purchase from the food and fiber manufacturing, transportation and wholesale and retail trade sectors. It does not sell to the wholesale and retail trade of the food and fiber commodities. However, it does sell to the transportation sector. Also, for the most part, it does not use gas in its production.

Table 5.1 summarizes the transactions matrix by dividing the purchases of each sector among the interindustry transactions, value added and other primary inputs. The higher proportion of total purchases from other industries implies a higher interaction with other sectors. The value added and other primary inputs are

leakages. Thus a higher proportion of total purchases going to the primary inputs means a lower interaction with other sectors of the economy.

The food and fiber system has a relatively high share of inter-industry transactions compared to the "rest of the economy" in both the years of study. In addition, the difference has increased over time. This indicates that the food and fiber system links more with the rest of the economy and the linkage is getting stronger over time. The food and fiber manufacturing sector has the highest proportion of total purchases coming from other industries which, to some extent, compensates for the very low proportion of the inter-industry purchases of the wholesale and retail trade of food and fiber sector.

The relative share of inter-industry transactions in economic activities has increased from 47 percent in 1975/76 to 53 percent in 1984/85 while the value added share in the economic activities

TABLE 5.1
THE PURCHASES OF THE FOOD AND FIBRE SYSTEM
(IN MILLION RUPEES), 1984/85 AND 1975/76

	1984/85					1975/76						
	Inter- Indust Purch	% Share	Value Added	% Share	O.P.I. ¹	% Share	Inter- Indust Purch.	% Share	Value Added	% Share	O.P.I. ¹	% Share
Food and Fiber System:												
Manuf. Farm Inputs	2264	34.6	1471	22.5	2809	42.9	572	41.5	379	27.5	428	31.4
Farming	75415	40.4	108873	57.6	4687	2.5	27519	40.4	39728	58.3	949	1.4
Manuf. Food and Fiber	191719	73.6	40465	15.5	28330	10.9	17035	69.6	7971	15.0	8216	15.4
Trans. Stor. and Comm.	3684	10.3	19832	55.4	12268	34.3	878	9.7	4732	52.2	3459	38.1
W.Sale & Retail Trade	1022	2.4	40973	97.1	196	0.5	263	2.4	10597	97.3	26	0.3
Subtotal	274103	51.3	211614	39.6	48291	9.0	66267	46.4	63407	44.4	13078	9.2
Rest of the Economy												
Manufacturing	62428	52.5	31636	26.6	24915	20.9	10566	46.3	5461	23.9	6803	29.8
Ser. to Haul commod.	26010	30.7	45871	54.1	12945	15.3	5663	28.4	10397	52.2	3853	19.4
Construction	30907	36.6	50912	60.3	2632	3.1	7564	33.4	12903	56.9	2192	9.7
Serv. & Public Admin	35447	27.7	86244	67.5	6097	4.8	9613	29.1	22931	69.5	443	1.3
Subtotal	154792	37.2	214663	51.6	46589	11.2	33406	34.0	51691	52.5	13291	13.5
Final Demand												
Exports	50844	44.0	38311	33.2	26282	22.8	18251	52.4	16440	47.2	167	0.5
Household	295476	81.7	41282	11.4	24941	6.9	106302	79.3	11467	8.6	16251	12.1
Investment/Discr.	174838	47.5	193324	52.5	0	0.0	16914	16.7	84587	83.2	111	0.1
Subtotal	521158	61.6	272917	32.3	51223	6.1	141467	52.3	112494	41.6	16529	6.1
Grand Total	950053	52.9	699194	38.9	146103	8.1	241141	47.1	227592	44.5	42898	8.4

¹ Other primary inputs, abbreviated above as O.P.I., include imports, tax and subsidies, gas and electricity.

decreased from 45 percent to 39 percent during the same period. The relative share of other primary inputs in the total transactions remained almost constant. This appears to indicate increased interactions and linkages of the economy. The same trend is observed in the food and fiber system as a whole, mainly because the higher inter-industry transaction shares of the manufacturing food and fiber and farm input sectors. In the farming, and wholesale and retail trade sectors, the relative shares of the three type of purchases are almost constant.

6. THE DIRECT REQUIREMENTS

The direct requirement of a sector is the input required to produce a unit output of that sector. A sector may have two types of direct requirements: a) inputs from other industrial sectors expressed in values per rupee of output. These are called "technical coefficients"; and b) primary inputs such as land in the form of rent, labor in the form of wages, capital in the form of investment and management in the form of profit. These four types of primary inputs are usually viewed as value added. There are other costs such as imports and taxes which are not, strictly speaking, primary inputs. However, in the context of input-output analysis, imports and taxes are also considered as primary inputs because these costs are not purchased from other industries. The per rupee output requirements for primary inputs are termed "primary input requirements." If primary inputs are expressed in quantities then per rupee output requirements are called "resource requirements." The following sections first discuss the technical coefficients and then the direct requirements of primary inputs and resources.

6.1. Technical coefficients

The technical coefficients in a sector show the technology used in that sector. If separate surveys are made, the change in technology over the study period can be analyzed by comparing the technical coefficients. In this case, due to the assumption that inter-industry transactions increase proportionately to the increase in value added, the technical coefficients remain constant except for some arbitrary adjustments.

The full matrix of technical coefficients for the year 1984/85 and 1974/75 given in Appendix 7 and 8, respectively. Table 6.1 aggregates technical coefficients into other than its own requirements (cross requirements) and compares it with the requirements that are met from within the sector to produce one rupee output (own requirements). The higher the own requirements, the lesser will be the direct interaction of a sector with other sectors of the economy. The food and fiber system as a whole purchased only

0.08 rupees output from the "rest of the economy" while it purchased 0.43 rupees output from within the food and fiber system to produce one rupee output during 1984/85. This shows a small amount of direct interaction of the food and fiber system with the "rest of the economy" as a whole. In addition, there was only small growth in across-sector purchases during the study period. However, strong interaction and across purchases existed among different subsectors of the food and fiber system. For example, during 1984/85, the manufacturing food and fiber sector purchased 0.61 rupees input from other sectors mostly related with the food and fiber system and .21 rupees from itself.

TABLE 6.1

THE OWN AND CROSS INPUT REQUIREMENTS OF THE FOOD AND FIBER SYSTEM FOR ONE RUPEE OF OUTPUT, 1975/76 AND 1984/85

	1984/85		1975/75	
	Own Requ- irements	Cross Re- quirements	Own Requ- irements	Cross Req- urement
Food and Fiber System:				
Manuf. Farm Inputs	0.00	0.41	0.00	0.49
Farming	0.24	0.32	0.25	0.32
Manuf. Food and Fiber	0.20	0.61	0.19	0.57
Trans. Storage and Comm	0.00	0.29	0.00	0.28
Wholesale & Ret. Trade	0.00	0.11	0.00	0.11
The Food and Fiber System	0.43	0.08	0.37	0.09
Rest of the Economy:				
Manufacturing	0.27	0.38	0.24	0.33
Services to Haul commod.	0.01	0.40	0.01	0.37
Construction	0.05	0.60	0.05	0.53
Services & Public Admin.	0.20	0.26	0.21	0.27
The Rest of the Economy	0.34	0.04	0.30	0.03

Source: Derived from Appendices 7 and 8.

A high proportion of the farming sector purchases comes from its own (0.24) while 0.32 comes from the other sectors related to the food and fiber system.

The rest of the economy has even lesser purchases from the food and fiber system and the direct interaction did not change much over the ten year period. However, strong direct interaction exists among subsectors of "the rest of the economy."

6.2. The Primary Input Requirements

The primary input requirements, in combination with technical coefficients, demonstrate the technology used in a sector. Therefore, the discussion of the primary input requirements will compare the technology used in the food and fiber system with other sectors of the economy and will highlight the technological changes over the study period.

Imports and value added are two primary inputs of policy concern. The taxes net of subsidies is a variable that is exogenously determined by the government and thus is not part of the technology. Therefore, primary input requirements for taxes net of subsidies is not a subject of discussion here (the effect of direct taxes on cost structure will, however, be discussed in the next section).

6.2.1. Imports

Sector-wise requirements of imports during each of the study period is shown in the Table 6.2. The food and fiber system has lesser import requirements compared to the "rest of the economy" in both of the study years.

The food and fiber system has almost the same import requirements per rupee of output produced during 1984/85. Overall import requirements per rupee of output produced in the economy has decreased during the study period.

The services used to transport commodities have the highest import requirements because these are energy intensive sectors and energy is mostly imported. The import requirements of manufacturing farm inputs and other manufacturing sectors are also high because development in these sectors depends upon the imported technologies.

As discussed earlier, the relative shares of the food and fiber system in imports have increased. Table 6.1 shows that the import requirements of the system have also increased over the nine year period. The import requirements per rupee of output have increased in the subsectors of farming and manufacturing farm inputs while the requirements have decreased in the subsectors of other manufacturing, services for hauling the other manufacturing goods, construction and other services. The relative share of these sectors in imports also move in the same direction. The import requirements of food and fiber manufacturing have decreased during the study period, although the relative share in imports has increased. This is because the increase in output of this sector outweighs the increase in per unit import requirements.

TABLE 6.2

THE DIRECT REQUIREMENTS FOR IMPORTS OF THE FOOD AND FIBRE SYSTEM
(RUPEES/RUPEE OUTPUT), 1984/85 AND 1975/76

	1984/85 Coefficients	1975/76 Coefficients
Food and Fiber System:		
Manufacturing Farm Inputs	0.335	0.196
Farming	0.027	0.011
Manufacturing Food and Fiber	0.067	0.090
Transport, Storage and Comm.	0.342	0.348
Wholesale & Retail Trade	0.002	0.000
Average	0.070	0.063
Rest of the Economy		
Manufacturing	0.119	0.251
Services to Haul commodities	0.145	0.189
Construction	0.031	0.096
Services & Public Adm.	0.040	0.008
Average	0.082	0.121
Household	0.039	0.119
Overall Average	0.065	0.098

Source: Calculated using [3].

6.2.2. Value added

The sector-wise requirements of value added during each of the study periods is shown in the Table 6.3.

The value added requirements per rupee of output in the food and fiber system is lower than in the "rest of the economy." This occurs because the food and fiber manufacturing and farm input manufacturing subsectors have lower value added requirements than other subsectors in the "rest of the economy." This is contrary to the general notion that technology in the food and fiber system is primitive, based on the use of primary inputs, and not advanced.

Value added is a major input in the farming and services sectors while the manufacturing sector has low requirements for value added, in both the years of study. The value added requirements of most of the sectors are the same in both of the reference years.

TABLE 6.3

**THE DIRECT REQUIREMENTS FOR VALUE ADDED OF THE FOOD AND FIBRE
SYSTEM (RUPEES/RUPEE OUTPUT), 1984/85 AND 1975/76**

	1984/85 Coefficients	1975/76 Coefficients
Food and Fiber System:		
Manufacturing Farm Inputs	0.225	0.275
Farming	0.576	0.583
Manufacturing Food and Fiber	0.155	0.150
Transport, Storage and Comm.	0.554	0.522
Wholesale & Retail Trade	0.971	0.973
Average	0.396	0.444
Rest of the Economy		
Manufacturing	0.266	0.239
Services to Haul commodities	0.541	0.522
Construction	0.603	0.569
Services & Public Adm.	0.675	0.695
Average	0.516	0.525
Household	0.114	0.086
Overall Average	0.356	0.337

Source: Calculated using [3]

6.3. Resource Requirements

When quantity rather than value of an input is a consideration, resources rather than primary input requirements for different sources of energy (electricity, gas, petroleum and coal) can be calculated. However, the problem in calculating resource requirements is that these are subject to inflation in output prices. Therefore, before comparing the resource requirements per rupee of output in each study year, a rupee in both of the years was made comparable by normalizing each entry of the transactions table, in the later year with the appropriate inflation rate.⁶

2. Inflationary affect in the transaction of 1984-85 compared to 1975-76 was adjusted by taking the difference in the % increase in value added in real terms and % increase in value added in constant term from 1975-76 to 1984-85. These sectoral inflation rates were used to row-wise normalize the entry in 1984-85 transaction table.

6.3.1 Energy

The energy requirements of different energy sources during 1975/76 and 1984/85 (both in nominal terms) are shown in the Table 6.4. The resource requirements after adjusting for inflation are also reported in Appendix 9.

TABLE 6.4

ENERGY REQUIREMENTS OF THE FOOD AND FIBER SYSTEM
(TOE/MILLION NOMINAL RUPEES), 1984/85 AND 1975/76

	1984/85					1975/76				
	Elect-ricity	Gas	Petrol	Coal	Total	Elect-ricity	Gas	Petrol	coal	Total
Food and Fiber System:										
Manufac. Farm Inputs	20.1	294.8	1.8	0.0	316.6	63.5	485.4	2.0	0.0	551.0
Farming	3.5	0.0	1.2	0.0	4.7	4.9	0.0	3.8	0.0	8.6
Manufac. Food & Fiber	2.8	3.6	1.8	0.0	8.1	7.0	10.3	2.1	0.0	19.4
Trans. Stor. & Comm.	0.1	0.0	38.8	0.0	38.8	0.1	0.0	106.7	0.0	106.8
Wholesale & Ret. Trade	0.9	0.6	0.0	0.0	1.5	1.5	1.1	0.0	0.0	2.6
Subtotal	2.9	5.4	3.9	0.0	12.2	5.6	8.6	9.4	0.0	23.6
Rest of the Economy										
Manufacturing	5.3	8.5	1.8	8.2	23.7	12.4	42.9	2.0	9.1	76.4
Service to Haul commo.	0.4	0.3	23.1	0.0	23.8	0.6	0.5	31.5	0.0	32.6
Construction	0.0	0.0	1.4	0.0	1.4	0.0	0.0	1.5	0.0	1.5
Services & Pub. Admin.	5.9	1.4	5.1	0.1	12.4	8.5	2.3	18.4	0.1	29.3
Subtotal	3.4	2.9	7.1	2.4	15.7	5.8	10.8	13.3	4.5	34.5
Household	3.3	2.4	2.1	2.4	7.9	8.5	1.1	3.8	0.1	7.0
Overall Average	3.2	3.8	4.4	12.1	9.3	4.4	6.5	8.4	1.2	20.5

Source: Derived from Appendix 5

The food and fiber system has lesser energy requirements compared to the "rest of the economy" except gas requirements which are higher in the food and fiber system because of the gas requirements in manufacturing farm inputs.

The electricity and gas requirements of the manufacturing farm input sector are highest followed by the other manufacturing sector, in both the years of study. The public administration and services sectors are the third most electric intensive sectors. The food and fiber manufacturing sector has almost equal electricity requirements with the farming sector. However, it ranks third from top in gas requirements. The other services sectors, for example, wholesale and retail trade of both food and fiber and others, transportation, and construction have comparatively low electricity and gas requirements per unit of output. The petrol requirement per rupee of output is highest in the transportation sector in both the years of study.

The electricity, gas and coal requirements for all the sectors decreased substantially in nominal terms. However, if output is in real terms, electricity requirements for all the sectors of the economy have increased except in the manufacturing farm inputs and food and fiber manufacturing sectors where the requirements decreased in the later year of the study. The gas requirements have increased for all the sectors of the economy except for food and fiber and other manufacturing where these have decreased. The per rupee petrol requirement increased for all the sectors of the economy except for farming where it decreased. The per rupee requirements of the supporting services transportation, wholesale and retail trade of both food and fiber and other commodities increased for all the sources of energy. The household sector has a more than four-fold increase for electricity and gas requirements per rupee of income (in constant terms) while requirement for coal has decreased by four times. As noted earlier, the subsidized energy prices and expatriate income are the main reasons of non-proportionate energy demand increases by the household sector.

6.3.2. Employment

The sector-wise employment requirement per rupee of output during 1975/76 and 1984/85 is shown in Table 6.5. The employment requirements for 1984/85 are expressed both in real and nominal terms.

The food and fiber system as a whole requires more labor per rupee of output compared to the "rest of the economy." The household and farming sectors, as expected, were the most labor intensive sectors followed by the supporting services sector, used for transporting and storing food and fiber and other commodities. All the significant sectors of the economy have declining labor requirements while household and construction sectors have increased labor requirements per unit of output. Comparing the investment/output ratio between the two study years reveals that all the sectors of the economy have higher investment requirements per unit of output. This appears to largely indicate that the economy is becoming more capital intensive with increased labor productivity. This is probably due to (controlled) low interest rates, over-valued exchange rates and some distortion in the labor market due to controlled wage rates. The growth in labor requirements in the household and services sectors during 1984/85 compared to 1975/76 indicates a higher incidence of self-employment and in some cases disguised employment. The higher requirements of both employment and investment in the construction sector indicate the growth of inefficiency in this sector. When the estimates are shown by class, the inefficiency in construction sector is traced to the construction of dwellings.

TABLE 6.5

**THE DIRECT EMPLOYMENT REQUIREMENTS OF THE FOOD AND FIBRE SYSTEM
(NO. OF WORKERS/RUPEE OUTPUT), 1984/85 AND 1975/76**

	1984/85		1975/76
	Nominal	Real	Real
Food and Fiber System:			
Manufacturing Farm Inputs	10	26	37
Farming	72	170	169
Manufacturing Food and Fiber	10	21	37
Transport, Storage and Comm.	16	41	69
Wholesale & Retail Trade	41	106	110
Average	34	80	107
Rest of the Economy			
Manufacturing	10	25	37
Services to Haul commodities	26	68	78
Construction	18	47	40
Services & Public Admin.	27	69	69
Average	19	51	56
Household	82	203	172
Overall Average	42	105	117

Source: The total population is taken from Economic Survey, 1987-99, PP. 10. The proportion of civilian labor force to population is taken from Labor Force Survey for 1975/76 and 1984/85 to calculate the total labor force in each of the study year. The employment shares in major sectors are reported in Labor Force Survey, 1975/76 and 1984/85. The subsector employment was calculated proportionate to output in the respective sector taken from the transactions table. The employment requirements were calculated using (5).

6.4. Summary

In summarizing the section on direct requirements, it can be observed that in producing one rupee of output the food and fiber system purchases more from the "rest of the economy" than the "rest of the economy" purchases from the food and fiber system. The food and fiber system also purchases more from with-in the system than from the "rest of the economy."

Both the food and fiber system and the rest of the economy have almost the same import requirements. However, the food and fiber system has almost 25 percent less value added requirements than the "rest of the economy" mainly because of the very low value added requirements for manufacturing food and fiber and farming sectors. The system has low overall energy requirements although it has higher gas requirements per unit of output produced because of the

heavy gas requirements of the farm input manufacturing sector. The food and fiber system, especially the farming subsector, requires more labor per rupee of output produced.

All these factors indicate that the food and fiber system is probably more commercialized (more across purchases, less value added requirements, and almost equal import requirements) compared to the "rest of the economy." The system has almost equal energy requirements and has a high capacity to absorb labor.

The import requirement of the food and fiber system has increased mainly because of the increased import requirements for the farm input sector and farming sectors while it has decreased for all the other sectors as well as for the economy as a whole. The value added requirements of the food and fiber system have decreased over time. The overall energy requirements and investment/output ratios of the food and fiber system as well as of the whole economy have increased while the employment requirements of almost all the sectors of the economy with a few exceptions have decreased indicating that the economy is moving towards more capital intensive technologies.

7. MULTIPLIERS

A multiplier shows the direct, indirect, and induced effect of expanding a sector on itself and on other related sectors. In the following section, the output, primary inputs, and resource multipliers are discussed. The result of only the open model is elaborated here which considers the household as part of the final demand on the purchases side and as part of the primary inputs on the selling side. The closed model which considers the household as an industrial sector is not reported here; it is thought that the sector is unable to pass on the multiplier effect to other sectors due to the availability of abundant unorganized labor. (Mackean et. al., 1988).

7.1. Output Multipliers

The output multipliers show the increase in the output of different sectors of the economy as well as the output of the whole economy that results from increasing final demand through expanding export, investments and consumption of a sector. The increase in the output of different sectors is due to the increase in demand in the outputs of those sectors in response to the expansion requirements of other sectors. Thus, output multipliers also show the direct, indirect and induced requirements to expand a sector. It is assumed that each and every sector responds to an increase in demand of its output which is a requirement of other sectors. An output increase in this manner is, "demand push."

The output multipliers during 1984/85 and 1975/76 are shown in Appendices 10 and 11, respectively. The effects of one rupee expansion of a sector through increased investment, export or consumption on the output of that sector, the other sectors of the food and fiber system, the other sectors of the "rest of the economy", as well as the total effects are given in the Table 7.1.

TABLE 7.1
OUTPUT MULTIPLIERS OF THE FOOD AND FIBER SYSTEM
(MILLION RUPEES/MILLION RUPEE EXPANSION), 1984/85 AND 1975/76

	1984/85				1975/76			
	1	2	3	4	1	2	3	4
Food and Fiber System:								
Manufac. Farm Inputs	1.00	0.03	0.53	1.56	1.00	0.03	0.60	1.64
Farming	1.33	0.03	0.28	1.64	1.33	0.03	0.28	1.64
Manufac. Food & Fiber	1.25	0.79	0.24	2.28	1.23	0.74	0.22	2.19
Trans. Stor. & Comm.	1.00	0.08	0.10	1.18	1.00	0.08	0.08	1.16
Wholesale & Ret. Trade	1.00	0.00	0.03	1.04	1.00	0.01	0.03	1.04
Food and Fiber System	1.77	--	0.22	1.99	1.60	--	0.21	1.82
Rest of the Economy								
Manufacturing	1.42	0.15	0.35	1.92	1.35	0.12	0.29	1.76
Service to Haul commo.	1.04	0.05	0.40	1.49	1.03	0.05	0.36	1.44
Construction	1.06	0.08	0.50	1.64	1.06	0.07	0.42	1.55
Services & Pub. Admin.	1.26	0.08	0.09	1.43	1.28	0.09	0.08	1.45
Rest of the Economy	1.52	0.10	--	1.61	1.45	0.08	--	1.53

1 = Own sector multiplier; 2 = Multiplier for other sectors of the food and fiber; 3 = Multiplier for other sectors of the "rest of the economy"; 4 = Total multiplier.

Source: Derived from Appendices 10 and 11.

A million rupee increase in the final demand of the food and fiber system in the 1984/85 values almost doubles the output of the whole economy through the multiplier effect of increasing the demand of output of all the sectors of the economy. In comparison, the same increase in the "rest of the economy" will increase the output of the whole economy by 1.61 million rupees. The food and fiber system not only has a higher total multiplier compared to the "rest of the economy" but also has a higher cross multiplier. The increase in the final demand of the food and fiber system will increase the output of the "rest of the economy" more (0.22) than what the increase in the final demand in the "rest of the economy" can induce in output in the food and fiber system (0.10). In other words, the food and fiber system creates more indirect demand for the "rest of the economy" outputs when it expands. It should be noted that the across effects are very low both in the food and fiber system and the "rest of the economy. The across effects are highest in manufacturing farm input, construction, and other manufacturing sectors.

Contrary to what is normally expected, the highest multiplier is from the food and fiber manufacturing sector rather than the other manufacturing sector. The farming, and wholesale and retail trade sectors have equal multipliers and also the next highest multipliers after manufacturing. Service sectors such as (a) food and fiber wholesale and retail trade (b) services used in transportation in the other manufacturing sector, have the lowest output multipliers. The low multiplier levels result because most of the sales of these sectors are consumed and thus considered as leakages. The service sectors used in transporting other manufactured commodities have higher multipliers in comparison to the multipliers for services used for hauling food and fiber commodities. The output multiplier for the public administration, defense, banking, and insurance sector fall in between the manufacturing and services sectors' multipliers.

The manufacturing sectors of both the food and fiber system and others, and the construction sector had higher multipliers in 1984/85 as compared to 1975/76 because of the growing interlinks of these sectors with the other sectors of the economy. The farm input manufacturing sector had a lower output multiplier in 1984/85 compared to 1975/76. Other sectors of the economy had almost the same multipliers during the study period.

7.2. Primary Input Multipliers

Primary inputs include items of value added as profit, rent, and interest, and expenditure on electricity, gas, imports and tax and subsidy. Electricity and gas is considered an industry rather than a primary input in the 1975/76 PIDE transactions table. However, in this analysis, these energy sources are considered as primary inputs because we are interested in estimating the effect of price change in each of these primary inputs on the price index of each sector of the economy which will be discussed in Section 7.4 on price multipliers. In analyzing the requirements, electricity and gas are considered resources rather than primary inputs. Therefore, the primary input multipliers include only value added, imports, and tax and subsidy.

The value added multiplier shows the direct and indirect increase in income due to the expansion in the final demand of a sector. The increase is highest in those sectors which are using more of the primary inputs as labor, land, capital, and management rather than more of the inter-industry inputs. Value added multipliers are highest in both reference years for the services used in wholesale and retail trade of food and fiber commodities, farming, services, and the construction sectors and lowest for farm input manufacturing, other manufacturing and services used for transporting food and fiber commodities. The value added multipliers are equal for the food and fiber system and for the rest of the economy.

TABLE 7.2

**PRIMARY INPUT MULTIPLIERS OF THE FOOD AND FIBER SYSTEM
(MILLION RUPEES/MILLION RUPEE EXPANSION), 1984/85 AND 1975/76**

	1984/85			1975/76		
	Value Added	Import	Tax	Value Added	Imports	Tax
Food and Fiber System:						
Manufac. Farm Inputs	0.49	0.40	0.02	0.57	0.30	0.01
Farming	0.92	0.08	-0.003	0.93	0.06	0.002
Manufac. Food & Fiber	0.79	0.15	0.04	0.74	0.17	0.07
Trans. Stor. & Comm.	0.64	0.36	0.004	0.60	0.37	0.03
Wholesale & Ret. Trade	0.99	0.004	0.00	1.00	0.001	0.00
Subtotal	0.82	0.14	0.03	0.82	0.13	0.04
Rest of the Economy						
Manufacturing	0.65	0.22	0.10	0.54	0.39	0.04
Service to Haul commo.	0.78	0.19	0.02	0.74	0.25	0.01
Construction	0.88	0.09	0.02	0.80	0.18	0.01
Services & Pub. Admin.	0.92	0.07	0.01	0.95	0.03	0.003
Subtotal	0.82	0.13	0.03	0.80	0.18	0.01

Primary input multipliers are calculated using [4].

The import multiplier shows the direct and indirect requirement for imports caused by a one rupee increase in the final demand of a sector. Manufacturing farm inputs, transportation and storage of food and fiber commodities, other manufacturing, services used for hauling the other manufactured goods are the sectors having the highest import multipliers. Manufacturing of food and fiber goods has a moderate and farming has a low import requirement. Import multipliers of almost all the sectors, except for the manufacturing of farm inputs, agriculture and services sectors have decreased in 1984/85 as compared to 1975/76. Manufacturing farm-inputs has higher import multipliers while agriculture has a slightly lower import multiplier in 1984/85 compared to 1975/76. Construction has a relatively high import multiplier in 1975/76 but it decreased about 50 percent in 1984/85.

If tax structures remain the same, a one million rupee expansion in the food and fiber system will generate 0.03 million rupee direct taxes which is slightly lower than tax generated from the "rest of the economy" by the same amount of expansion. The direct tax generating capacity of the food and fiber system has decreased while the tax generating capacity of the "rest of the economy" has increased from 1975/76 to 1984/85. The highest tax generating capacity is in other manufacturing followed by food and fiber manufacturing.

7.3. Resource Multipliers

The resource multiplier shows the direct and indirect requirement of a resource when a sector is expanded through increased final demand (export, consumption, investment etc). Electricity, gas, petroleum, coal and employment are considered as resources in this analysis. These are discussed under two broad categories: energy and employment multipliers.

7.3.1. Energy Multipliers

The sector-wise energy multipliers in terms of TOE for different sources of energy during 1984/85 and 1975/76 (both in nominal terms) are given in Table 7.3.

Energy multipliers of all the sectors decreased substantially over the ten year period because one rupee in 1984/85 has a much lower value than a rupee in 1975/76. To show a comparison over time, energy multipliers in 1975/76 values are also reported in Appendix 12.

The food and fiber sector used a little higher total energy for its expansion during 1984/85 because the farm input subsector required very heavy amounts of gas. The electricity requirements are a little higher while the petrol and coal requirements

TABLE 7.3

**ENERGY MULTIPLIERS OF THE FOOD AND FIBER SYSTEM
(TOE/MILLION RUPEES EXPANSION), 1984/85 AND 1975/76**

	1984/85					1975/76				
	Elect- ricity	Gas	Petrol	Coal	Total	Elect- ricity	Gas	Petrol	coal	Total
Food and Fiber System:										
Manufac. Farm Inputs	21.7	296.6	7.7	1.5	327.5	67.2	484.5	13.1	3.8	568.6
Farming	5.8	6.6	6.0	0.4	18.8	9.0	12.4	11.9	0.9	34.2
Manufac. Food & Fiber	6.9	8.2	7.7	0.5	23.3	13.6	20.1	13.9	1.1	48.7
Trans. Stor. & Comm.	0.8	0.9	39.5	0.5	41.7	1.3	3.1	107.9	1.1	113.4
Wholesale & Ret. Trade	1.1	0.7	0.2	0.01	2.0	1.8	1.3	0.6	0.02	3.7
Subtotal	5.9	10.2	8.5	0.5	25.1	10.3	16.1	17.9	0.96	45.3
Rest of the Economy										
Manufacturing	8.6	12.7	9.0	11.6	41.9	18.2	59.1	11.9	25.8	115.0
Service to Haul commo.	2.7	2.2	26.4	1.5	32.8	4.4	7.9	38.9	3.0	54.2
Construction	2.6	3.1	4.5	2.5	12.7	4.6	12.3	6.2	5.1	28.2
Services & Pub. Admin.	7.9	2.4	7.7	0.4	18.4	11.8	5.3	25.5	0.9	43.5
Subtotal	5.4	4.9	11.1	3.6	25.0	8.9	16.4	20.1	6.5	51.9

Source: Derived from Appendix 9.

are lower in the food and fiber system as compared to the "rest of the economy."

The farm input manufacturing sector has the highest energy requirements (direct and indirect) for its expansion because of the high gas requirement in the fertilizer industry. Next comes other manufacturing and transportation sectors (of both food and fiber and other commodities) because of the high petroleum requirements for transport and high requirements of almost all the sources of energy for manufacturing. On the low end, the farming sector has one of the lowest energy multipliers, after wholesale and retail trade of the food and fiber and services sectors.

7.3.2. Employment Multipliers

Employment multipliers dictate the total employment requirements needed to expand a sector through the multiplier effect. The employment multiplier for 1975/76 and for 1984/85 both in nominated value of 1984/85 (unadjusted) and in real value in terms of 1975/76 (unadjusted) are reported in the Table 7.4.

TABLE 7.4

**EMPLOYMENT MULTIPLIERS OF THE FOOD AND FIBER SYSTEM
(MEN/MILLION RUPEES EXPANSION), 1984/85 AND 1975/76**

	1984/85		1975/76
	Adjusted	Unadjusted	Unadjusted
Food and Fiber System:			
Manufac. Farm Inputs	58	21	76
Farming	266	102	246
Manufac. Food & Fiber	197	69	176
Trans. Stor. & Comm.	66	23	86
Wholesale & Ret. Trade	108	42	113
Subtotal	173	65	185
Rest of the Economy			
Manufacturing	77	28	82
Service to Haul commo.	95	36	104
Construction	85	32	73
Services & Pub. Admin.	101	38	101
Subtotal	89	33	90

Source: Calculated using [5].

The food and fiber system has almost double the employment multiplier in both the years of study. It implies that a million rupee investment in the food and fiber system has almost twice the capacity to generate employment in the economy as that of the "rest of the economy." Farming and manufacturing of the food and fiber system have the highest multipliers as compared to other sectors. However, the farm input and food and fiber transportation sectors have the lowest employment generating capacity.

If nominal multiplier values are compared, there has been a substantial decrease in the employment multiplier during 1975/76 and 1984/85. However, when the transactions in 1984/85 are adjusted for inflation, the overall employment multiplier for the food and fiber system and for the "rest of the economy" has decreased. The employment multiplier of farm inputs, food and fiber transportation, and wholesale and retail trade have decreased while it has increased substantially in farming, and food and fiber manufacturing sectors. The employment multipliers of different subsectors in the "rest of the economy" have slightly decreased.

7.4. Price Multipliers

The price multiplier indicates the percentage increase in the prices (cost) of different sectors of the economy with a one percent increase in the prices of primary inputs used in each sector. The percentage increase in the prices of different sectors' commodities are shown in Appendix 13. The weighted price multiplier are shown in Table 7.5.

In the input-output model, prices and costs are synonymous. Prices (cost) of different sectors of the economy, in this model, are driven by the prices (cost) of the primary inputs. Therefore, the doubling of prices of all primary inputs will double all prices. Imports, taxes, value added (wages, profit, rent), gas and electricity are considered as primary inputs, in this analysis. The price multipliers for only 1984/85 are discussed because the earlier year price multipliers are not relevant for policy purposes.

Value added is a major input for the whole economy. Therefore, prices of the economy are sensitive to price increases in basic primary inputs as rent, profit and wages as compared to prices of primary inputs having a very small proportional share in total costs as prices of electricity and gas or indirect tax rates. A 100 percent increase of rent, savings and profit would cause an 82.5 percent increase in the weighted average prices of the economy. The major proportion of this increase comes from those sectors using the basic primary inputs like agriculture, services, construction, and wholesale and retail trade of the food and fiber systems.

TABLE 7.5.

WEIGHTED PRICE MULTIPLIERS OF THE FOOD AND FIBER SYSTEM, 1984/85

	Import	Value Added	Elect-ricity	Grs	Tax
Food and Fiber System:					
Manufac. Farm Inputs	0.003	0.003	0.0001	0.0006	0.0001
Farming	0.015	0.183	0.001	0.0005	-0.0005
Manufac. Food & Fiber	0.040	0.218	0.003	0.0030	0.0102
Trans. Stor. & Comm.	0.013	0.024	0.0001	0.00004	0.0002
Wholesale & Ret. Trade	0.0002	0.044	0.0001	0.00004	0.0000
Weighted Average	0.072	0.472	0.004	0.0042	0.0099
Rest of the Economy					
Manufacturing	0.027	0.081	0.0018	0.0027	0.0122
Service to Haul commo.	0.017	0.070	0.0003	0.0003	0.0017
Construction	0.008	0.078	0.0003	0.0004	0.0019
Services & Pub. Admin.	0.009	0.123	0.0007	0.0005	0.0008
Weighted Average	0.061	0.353	0.003	0.0040	0.0165
Overall Weighted Average Price Index	0.133	0.825	0.007	0.0083	0.0264

Source: Calculated using [9].

Imports are the next most important primary input with respect to price sensitivity of the economy. A 100 percent increase in import prices by increasing import duties, devaluation of the rupee and/or increase in export duties by the exporter country etc. would cause a 13.3 percent increase in the weighted average prices of the economy. Most of the increases have come from those sectors of the economy where the proportion of import cost in the total cost is higher, for example, farm input manufacturing, transportation, and manufacturing of both food and fiber and others. Farm prices are not sensitive to import prices.

Increasing the direct tax rate by 100 percent of any sector would increase the prices of that sector by less than 10 percent. For example, doubling the direct tax in manufacturing would increase the prices of this sector by 9.7 percent. This would cause a weighted increase in the general price index by only 1.2 percent. If the tax rate is doubled for all sectors of the economy, this would result in an increase in the weighted average price index of

2.6 percent. This is one of several implications of widening the very limited tax base in the economy.

The prices of electricity and gas have a very minimal effect on the general price index of the economy. This is because electricity and gas costs have a very small share in the total cost of each sector. Doubling the prices of gas used in manufacturing of food and fiber and others will increase the prices in these sectors by 1.1 percent and 2.2 percent, respectively which would increase the general price index by 0.30 percent and 0.27 percent, respectively. The price increase of gas for other sectors has an even smaller impact on the general price index of the economy or on the prices of that sector's commodities. Doubling the prices of gas for all the sectors of the economy would increase the weighted price index by 0.8 percent and the effect is equally distributed among the food and fiber system and the "rest of the economy." Similarly, doubling the prices of electricity for food and fiber and other manufacturing has a stronger impact on the general price index by 0.280 and 0.181 percent, respectively. A 100 percent increase in the prices of electricity for all the sectors of the economy would increase the weighted average price index by 0.75 percent although the price increase of the manufacturing sector commodities will be substantial (10 percent in case of food and fiber manufacturing and 14 percent in case of food and fiber manufacturing).

7.5. Forward Linkages

The forward linkages show how the output of different sectors of the economy is adjusted with the increased supply of primary inputs in a sector. The forward linkages assume that the sales pattern remains constant when the output of the economy is adjusted to the increased supply of primary inputs. The increase in output in response to an increase in the primary input supply is "supply driven" because the output of each sector is adjusted according to the supply of inputs used in the output of each sector.

A summary of forward linkages is given in the Appendix 14. Table 7.6 shows how the output of the sector in which primary inputs have increased is adjusted (own affect) and how this increase in primary inputs affects the outputs of other food and fiber sectors (cross effect) and other sectors of the "rest of the economy" (cross effect). Forward linkages for only 1984/85 are reported here because the sales pattern for the earlier period 1975/76 is difficult to determine.

The food and fiber system as a whole has high forward linkages as compared to the "rest of the economy." The forward linkage of the farming sector is the highest, followed by the farm input sector and the other manufacturing sector. The construction sector has very low level forward linkages.

TABLE 7.6

**THE FORWARD LINKAGES OF THE FOOD AND FIBER SYSTEM,
1984/85.**

	1	2	3	4
Food and Fiber System:				
Manufac. Farm Inputs	1.0002	1.0137	0.0380	2.06
Farming	1.3277	0.9373	0.0838	2.35
Manufac. Food & Fiber	1.2506	0.0040	0.0627	1.32
Trans. Stor. & Comm.	1.0011	0.3711	0.1421	1.51
Wholesale & Ret. Tra.	1.0011	0.4138	0.0643	1.48
Average	1.7716	--	0.0765	1.85
Rest of the Economy				
Manufacturing	1.4232	0.2451	0.3870	2.05
Service to Haul com.	1.0383	0.7033	0.4376	2.18
Construction	1.0614	0.0268	0.0585	1.15
Services & Pub. Ad.	1.2590	0.2485	0.3189	1.83
Average	1.5164	0.2815	--	1.80

1 = Own sector forward linkages; 2 = Forward linkages for Other sectors of the food and fiber system;
3 = Forward linkages for other sector of "rest of the economy" ; 4 = Total forward linkages.

Source: Derived from Appendix 14.

The farm input sector, as expected, has the highest cross forward linkages. The increase in the primary inputs in this sector will increase output of this sector which will be used an input in farming and the output of farming in turn will be used an input in the food and fiber manufacturing sector. In this way, the farm input sector has the strongest cross forward multiplier effect on farming and on the food and fiber manufacturing sectors. Similarly, increasing primary inputs in the farming sector will supply the inputs to the food and fiber manufacturing sector and thus have strong incentive to increase the output of the later sector. Among the "rest of the economy" the services used to haul commodities have the strongest cross effect on the food and fiber system as well as on the other sectors of the rest of the economy.

Contrary to the "demand push" model, in the "supply push" model the "rest of the economy" has stronger across effect on the food and fiber system compared to the across effect of the food and

fiber system on the "rest of the economy." These results are the same, expressed in different ways. In the "supply push" model the "rest of the economy" gives more supply to the food and fiber system while in the "demand push" model the food and fiber system takes more inputs from the "rest of the economy."

Summarizing the section on multipliers, it is observed that the expansion of the food and fiber system has higher own as well as across multiplier effects as compared to the "rest of the economy." Food and fiber manufacturing and farming are the sectors having the highest output multipliers. Farming is one of the sectors having the highest value added multipliers after the services sector, implying that this sector has the highest capacity to generate value added per rupee of investment. Food and fiber manufacturing and farming depend upon inputs that are locally available. These sectors have moderate to low import and energy requirements for their expansion, although these requirements are high for the farm input sector which make the food and fiber system equal to "rest of the economy" with respect to these requirements. The food and fiber system has almost double employment generating capacity compared to the "rest of the economy" even though the employment generating capacity of the farm input manufacturing sector and the transportation of the food and fiber commodities are very low. This is because farming and food and fiber manufacturing have the highest employment generating capacity in the economy.

The economy is highly vulnerable to cost increases in primary inputs, as wages, rent, interest, and profit. The increase in the cost of imported items also significantly increases the general price index of the economy. However, farming sector prices are less prone to respond to changes in import prices. Electricity and gas prices have a minimal effect on the general price index of the economy. A 100 percent increase in the prices of electricity and gas would increase the index by only 0.7 and 0.8 percent, respectively.

8. SUMMARY AND CONCLUSIONS

The analysis of this report considers the food and fiber system as a whole and its linkages with "rest of the economy." The economy is divided into 5 sectors of the food and fiber system, 4 sectors of "rest of the economy," as well as 6 primary inputs, and 3 types of final demand. The PIDE input-output model for the year 1975/76 was re-organized accordingly and up-dated using information from the national accounts for the year 1984/85.

The food and fiber system consists of farming and agribusiness. Farming is considered as a single sector while agribusiness is considered as farm input manufacturing, food and fiber manufacturing, food and fiber transportation, storage and communications, and

food and fiber wholesale and retail trade. The rest of the economy is condensed into manufacturing, transportation, construction, and service and public administration.

Through an analysis of the contributions of the food and fiber system the Pakistan economy is portrayed as an agricultural based economy that is developing a more complex food and fiber system and slowly shifting to a more industrialized base. Farming itself has declined as a contributor to the economy but agribusiness has increased its contribution. In addition, the rest of the economy has grown as a share of the total economy but by only a few percentage points over the 1975/76 to 1984/85 period studied.

Due to the disproportionate amount of labor in farming, it appears that the farming sector carries disguised labor and to some extent is the employer of last resort. The growth of the agribusiness sector is absorbing some of the farm labor. Also, several percentage point shares have shifted to the rest of the economy over the period of study. Under the current rates of population growth the industrialized sector must develop over a million jobs per year in order to maintain the current sector employment pattern.

The food and fiber system is a "deep" sector with substantial linkages to the rest of the economy and interlinkages within its self. The analysis shows that the food and fiber system has a relatively high multiplier effect on the total economy. In addition, the food and fiber system purchases more from the rest of the economy than the rest of the economy purchases from the food and fiber system. This is further established by the higher own- and cross-output multipliers of the system. In addition, there are indications that the food and fiber system is more commercialized (more across purchases, less direct requirements of value added and almost equal import requirements) compared to the "rest of the economy." The system has almost equal direct energy requirements and higher requirements of labor.

The modernization process has been generated both from within and from imports. Opposite to popular belief, most of the growth in imports has been from producer items. Overall, shares of the food and fiber system and "rest of the economy" in imports have increased at the cost of household consumption, indicating a modernizing process based partially on imported technologies. In addition, there is some evidence that the food and fiber system as well as the whole economy have moved towards more capital intensive technologies because the investment/output ratios and overall direct energy requirements of the food and fiber system as well as of the whole economy have increased while the direct employment requirements of almost all the sectors of the economy, with a few exceptions, have decreased.

The Pakistan economy, being still a traditional economy, is heavily based on the supply of primary inputs for its expansion. The general price index of the economy, therefore, is highly vulnerable to cost increases in primary inputs, as wages, rent, interest, and profit, and least affected with the price changes in electricity and gas. However, this situation will reverse with modernization of the economy. The next important item, after primary inputs, for the expansion of the economy is imported technology, and thus general price index is affected by the change in import prices.

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APPENDIX 1

TRANSACTIONS MATRIX (MILLION RUPEES)
FOR EAN WORKING MODEL, 1984/85

	AGRI- CULTURE	MFG-F INPUTS	MFG-F FIBER	WR.T. F&FIB.	TS& C F&FIB.	WR.T. OTHER	TS& C OTHER	MFG- OTHER	MIN. & QUARR.	CONSTR- UCTION	OWN. DWELL.	BANK & INS.	PUB.ADM. & DEF. SERVICES	HOUSE- HOLDS EXPORTS	INVEST/ DESCRIP.	TOTAL SALES		
ROW	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
AGRICULTURE	46251	0	104428	0	2060	0	17	903	0	2171	0	0	334	319	42617	12084	-22209	188975
MFG-F. INPUT	2929	0	0	0	0	0	0	2	0	0	0	0	0	0	0	937	2676	6544
MFG-F&FIBER	0	0	51321	20	2	1	0	3919	0	55	0	0	1929	1839	107910	16586	76930	260514
WR.T. F-FIB	0	0	13719	0	0	0	0	1025	0	0	0	0	0	0	0	36404	0	-8957
T.S&C-F&FIB	0	1	9422	0	0	1766	0	1043	0	0	0	0	0	0	0	5332	0	18220
WR.T-OTHER	15333	338	1261	0	0	0	0	8462	871	0	0	0	0	0	0	29785	0	-21812
T,S&C-OTHER	6428	818	866	0	0	0	390	8610	261	0	0	0	0	0	0	7998	0	21654
MFG-OTHERS	1723	608	4719	0	1526	0	10125	32345	495	16081	342	113	1243	1185	7998	0	30472	50587
M&QUARRYING	275	257	46	0	7	0	346	2482	0	3293	0	0	567	540	12903	5562	30472	118978
CONSTRUCTION	0	0	3	0	33	0	24	2	0	0	1041	119	0	0	42	0	5065	11811
O.DWELLINGS.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	52810	54031
BANK&INS	660	97	3830	1002	57	398	22	1554	108	98	19	406	305	290	13	0	-5346	18610
P.A&DEFENCE	880	70	1020	0	0	474	5790	1008	758	2186	0	699	0	0	5223	8879	29123	18090
SERVICES	935	74	1084	0	0	504	6153	1071	805	2323	0	743	11684	11140	23293	6796	-13019	53587
HOUSEHOLDS	30484	412	17804	3688	6743	2787	5231	14553	4000	16665	3113	2139	10647	10486	1312	38311	193323	361699
IMPORTS	5137	2193	17517	95	12245	94	12245	14147	1146	1474	0	43	3227	1901	14204	478	0	86146
ELECTRICITY	613	36	1446	59	23	51	10	1118	0	0	0	351	62	47	2167	0	-0	5983
GAS	0	559	1840	43	0	35	10	1748	0	0	0	244	21	32	1570	0	0	6102
T.SUBSIDIES	-1063	21	7527	0	0	0	500	7902	0	12	0	10	25	133	7000	25804	0	47872
S.E.R&SAVING	78389	1059	22660	37286	13089	28128	9725	17083	3367	9673	14095	11231	26067	25674	39970	0	0	337495
T. PURCHASE	188975	6544	260514	42192	35784	34239	50587	118978	11811	54031	18610	18090	56111	53587	361699	115437	368161	1795350

APPENDIX 2

RESOURCE REQUIREMENTS FOR EAM WORKING MODEL, 1984/85

ROW	UNIT	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		AGRI- CULTURE	MFG-F INPUTS	MFG-F FIBER	WER.T. F&FIB.	TSE C F&FIB.	WER.T. OTHER	TSE C OTHER	MFG- OTHER	MINI.& QUARR.	CONSTR- UCTION	OWN. DWELL.	BANK & INS.	PUB.ADM. & DEF.	SERVICES	HOUSE- HOLDS
ELECTRICITY	TOE	665926	131352	725418	37449	2000	33590	0	630491	0	0	0	232398	487424	30856	1208088
GAS	TOE	0	1929171	934289	27005	0	22994	0	1006250	0	0	0	159088	0	21122	874505
COAL	TOE	0	0	0	0	0	0	0	972839	0	0	0	0	6783	0	7174
PETROL	TOE	225213	11533	458496	0	1387722	0	1961984	209855	20348	95022	0	0	648508	0	772075
EMPLOYMENT	MILLION MEN	13.629	0.063	2.485	1.718	0.581	1.393	0.821	1.138	0.046	1.200	0.310	0.237	1.631	1.524	3.154

APPENDIX 3

PRIMARY INPUT REQUIREMENTS FOR EAM WORKING MODEL, 1984/85

ROW	UNITS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		AGRI- CULTURE	MFG-F INPUTS	MFG-F FIBER	WER.T. F&FIB.	TSE C F&FIB.	WER.T. OTHER	TSE C OTHER	MFG- OTHER	MINI.& QUARR.	CONSTR- UCTION	OWN. DWELL.	BANK & INS.	PUB.ADM. & DEF.	SERVICES	HOUSE- HOLDS
IMPORTS	MILLION RUPEES	5137	2193	17517	95	12245	94	12245	14147	1146	1474	0	43	3227	1901	14204
ELECTRICITY	MILLION RUPEES	613	36	1446	59	23	51	10	1118	0	0	0	351	62	47	2167
GAS	MILLION RUPEES	0	559	1840	43	0	35	10	1748	0	0	0	244	21	32	1570
T.SUBSIDIES	MILLION RUPEES	-1063	21	7527	0	0	0	500	7902	0	12	0	10	25	133	7000
VALUE ADDED	MILLION RUPEES	108873	1471	40465	40973	19832	30915	14956	31636	7367	26338	17208	13370	36714	36160	41282

APPENDIX 4

SECTORAL CLASSIFICATION OF PIDE MODEL
FOR EAN WORKING MODEL

1. Agriculture	Textiles NEC-Small Wool Textiles-Large Thread-Large Carpets-Small Carpets-large Textiles NEC-Small Footwear Apparel Cotton Ginning-Large Wood Products Paper-Large Leather-Small Leather-Large	3. Wholesale and Retail Trade... Food and Fiber
Wheat-Small Wheat-Large Rice-Small Rice-Large Cotton-Small Cotton-Large Sugar-Small Sugar-Large Livestock Tobacco Oilseeds Pulses Crops NEC Fish Forestry	2.3. Other Manufacture	4. Transport, Storage and Communication ... Food and Fiber
2. Manufacturing	Printing and Publishing-large Printing and Publishing-small Rubber Products Chemical-small Chemicals-NEC Medicine-large Cement-large Paints-Large Soaps-Large Plastics-Large Petroleum-Large Glass-Large Non Metals-Small Non Metals-Large Iron-Small Iron-Large Metal Products-Small Metal Products-Large Machinery NEC-Small Machinery NEC-Large Electrical Machinery-Small Electrical Machinery-Large Transportation-Small Bicycles-Large Autos-Large Ships-Large Manufacturing NEC-Small Sports Equipment Manufacturing NEC-Large	5. Trade and Communication 5.1 Wholesale and Retail Trade-Others 5.2 Transport, Storage and Communication---Others Road Transportation Rail Transportation Water Transportation Radio-TV Telephone
2.1. Farm Inputs		6. Construction, Dwelling, Mining and Quarrying
Fertilizer-Large Agri. machinery-small Agri. machinery-large		6.1. Construction Low Cost residential High Cost residential Rural Buildings Factory Buildings Public Buildings Roads Infrastructure
2.2. Food and Fiber		6.2. Ownership of Dwellings 6.3. Mining & Quarrying
Grain Mills-Large Rice Huskers-Small Rice Huskers-Large Gurkhan-Small Sugar Refining-Large Edible Oils-Large Tea Blending-Large Fish Products-Large Food NEC-Small Food NEC large Beverages Tobacco Products-Small Tobacco Products-Large Cotton textiles-Small Cotton Yarn-Large Cotton Fabrics Silk Textiles-Small Silk Textiles-Large		7. Other Services 7.1. Banking and Insurance 7.2. Public Administration and Defence 7.3. Other Services
		8. Primary Inputs Electricity Distribution Gas Distribution Imports Tax-Subsidies Value Added
		9. Final Demand Household Consumption Exports Investment

APPENDIX 5

TRANSACTIONS MATRIX (MILLION RUPEES),
FOR EAM OPERATIONAL MODEL, 1984/85

ROW	1	2	3	4	5	6	7	8	9	10	11	12	13
FOOD AND FIBRE SYSTEM:													
MFG-F. INPUTS (1)	0	2929	0	0	0	2	0	0	0	0	937	2676	6544
AGRICULTURE (2)	0	46251	104428	2060	0	903	17	2171	653	42617	12084	-22209	188975
MFG-F&FIBRE (3)	0	0	51321	2	20	3919	2	55	3769	107910	16586	76930	260514
T.S&C-F&FIB. (4)	1	0	9422	0	0	1043	1766	0	0	5332	0	18220	35784
W&R.T.F-FIB (5)	0	0	13719	0	0	1025	0	0	0	36404	0	-8957	42192
SUBTOTAL	1	49180	178890	2062	20	6892	1785	2226	4422	192263	29607	66660	534009
REST OF THE ECONOMY:													
MFG-OTHERS (6)	608	1723	4719	1526	0	32345	10125	16918	2077	12903	5562	30472	118978
TS&C,WRT-O (7)	1156	21761	2128	0	0	17073	390	1132	3562	37783	0	-157	84827
CON,CD,M&Q (8)	257	275	48	39	0	2484	369	4334	119	2399	0	52528	84451
OTHER SER. (9)	241	2475	5934	57	1002	3634	13341	6298	25267	28529	15675	25334	127788
SUBTOTAL	2262	26234	12829	1622	1002	55536	24225	28682	31025	103213	21237	108177	416044
PRIMARY INPUTS:													
HOUSEHOLDS (10)	412	30484	17804	6743	3688	14553	8018	23777	23273	1312	38311	193324	361699
ELECTRICITY (12)	36	613	1446	23	59	1118	61	0	460	2167	0	0	5983
GAS (13)	559	0	1840	0	43	1748	45	0	297	1570	0	0	6102
IMPORTS (11)	2193	5137	17517	12245	95	14147	12339	2620	5171	14204	478	0	86146
TAX-SUBS. (14)	21	-1063	7527	0	0	7902	500	12	169	7000	25804	0	47872
SELF EMPLY.(15)	1059	78389	22660	13089	37286	17083	37853	27135	62971	39970	0	0	337496
RENT & SAV.													
SUBTOTAL	4280	113560	68794	32100	41171	56551	58816	53544	92341	66223	64593	193324	845298
T.PURCHASES	6544	188975	260514	35784	42192	118978	84827	84451	127788	361699	115437	368162	1795350

* The estimates for consumption, export, import, tax and subsidies, and value added were updated using the secondary sources data. The inter-industry transactions matrix (Z) was updated using the following formula:

$$Z_{ij} = T_{ij} * V_j$$

where

Z_{ij} = Purchases of the i-th row sector from the j-th column sector during 1984/85.

T_{ij} = Purchases of the i-th row sector from the j-th sector per rupee of value added in the j-th sector during 1974/75.

V_j = The value added in the j-th sector in 1984/85.

The inter-industry costs were again adjusted based on the 1983/84 industrial cost statistics by major industry group.

1 = Manufacturing of farm-inputs; 2 = Crop, livestock and forestry production; 3 = Manufacturing of food and fibre; 4 = Transportation, storage, and communications of food and fibre; 6 = Manufacturing of other commodities; 7 = Transportation, storage, communication, and wholesale and retail trade of other commodities; 8 = Construction, ownership of dwelling, mining and quarrying; 9 = Services, public administration, defence, banking and insurance; 10 = Household; 11 = Export; 12 = Investment and discrepancies; 13 = Total sales; 14 = Tax net of subsidies; 15 = Self employment rent and savings; (10 + 15) = Value added.

APPENDIX 6

TRANSACTIONS MATRIX (MILLION RUPEES)
FOR EAM OPERATIONAL MODEL, 1975/76

ROW	1	2	3	4	5	6	7	8	9	10	11	12	13
FOOD AND FIBRE SYSTEM:													
MFG-F.INPUT (1)	0	1069	0	0	0	0	0	0	0	81	18	209	1378
AGRICULTURE (2)	0	16877	20172	491	0	153	4	535	180	27407	273	2100	68196
MFG-F&FIBER (3)	0	0	9914	0	5	663	0	13	1040	32947	7290	1350	53222
T.S&C-F&FIB (4)	0	0	1820	0	0	177	408	0	0	6648	13	4	9069
W&R.T.F-FIB (5)	0	0	2650	0	0	174	0	0	0	6264	0	1799	10887
SUBTOTAL	0	17946	34556	491	5	1167	412	548	1220	73347	7599	5462	142752
REST OF THE ECONOMY:													
MFG-OTHERS (6)	154	629	912	364	0	5475	2186	4182	534	7562	1070	-237	22830
TS&,WRT-O (7)	292	7941	411	0	0	2890	84	180	937	2963	2	4214	19913
CON,O.W,M&Q (8)	65	100	9	9	0	420	80	1245	28	5383	86	15233	22659
SER,PA&D,BI (9)	61	903	1146	14	258	615	2901	1408	6895	17047	9496	-7757	32987
SUBTOTAL	572	9573	2478	387	258	9400	5251	7015	8394	32955	10654	11453	98389
PRIMARY INPUTS:													
HOUSEHOLDS (10)	107	11246	3480	1626	972	2434	1817	5658	6243	0	16440	83997	134019
ELECTRICITY (11)	18	224	260	6	15	107	14	0	146	222	0	15	1027
GAS (12)	132	0	375	0	11	378	10	0	39	120	0	96	1161
IMPORTS (13)	270	726	4807	3157	0	5736	3767	2173	258	15909	167	0	36970
T.SUBSIDIES (14)	7	0	2775	297	0	582	62	19	0	0	0	0	3742
S.E.R & SAV (15)	272	28481	4492	3106	9625	3027	8579	7244	16688	11467	0	590	93572
SUBTOTAL	806	40677	16189	8192	10623	12264	14249	15094	23374	27718	16607	84698	270491
T.PURCHASES	1378	68196	53222	9069	10887	22830	19913	22659	32987	134020	34859	101612	511632

1 = Manufacturing of farm-inputs; 2 = Crop, livestock and forestry production; 3 = Manufacturing of food and fibre; 4 = Transportation, storage, and communications of food and fibre; 6 = Manufacturing of other commodities; 7 = Transportation, storage, communication, and wholesale and retail trade of other commodities; 8 = Construction, ownership of dwelling, mining and quarrying; 9 = Services, public administration, defence, banking and insurance; 10 = Household; 11 = Export; 12 = Investment and discrepancies; 13 = Total sales; 14 = Tax net of subsidies; 15 = Self employment rent and savings; (10 + 15) = Value added.

APPENDIX 7

TECHNICAL COEFFICIENTS (MILLION RUPEES/MILLION RUPEES OUTPUT)
FOR EAN OPERATIONAL MODEL, 1984/85

	MFG-FARM INPUTS	AGRI- CULTURE	MFG-FOOD FIBER	TS.& C FD.& FIB.	WS&RT FD.& FIB.	MFG OTHER	TS&-O W&R.T-O	M&Q,O.D CONSTR-	B&I,PA&D SERVICES	HOUSE- HOLDS
ROW	1	2	3	4	5	6	7	8	9	10
FOOD AND FIBER SYSTEM:										
MFG-F.INPUT	0.00000	0.01550	0.00000	0.00000	0.00000	0.00002	0.00000	0.00000	0.00000	0.00000
AGRICULTURE	0.00002	0.24475	0.40085	0.05757	0.00000	0.00759	0.00020	0.02571	0.00511	0.11782
MFG-F.FIBER	0.00007	0.00000	0.19700	0.00005	0.00047	0.03294	0.00002	0.00065	0.02949	0.29834
T.S&C.F&FIB	0.00010	0.00000	0.03617	0.00000	0.00000	0.00877	0.02082	0.00000	0.00000	0.01474
W&R.T.F-FIB	0.00004	0.00000	0.05266	0.00000	0.00000	0.00862	0.00000	0.00000	0.00000	0.10065
SUBTOTAL	0.00023	0.26025	0.68668	0.05762	0.00047	0.05794	0.02104	0.02636	0.03460	0.53155
REST OF THE ECONOMY:										
MFG-OTHERS	0.09292	0.00912	0.01812	0.04264	0.00000	0.27185	0.11936	0.20033	0.01626	0.03567
TS&C,WRT-O	0.17663	0.11515	0.00818	0.00000	0.00000	0.14350	0.00459	0.01340	0.02788	0.10446
CON,O.D,M&Q	0.03926	0.00146	0.00019	0.00110	0.00000	0.02087	0.00435	0.05132	0.00093	0.06635
SER,PA&D,BI	0.03685	0.01310	0.02278	0.00159	0.02376	0.03054	0.15728	0.07457	0.19772	0.07888
HOUSEHOLDS	0.06296	0.16132	0.06834	0.18843	0.08740	0.12232	0.09452	0.28155	0.18212	0.00363
SUBTOTAL	0.40862	0.30015	0.11761	0.23377	0.11116	0.58908	0.38010	0.62117	0.42491	0.28899
OVERALL TOTAL	0.40885	0.56040	0.80429	0.29139	0.11163	0.64702	0.40114	0.64753	0.45951	0.82054

APPENDIX B

TECHNICAL COEFFICIENTS (MILLION RUPEES/MILLION RUPEES OUTPUT)
FOR EAM OPERATIONAL MODEL 1975/76

	MFG-FARM INPUTS	AGRI- CULTURE	MFG-FOOD FIBER	TS&C FD.& FIB.	WS&RT FD.& FIB.	MFG OTHER	TS&-O W&R.T-O	M&O,O.D CONSTR-	B&I,PA&D SERVICES	HOUSE- HOLDS
ROW	1	2	3	4	5	6	7	8	9	10
FOOD AND FIBER SYSTEM:										
MFG-F.INPUT	0.00000	0.01567	0.00000	0.00000	0.00000	0.00001	0.00000	0.00000	0.00000	0.00061
AGRICULTURE	0.00003	0.24748	0.37902	0.05414	0.00000	0.00669	0.00020	0.02361	0.00546	0.20450
MFG-F&FIBER	0.00009	0.00000	0.18627	0.00005	0.00046	0.02906	0.00002	0.00059	0.03151	0.24584
T.S&C-F&FIB	0.00012	0.00000	0.03420	0.00000	0.00000	0.00774	0.02048	0.00000	0.00000	0.04960
W&R.T.F-FIB	0.00005	0.00000	0.04979	0.00000	0.00000	0.00760	0.00000	0.00000	0.00000	0.04674
SUBTOTAL	0.00029	0.26315	0.64928	0.05419	0.00046	0.05110	0.02070	0.02420	0.03697	0.54729
REST OF THE ECONOMY:										
MFG-OTHERS	0.11141	0.00922	0.01713	0.04014	0.00000	0.23980	0.10978	0.18459	0.01619	0.05642
TS&,WRT-O	0.21178	0.11644	0.00772	0.00000	0.00000	0.12658	0.00422	0.00793	0.02840	0.02211
CON,O.W,M&O	0.04707	0.00147	0.00018	0.00104	0.00000	0.01841	0.00400	0.05497	0.00085	0.04017
SER,PA&D,BI	0.04418	0.01325	0.02154	0.00150	0.02372	0.02694	0.14569	0.06214	0.20901	0.12720
HOUSEHOLDS	0.07742	0.16491	0.06538	0.17929	0.08929	0.10660	0.09125	0.24971	0.18925	0.00000
SUBTOTAL	0.49186	0.30529	0.11195	0.22197	0.11301	0.51833	0.35494	0.55934	0.44370	0.24590
OVERALL TOTAL	0.49215	0.56844	0.76123	0.27616	0.11347	0.56943	0.37564	0.58354	0.48067	0.79319

APPENDIX 9

ENERGY REQUIREMENTS (TOE/MILLION RUPEES OUTPUT)
FOR EAM OPERATIONAL MODEL, 1975/76 AND 1984/85

	Electricity			Gas			Petrol			Coal			Total (TOE)		
	1984/85		1975/76	1984/85		1975/76	1984/85		1975/76	1984/85		1975/76	1984/85		1975/76
	Unad.	Adj.	Unad.	Unad.	Adj.	Unad.	Unad.	Adj.	Unad.	Unad.	Adj.	Unad.	Unad.	Adj.	Unad.
FOOD AND FIBER															
MFG-F. INPUTS (1)	20.1	54.5	63.5	294.8	800.4	485.4	1.8	4.8	2.0	0.0	0.0	0.0	316.6	859.8	551.0
FARMING (2)	3.5	8.3	4.9	0.0	0.0	0.0	1.2	2.8	3.8	0.0	0.0	0.0	4.7	11.1	8.6
MFG-F&FIBRE (3)	2.8	6.2	7.0	3.6	8.0	10.3	1.8	3.9	2.1	0.0	0.0	0.0	8.1	18.1	19.4
T.S&C-F&FIB. (4)	0.1	0.1	0.1	0.0	0.0	0.0	38.8	98.4	106.7	0.0	0.0	0.0	38.8	98.5	106.8
W&R.T.F-FIB (5)	0.9	2.3	1.5	0.6	1.7	1.1	0.0	0.0	0.0	0.0	0.0	0.0	1.5	4.0	2.6
AVERAGE	2.9	6.8	5.6	5.4	12.56	8.6	3.9	9.1	9.4	0.0	0.0	0.0	12.2	28.4	23.6
REST OF THE ECONOMY:															
MFG-OTHERS (6)	5.3	14.0	12.4	8.5	22.4	42.9	1.8	4.7	2.0	8.2	21.2	19.1	23.7	62.6	76.4
TS&C,WRT-O (7)	0.4	1.0	0.6	0.3	0.7	0.5	23.1	60.0	31.5	0.0	0.0	0.0	23.8	61.7	32.6
CON,OD,M&Q (8)	0.9	0.0	0.0	0.0	0.0	0.0	1.4	3.5	1.5	0.0	0.0	0.0	1.4	3.5	1.5
SER,PA&D,BI (9)	5.9	15.2	8.5	1.4	3.7	2.3	5.1	13.1	18.4	0.1	0.1	0.1	12.4	32.1	29.3
AVERAGE	3.4	8.8	5.8	2.9	7.6	10.8	7.1	18.4	13.3	2.4	10.0	4.5	15.7	40.9	34.5
HOUSEHOLD (10)	3.3	8.3	8.5	2.4	6.0	1.1	2.1	5.3	3.8	0.1	0.1	0.1	7.9	19.7	7.0
OVERALL AVERAGE	3.2	7.8	4.4	3.8	9.3	6.5	4.4	10.8	8.4	0.8	2.6	1.2	12.1	29.8	26.5

(1)=Manufacturing farm inputs; (2)=Farming; (3)=Manufacturing food and fiber; (4)=Transportation, storage & communication of food and fiber; (5)=Wholesale and retail trade of food and fiber; (6)=Manufacturing of other commodities; (7)=Services used to haul the other commodities; (8)=Construction, ownership of dwelling, mining and quarrying; (9)=Government and private services; (10)=Household.

Adj = Energy requirements per rupee of output when output is adjusted in 1975/76 values.

Und = Energy requirements per rupee of output when output is in nominal term.

Source: The various type of energy consumption in major sectors are reported in various issues of Energy Book. It was allocated in the subsectors proportionately to the respective subsector output. The output of each of the year is taken from the respective transactions table. The direct energy requirements are calculated using [5].

APPENDIX 10

OUTPUT MULTIPLIERS (MILLION RUPEES/MILLION RUPEES EXPANSION)
FOR EAM OPERATIONAL TABLE, 1984/85

ROW	AGRI- CULTURE	MFG-FARM INPUTS	MFG-FOOD FIBER	W&R.T. FD.& FIB.	TS.& C FD.& FIB.	MFG OTHER	TS&-O W&R.T-O	M&Q,O.D CONSTR-	B&I,PA&D SERVICES
	1	2	3	4	5	6	7	8	9
FOOD AND FIBER SYSTEM:									
MFG-F.INPUT	0.020580	1.000165	0.010365	0.000018	0.001221	0.000806	0.000215	0.000780	0.000537
AGRICULTURE	1.327666	0.010446	0.668657	0.001133	0.078730	0.050626	0.013686	0.050041	0.034593
MFG-F.FIBER	0.004156	0.011024	1.250570	0.001717	0.003049	0.062193	0.015179	0.018071	0.047807
T.S&C.F&FIB	0.004043	0.006379	0.047873	0.000094	1.001064	0.019206	0.023738	0.004770	0.003005
W&R.T.F-FIB	0.000646	0.002151	0.066395	1.000098	0.000712	0.015542	0.002345	0.003601	0.002845
SUBTOTAL	1.357091	1.030165	2.043860	1.003060	1.084776	0.148373	0.055163	0.077263	0.088787
REST OF THE ECONOMY:									
MFG-OTHERS	0.049428	0.177409	0.062697	0.000933	0.063931	1.423245	0.179370	0.307447	0.038048
TS&C,WRT-O	0.166080	0.207725	0.100541	0.001122	0.018879	0.214990	1.038274	0.068192	0.045265
CON,O.D,M&Q	0.004800	0.046365	0.003666	0.000058	0.002837	0.032548	0.008978	1.061412	0.002368
SER,PA&D,BI	0.057654	0.098282	0.071401	0.029941	0.009835	0.102484	0.211986	0.125213	1.259034
SUBTOTAL	0.277962	0.529781	0.238305	0.032054	0.095482	1.773267	1.4331614	1.562264	1.344715
OVERALL TOTAL	1.635053	1.559945	2.282165	1.035113	1.180259	1.921641	1.493771	1.639528	1.433503

APPENDIX 11

OUTPUT MULTIPLIERS (MILLION RUPEES/MILLION RUPEES EXPANSION)
FOR EAM OPERATIONAL MODEL, 1975/76

ROW	AGRI- CULTURE	MFG-FARM INPUTS	MFG-FOOD FIBER	W&R.T. FD.& FIB.	TS.& C FD.& FIB.	MFG OTHER	TS&-O W&R.T-O	MEQ,O.D CONSTR-	B&I,PA&D SERVICES
	1	2	3	4	5	6	7	8	9
FOOD AND FIBER SYSTEM:									
MFG-F.INPUT	0.020879	1.000171	0.009805	0.000018	0.001159	0.000655	0.000184	0.000694	0.000555
AGRICULTURE	1.332094	0.010730	0.625554	0.001130	0.073878	0.040660	0.011640	0.044033	0.035409
MFG-F&FIBER	0.003842	0.011578	1.233465	0.001775	0.002427	0.051576	0.013237	0.014391	0.050713
T.S&C-F&FIB	0.003926	0.007022	0.044525	0.000091	1.000861	0.015908	0.022785	0.003618	0.002949
W&R.T.F-FIB	0.000543	0.002132	0.061834	1.000095	0.000555	0.012850	0.001850	0.002762	0.002800
SUBTOTAL	1.361284	1.031633	1.975183	1.003109	1.078880	0.121649	0.049696	0.065499	0.092425
REST OF THE ECONOMY:									
MFG-OTHERS	0.046099	0.198113	0.054894	0.000881	0.057115	1.352424	0.156649	0.269031	0.036093
TS&,WRT-O	0.167741	0.242877	0.093683	0.001126	0.016425	0.179816	1.031324	0.051023	0.045656
CON,O.W,M&Q	0.004779	0.054829	0.003267	0.000052	0.002462	0.027310	0.007652	1.063822	0.002139
SER,PA&D,BI	0.056443	0.112226	0.065931	0.030295	0.008446	0.083869	0.196559	0.103399	1.276144
SUBTOTAL	0.275062	0.608045	0.217775	0.032354	0.084448	1.643420	1.392184	1.487275	1.360032
TOTAL	1.636345	1.639678	2.192959	1.035463	1.163327	1.765068	1.441880	1.552774	1.452457

APPENDIX 12

ENERGY MULTIPLIERS (TOE/MILLION RUPEES EXPANSION)
FOR EAM OPERATIONAL MODEL, 1975/76 AND 1984/85

	Electricity			Gas			Petrol			Coal			Total (TOE)		
	1984/85		1975/76	1984/85		1975/76	1984/85		1975/76	1984/85		1975/76	1984/85		1975/76
	Uned.	Adj.	Uned.	Uned.	Adj.	Uned.	Uned.	Adj.	Uned.	Uned.	Adj.	Uned.	Uned.	Adj.	Uned.
FOOD AND FIBER															
MFG-F.INPUTS (1)	21.7	59.2	67.2	296.6	805.6	496.5	7.7	21.1	13.0	1.4	4.2	3.8	327.5	890.2	578.5
FARMING (2)	5.7	15.1	9.0	6.6	18.6	12.4	6.0	15.7	11.9	0.4	1.1	0.9	18.8	50.6	34.1
MFG-F&FIBRE (3)	6.9	17.8	13.5	8.2	21.8	20.1	7.7	19.3	13.9	0.5	1.4	1.1	23.3	60.3	48.8
T.S&C-F&FIB. (4)	0.7	2.4	1.3	0.9	3.0	3.1	39.5	100.7	107.9	0.5	1.5	1.1	41.8	107.6	113.4
W&R.T.F-FIB (5)	1.1	2.8	1.8	0.7	1.8	1.3	0.2	0.5	0.6	0.0	0.0	0.0	2.0	5.2	3.6
AVERAGE	5.9	15.6	10.3	10.2	26.9	16.1	8.4	22.3	15.3	0.5	1.4	0.9	25.1	66.3	45.3
REST OF THE ECONOMY:															
MFG-OTHERS (6)	8.6	23.4	18.2	12.7	34.5	59.1	9.0	24.2	11.9	11.6	31.5	25.8	41.9	113.7	115.1
TS&C,WRT-O (7)	2.7	7.3	4.4	2.2	6.1	7.9	26.4	68.5	38.9	1.5	4.1	3.0	32.8	86.1	54.3
CON,OD,M&Q (8)	2.6	7.3	4.6	3.1	8.7	12.3	4.5	12.0	6.2	2.5	6.9	5.1	12.8	35.0	28.3
SER,PA&D,BI (9)	7.9	20.6	11.8	2.4	6.5	5.3	7.7	20.0	25.5	0.4	1.0	0.9	18.4	48.3	43.5
AVERAGE	5.4	14.4	8.9	4.9	13.1	16.4	11.0	29.2	2.7	3.6	9.4	6.5	25.0	66.1	51.9

(1)=Manufacturing farm inputs; (2)=Farming; (3)=Manufacturing food and fiber; (4)=Transportation, storage & communication of food and fiber; (5)=Wholesale and retail trade of food and fiber; (6)=Manufacturing of other commodities; (7)=Services used to haul the other commodities; (8)=Construction, ownership of dwelling, mining and quarrying; (9)=Government and private services; (10)=Household.

APPENDIX 13

PRICE MULTIPLIERS FOR THE EAM
OPERATIONAL MODEL, 1984/85

	Import	Value Added	Elect- ricity	Gas	Tax
Food and Fiber System:					
Manufac. Farm Inputs	0.395	0.492	0.008	0.088	0.017
Farming	0.077	0.918	0.005	0.003	-0.003
Manufac. Food & Fiber	0.147	0.794	0.010	0.011	0.037
Trans. Stor. & Comm.	0.356	0.637	0.002	0.001	0.004
Wholesale & Ret. Trade	0.004	0.993	0.002	0.001	0.0001
Average	0.196	0.767	0.005	0.021	0.011
Rest of the Economy					
Manufacturing	0.218	0.648	0.014	0.022	0.097
Service to Haul commo.	0.191	0.783	0.003	0.004	0.019
Construction	0.089	0.881	0.004	0.005	0.021
Services & Pub. Admin.	0.067	0.918	0.005	0.004	0.006
Average	0.141	0.808	0.007	0.009	0.036
Average Price Index	0.169	0.787	0.006	0.015	0.023

APPENDIX 14

FORWARD LINKAGES (MILLION RUPEES/MILLION RUPEES INCREASE IN PRIMARY INPUTS)
FOR EAM OPERATIONAL MODEL, 1984/85

ROW	MFG-FARM INPUTS	AGRICU- LTURE	MFG-FOOD FIBER	TS.& C FD.& FIB.	WHS & R. TR. FD.& FIB.	SUBTOTAL FD. & FIB.	MFG OTHER	TS&-O W&R.T-O	M&Q,O.D CONSTR-	B&I,PA&D SERVICES	SUBTOTAL REST OF ECON.	TOTAL
	1	2	3	4	5		6	7	8	9		
FOOD AND FIBER SYSTEM:												
MFG-F.INPUT	1.000165	0.594275	0.412622	0.006678	0.000113	2.013852	0.014652	0.002784	0.010069	0.010481	0.037986	2.051839
AGRICULTURE	0.000362	1.327666	0.921785	0.014908	0.000253	2.264974	0.031874	0.006143	0.022363	0.023392	0.083773	2.348747
MFG-F&FIBER	0.000277	0.003014	1.250570	0.000419	0.000278	1.254558	0.028404	0.004942	0.005858	0.023451	0.062655	1.317213
T.S&C-F&FIB	0.001167	0.021353	0.348526	1.001064	0.000110	1.372221	0.063860	0.056272	0.011256	0.010732	0.142119	1.514340
W&R.T.F-FIB	0.000334	0.002892	0.409961	0.000604	1.000098	1.413889	0.043827	0.004715	0.007209	0.008618	0.064369	1.478258
REST OF THE ECONOMY:												
MFG-OTHERS	0.009758	0.078507	0.137281	0.019228	0.000331	0.245105	1.423245	0.127884	0.218226	0.040865	1.810220	2.055325
SER., M&D, BI	0.016025	0.369987	0.308773	0.007964	0.000558	0.703308	0.301545	1.038274	0.067890	0.068190	1.475899	2.179207
TS&,WRT-O	0.003593	0.010742	0.011310	0.001202	0.000029	0.026876	0.045855	0.009018	1.061412	0.003584	1.119869	1.146745
CON, O.W, M&Q	0.005033	0.085260	0.145560	0.002754	0.009886	0.248493	0.095419	0.140718	0.082749	1.259034	1.577920	1.826413