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POLICY ISSUES AND OPTIONS IN EGYPTIAN POULTRY FEED

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List of Acronyms and Abbreviations

Agricultural Economics Research Institute	AERI
Agricultural Policy Reform Program	APRP
Agricultural Research Center of MALR	ARC
Governorate-Level Bank for Development and Agricultural Credit	BDAC
Central Administration for Agricultural Economics and Statistics	CAAES
Cost & Freight	C & F
Central Agricultural Cooperative Union	CACU
Central Agency for Public Mobilization and Statistics	CAPMAS
Cost, Insurance & Freight	CIF
Domestic Resource Cost	DRC
Egyptian Agricultural Organization	EAO
Egyptian Fertilizer Development Center	EFDC
Effective Protection Coefficient	EPC
Fertilize Management Information System	FMIS
Feddan (1 feddan = 0.42 hectare)	Fd
Free On Board	FOB
Gross Domestic Product	GDP
General Agreement on Tariffs and Trade	GATT
General Organization of Poultry Production	GOPP
International Fertilize Development Center	IFDC
Kilogram	kg
Egyptian Chemical Industries	KIMA
Egyptian Pound (currency unit)	LE
Ministry of Agriculture and Land Reclamation	MALR
Ministry of Public Enterprise	MPE
Ministry of Trade and Supply	MOTS
Metric Ton	MT
Nominal Protection Coefficient	NPC
Nominal Protection Coefficient on Tradable Inputs	NPCI
Nominal Protection Coefficient on Tradable Outputs	NPCO
Policy Analysis Matrix	PAM
Principal Bank for Development and Agricultural Credit	PBDAC
Profitability Coefficient	PC
Private Cost Ratio	PCR
Piaster	Piaster
Reform Design and Implementation Unit of APRP	RDI
Subsidy Ratio to Producers	SRP
United Nations Development Program	UNDP
United States Agency for International Development	USAID
World Trade Organization	WTO

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Introduction

The Reform Design and Implementation Unit (RDI) under the Agricultural Policy Reform Project (APRP) authorized this study to examine Egypt's poultry feed markets and assess the international competitiveness of producing feed grains in Egypt. The study team also wanted to: 1) identify regulatory and administrative obstacles to the smooth functioning of an internationally competitive market in feed grains and 2) assess the impact of lifting the import ban on poultry products and imposing a high import tariff instead.

The study team carried out the following activities:

- Reviewed the major studies regarding poultry and poultry feed subsectors.
- Visited some poultry companies and feed mills that produce different kinds of poultry feed.
- Interviewed public sector policy makers and private sector individuals involved in the poultry and feed business.
- Collected primary and secondary data and information needed for the analysis.
- Identified and assessed public and private feed mill operating capacity and capacity utilization in the country.
- Assessed the demand for and consumption of different types of feed, domestic or imported.
- Identified the regulations and decrees concerning the feed market.
- Compared international prices of feed ingredients and domestic prices of feeds, and analyze those differences.
- Evaluated the potential impact of reducing poultry import tariff rates.

The performance of the poultry and poultry feed subsectors, including production, marketing and pricing, are affected heavily by the overall economic policies of the country. Before 1986, agriculture was completely controlled by the government and subject to intervention at all levels of production, import and distribution of inputs, including feeds and feed ingredients. The main interventions related to poultry feed subsector were:

- Input price of feeds, feed ingredients and chicks, and interest rate on capital were administratively set at fixed, subsidized levels.
- Feed mills were heavily subsidized through very cheap inputs.
- Imports of feed ingredients, such as yellow corn and soybean meal, were subsidized; they were evaluated at subsidized preferential exchange rates. The government handled all importing through the PBDAC, the sole distributor starting in 1976.
- Agricultural output was taxed in favor of the consumer in the form of low prices for chickens and table eggs.

To eliminate price and market distortions that resulted from intervention policies, a policy reform program began in 1986 to eliminate gradually direct and indirect subsidies on most inputs and outputs. This has led to substantial increases in prices.

The current report consists of three chapters. The first chapter gives a summary and general description of the commercial poultry sector in Egypt. The second chapter focuses on poultry feed marketing and prices and international poultry feed markets. Egyptian self-sufficiency ratios in feeds and feed ingredients are also covered. The third chapter uses the partial equilibrium approach to analyze the impacts of Egyptian policies currently in use on both producers and users of main crops in Egypt, with special focus on corn and soybean. Egypt's comparative advantage in producing feed crops is investigated using the policy analysis matrix.

Chapter 1

Commercial Poultry Sector

1. Commercial Poultry Sector

1.1. Importance of Poultry Sector

According to 1996 estimates, Egyptian agricultural gross domestic product (GDP) amounted to LE 56.1 billion. Animal production represented 27.6% of that value; plant production, 67.8%; and fish production, 4.6%. The total value of animal production was estimated at LE 15.5 billion. Poultry meat and table eggs represented 21.4% of that value; red meat, 48%; milk, 22.8%; and manure, honey and raw, 7.7%.

The poultry industry was divided into commercial/modern and rural/traditional. Commercial activities produced LE 7 billion in poultry products, employed half a million people and provided 77% of the chicken meat and 66-70% of table eggs consumed in Egypt.

1.1.1. Description of Commercial Poultry: Figure 1.1 shows the composition of the commercial poultry sector. Several components or industries are vertically and/or horizontally integrated. The main components of the industry can be summarized as follows.

1.1.2. Pure Line Breeds: All pure line breeds—great-grandparents for both broiler and layer—are imported. The technology to produce pure line breeds is not yet available in Egypt. Great-grandparent chicks were imported at $26/chick, according to 1998 estimates. These imported chicks are the main input for the grandparent farms.

1.1.3. Grandparent Stock: Grandparent stock is the first activity in the commercial sector in Egypt. The main input for grandparent stock industry is the first offspring from the pure lines; the main output is the chicks that feed the parent stock industry.

In Egypt there are no grandparent stock farms for commercial layers. There are three grandparent stock farms that produce 3.2 million broiler parents as follows:

- 1.3 million Arbor Acres bred by Misr Grandparent Company
- 0.9 million of Avian bred by Gedoud El-Waddi Company
- 1.0 million of Hubard bred by Cairo for Poultry Gedoud Company

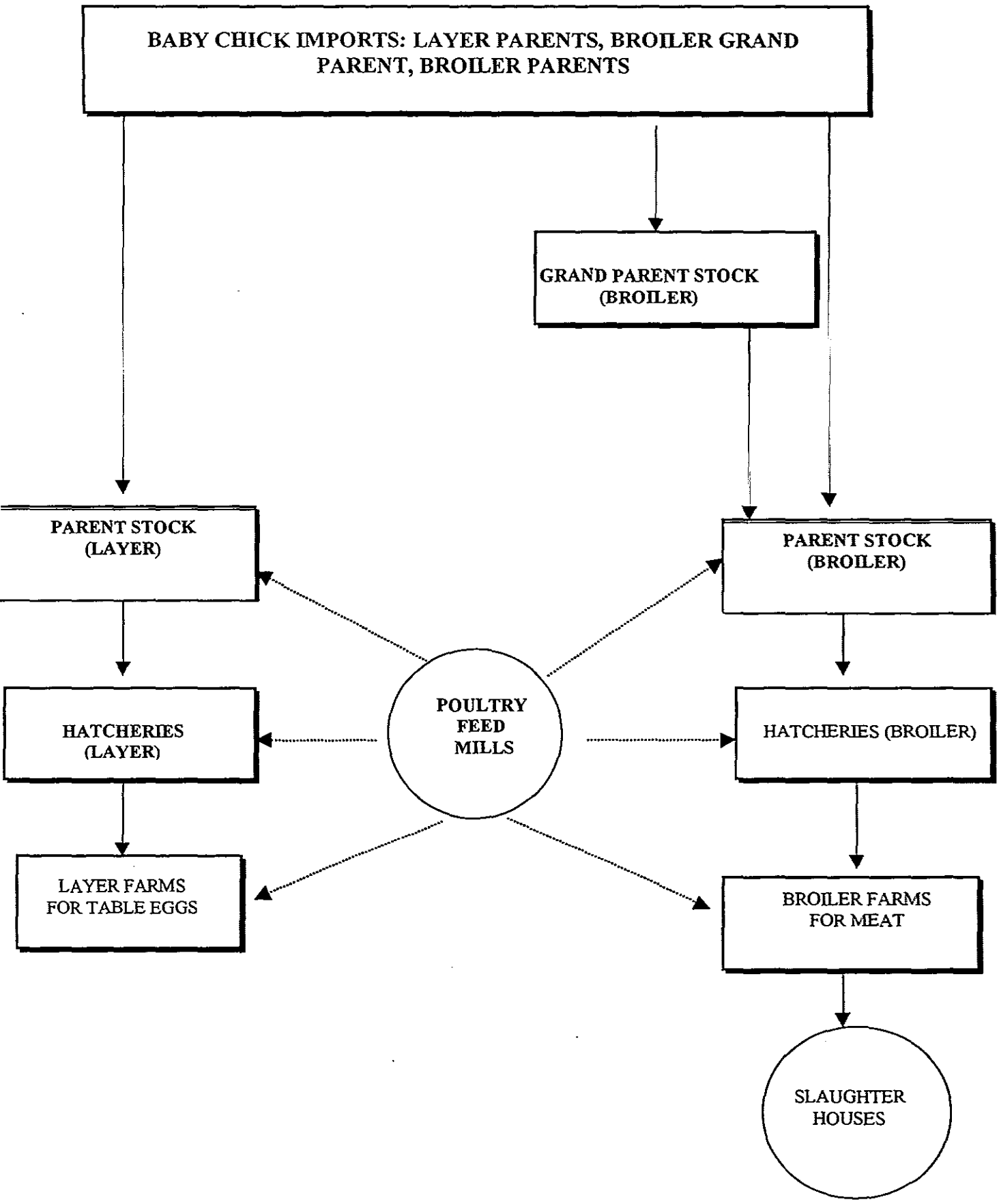
The total national demand for broiler parent stock is 4.8-5.2 millions/year. Between 1.6-2.0 million parents are imports.[1]

1.1.4. Parent Stock

1.1.4.1. Broiler Parent Stock: According to 1997 estimates, there were 239 farms (1,547 houses) with total capacity of 6.4 million parents that could produce 857 million eggs/year. Actual production was 5.6 million chickens producing 481 million eggs/year. The main output of such farms are fertile eggs that went to hatcheries to provide day-old chicks for broiler farms.

[1]Information about domestic production, imports and annual requirements of layer and broiler parent stocks are from Misr El Arabiya Company.

FIGURE 1.1: COMPONENTS OF COMMERCIAL POULTRY SECTOR



1.1.4.2. Layer Parent Stock: There were 30 layer parent stock farms (146 houses) with a total capacity of 759,000 chickens that could lay 127 million egg/year. Actual production was 410,000 chickens that laid 42 million eggs/year.

1.1.5. Meat and Egg Production

1.1.5.1. Broiler Production: There were 11,834 broiler farms (18,861 houses) with a total capacity of 480 million birds. Actual production included 13,714 houses producing 257.5 million birds.

1.1.5.2. Layer Production: There were 1,340 layer farms (2,749 houses) with total capacity of 22.4 million chickens and 5.649 million eggs. The actual number of layer chickens was 14.5 million; actual egg production was 2.552 million eggs/year.

1.1.6. Other Commercial Activities: The commercial sector is conducting large-scale activities to improve baladi chickens, ducks, turkeys and rabbits. Their combined activity is summarized below.

1.1.6.1. Parent Stock

- Improved baladi chickens
  - Total capacity 419 farms (789 houses), 2.4 million birds, 464 million eggs
  - Actual production 720 houses, 1.99 million birds, 233 million eggs
- Ducks
  - Total capacity 201 farms (294 houses), 631,000 birds, 78 million eggs
  - Actual production 462,000 birds, 45 million eggs
- Turkeys
  - Total capacity 4 farms (48 houses), 8,200 birds, 533,00 eggs
  - Actual production 7,400 birds, 442,000 eggs

1.1.6.2. Production[2]

- Improved baladi chicken[3]
  - Total capacity 893 farms (1,359 houses), 21.842 million birds
  - Actual production 1,234 houses, 14.238 million birds

---

[2] Geese and pigeons are not produced on a commercial scale.

[3] Production of improved baladi chicken is done in two stages: incubation stage, which starts with day-old chicks and ends with month-old chicks, and the production stage, which starts with month-old chicks and ends with marketable baladi chickens. Incubation includes total capacity of about 549 farms (952 houses); actual production is about 20 million month-old chicks.

- Ducks
  - Total capacity 216 farms (349 houses), 3.953 million birds
  - Actual production 1.968 million birds
- Turkeys
  - Total capacity 36 farms (50 houses), 397,000 birds
  - Actual production 156,000 birds
- Rabbits
  - Total capacity 84 farms (176 houses), 2.7 million animals
  - Actual production 1.02 million animals

1.1.7. Hatching Industry: There are two kinds of hatcheries: mechanical/modern and traditional/domestic.

- Modern hatcheries
  - Total capacity 142 hatcheries, 777 million eggs/year
  - Actual production 127 hatcheries
  - Actual hatched eggs 424 million broilers, 27 million layers, 17 million improved baladi
  - Actual chicks 307 million broilers, 16 million layers, 13 million improved baladi chickens
- Traditional hatcheries
  - Total capacity 758 hatcheries
  - Actual hatched eggs 121 millions/year
  - Actual chicks 84 millions/year
- Duck and turkey hatcheries
  - Total capacity 4 duck hatcheries, 12.6 million eggs/year
  - Total capacity 4 turkey hatcheries, 3.6 million eggs/year

1.1.8. Slaughterhouses

- Modern slaughterhouses
  - Total capacity 19 houses, 63.8 thousand birds/hour
  - Actual production 28.1 million birds/year
- Traditional slaughterhouses
  - Total capacity 101 houses, 35.2 thousand birds/hour
  - Actual production 6.3 million birds/year

1.1.9. Feed Industry: There were 85 poultry feed mills in Egypt in 1997. The total capacity of those mills was 826 MT/hour. Actual production amounted to only 616,143 MT/year. As poultry feed represents the main topic in our study, details on feed production, imports, marketing and use will be the core of the next chapters.

1.2. Performance of the Broiler Subsector

Indicators that describe efficiency or performance in the broiler industry are summarized below.

1.2.1. Utilization Rate of Existing Capacities: Table 1.1 and Figure 1.2 show the evolution of existing broiler farm capacities during between 1981 and 1997, and describe situations before, during and after the main policy reforms began 1986. The table identifies three distinct periods:

- 1982-88 when farm capacity ranged between 10,130 and 12,770
- 1989-92 when farm capacity ranged between 6,340 and 8,840 (which may be attributed to policy reforms, especially subsidy elimination)
- 1992-97 when the industry began to absorb the transitory effects of the policy reforms and adjust to the free market.

Note that the rate of utilization of available farm capacities increased from 48% in 1992 to 57% in 1993 to 73% in 1997.

Table 1.2 and Figure 1.3 also show the short-term effects of policy reforms on actual broiler production. Percentage of idle capacity increased substantially from 37% in 1987 to 53% in 1988 to 73% in 1989 and 1990. This percentage may still be judged high in 1997 at 46% (Table 1.2), if compared to idle farm capacity of 27% (Table 1.1). High percentage of idle capacities represents increased costs of investment and overhead and, consequently, increased costs of production.

1.2.2 Production Rate and Utilized Capacities: In addition to declines in utilized capacities, rates of production declined as well. This means a reduction in the utilization of working (non-idle) broiler houses. Table 1.3 and Figure 1.4 show this negative trend. The table shows that the utilization rate decreased from 100% in 1982-87 to 63% in 1988. The rate has not recovered entirely and was only 75% in 1997. This again means increased costs of production.

1.2.3. Dominance of Small-Scale Farms: The broiler industry in Egypt is dominated by small-scale farms. In fact, 1997 data indicate that of 11,834 broiler farms, 11,397 (96%) had capacities of less than 20,000 birds per lot, and 437 (4%) farms had capacities of 20,000 birds or more per lot. Some 84% were small scale when considering only operating houses (calculated from Table 1.1); 74% of actual production of broilers was from small-scale farms (calculated from Table 1.2). The production rate of utilized houses was lower in small-scale than in large-scale farms, perhaps due to the fact that large-scale farms enjoyed economies of scale that are reflected in decreased costs of production. Thus, when input prices are high or output prices are low, large-scale farms continued their production while some of small-scale farms shut down, partially or completely.

Table 1.1: Broiler Farm Capacities in the Modern Sector, 1981-1996

Year	Operating Houses		Idle Houses		Total Houses	
	Number	% of Total	Number	% of Total	Number	% of Total
1981	6,373	89	785	11	7,158	100
82	11,040	87	1,720	13	12,760	100
83	10,125	74	3,482	26	13,607	100
84	12,773	88	1,722	12	14,495	100
85	12,124	74	4,242	26	16,366	100
86	11,526	67	5,603	33	17,129	100
87	11,250	63	6,647	37	17,897	100
88	12,565	74	4,303	26	16,868	100
89	7,960	44	10,165	56	18,125	100
1990	8,235	44	10,609	56	18,844	100
91	6,340	34	12,359	66	18,699	100
92	8,844	48	9,609	52	18,453	100
93	11,036	57	8,248	43	19,284	100
94	11,567	65	6,138	35	17,705	100
95	12,469	70	5,463	30	17,932	100
96	13,076	71	5,298	29	18,374	100
All Farms	13,714	73	5,147	27	18,861	100
L.Scale Farms*	2,151	84	414	16	2,565	100
S.Scale Farms**	11,563	71	4,733	29	16,296	100

* Large-scale farms: capacity of 20,000 birds or more per batch.There are 2,151 houses under large-scale farms.

** Small-scale farms: capacity of less than 20,000 birds per batch.

Source:(1) Ibrahim, A.A., Egypt:Poultry Trade Policy Study, DEPRA, MTS&USAID, Draft, Sep. 1998.
(2) MALR, CAAES, Livestock Statistics, several issues.

Figure 1.2: Operating, Idle, and Total Broiler Farms

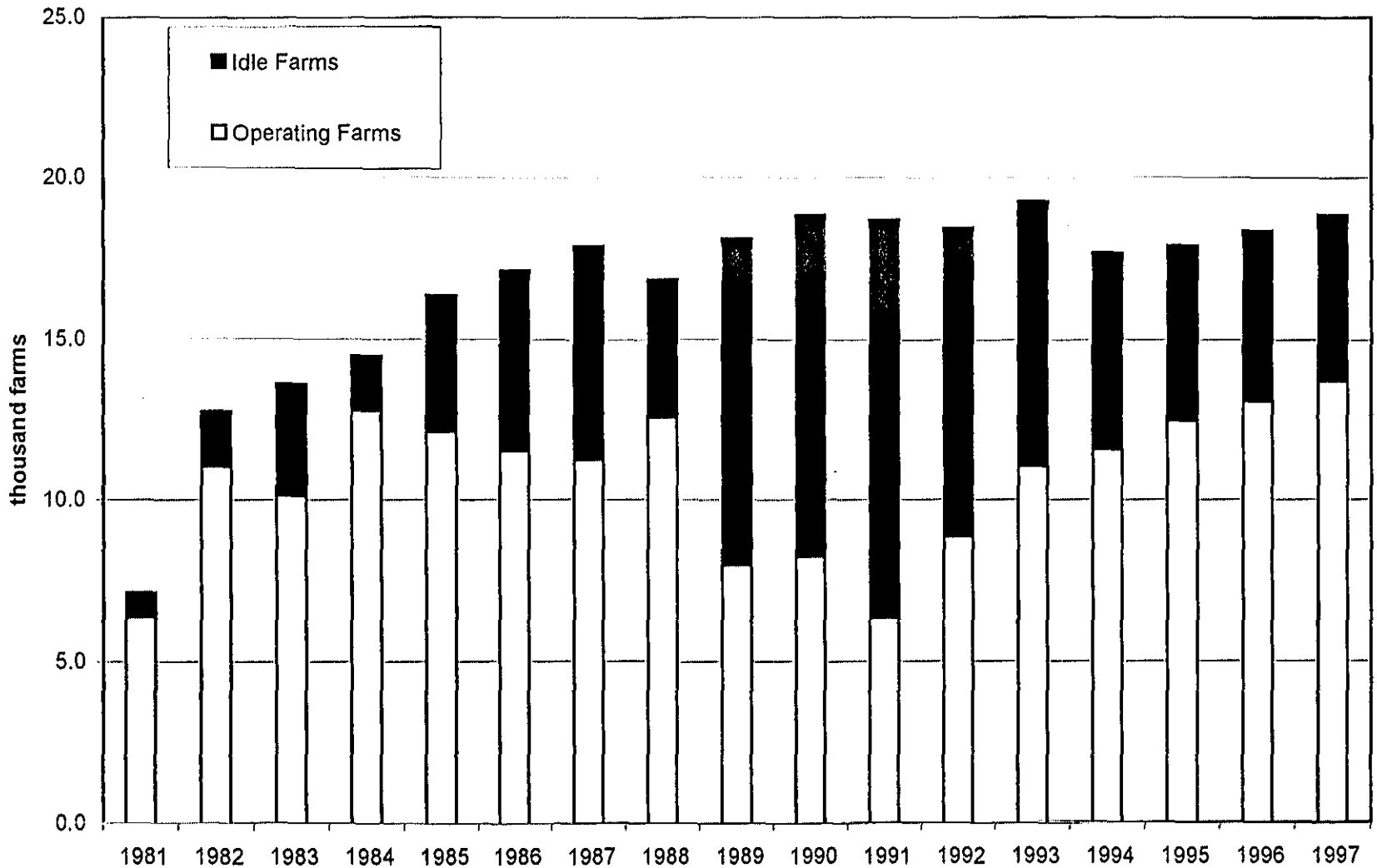


Table 1.2: Broiler Production Capacities in the Modern Sector, 1981-1996

Year	Actual Production		Idle Capacity		Total Capacity	
	Mill Bird	% of Total	Mill Bird	% of Total	Mill Bird	% of Total
1981	203	89	25	11	228	100
82	276	87	43	13	319	100
83	253	74	87	26	340	100
84	319	88	43	12	362	100
85	303	74	106	26	409	100
86	288	67	140	33	428	100
87	281	63	166	37	447	100
88	197	47	224	53	421	100
89	124	27	329	73	453	100
90	129	27	342	73	471	100
91	141	30	327	70	468	100
92	161	35	304	65	466	100
93	184	40	278	60	463	100
94	183	48	198	52	381	100
95	212	47	236	53	447	100
96	238	52	221	48	458	100
All Farms	258	54	222	46	480	100
L.Scale Farms*	65	63	38	37	103	100
S.Scale Farms**	192	51	285	76	377	100

* Large scale farms: capacity of 20,000 birds or more per batch.

** Small scale farms: capacity of less than 20,000 birds per batch.

Source:(1) Ibrahim, A.A., Egypt:Poultry Trade Policy Study, DEPRA, MTS&USAID, Draft, Sep. 1998.
(2) MALR, CAAES, Livestock Statistics, several issues.

Figure 1.3: Broiler Actual Production, Idle, and Total Capacities

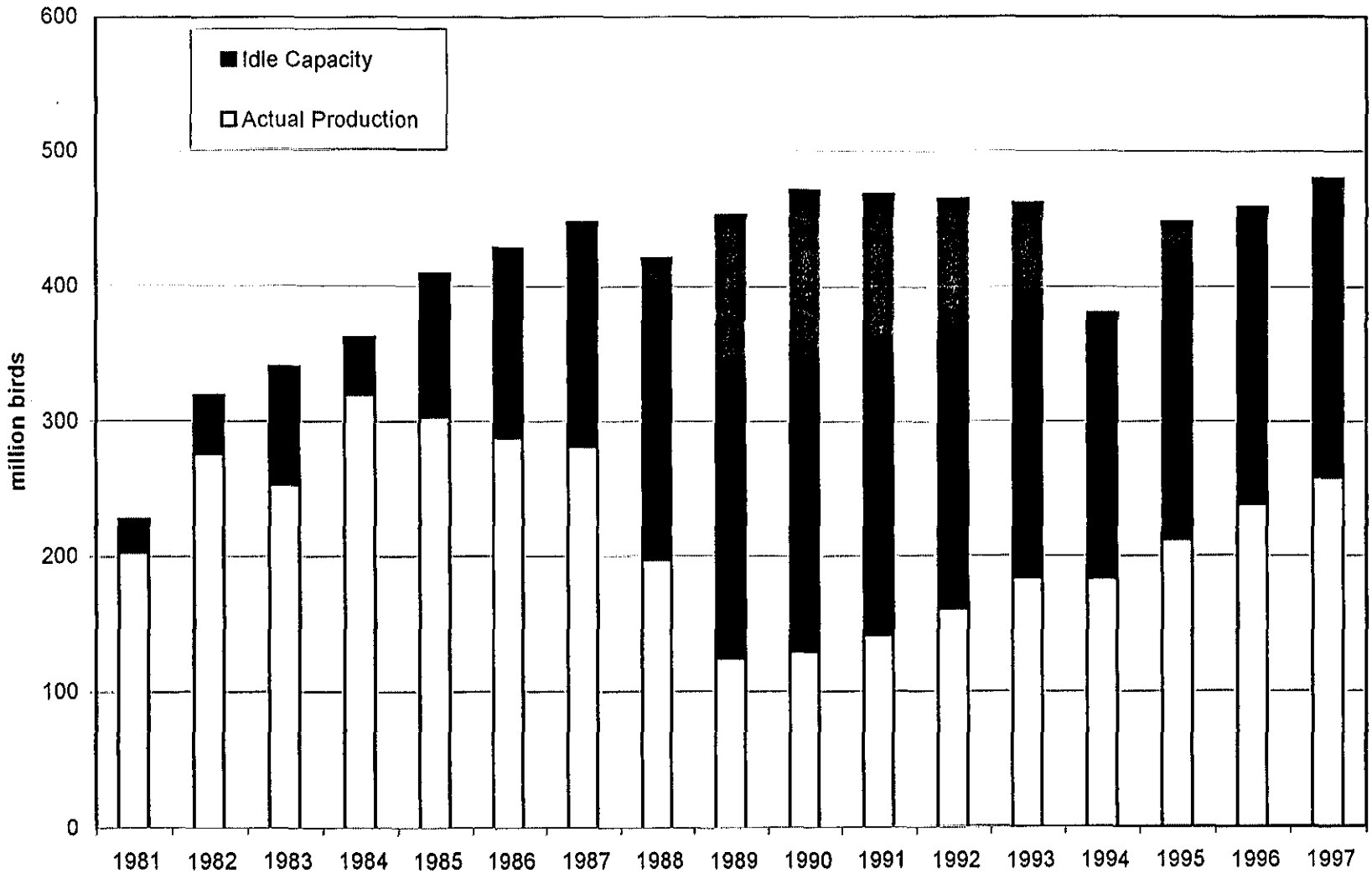
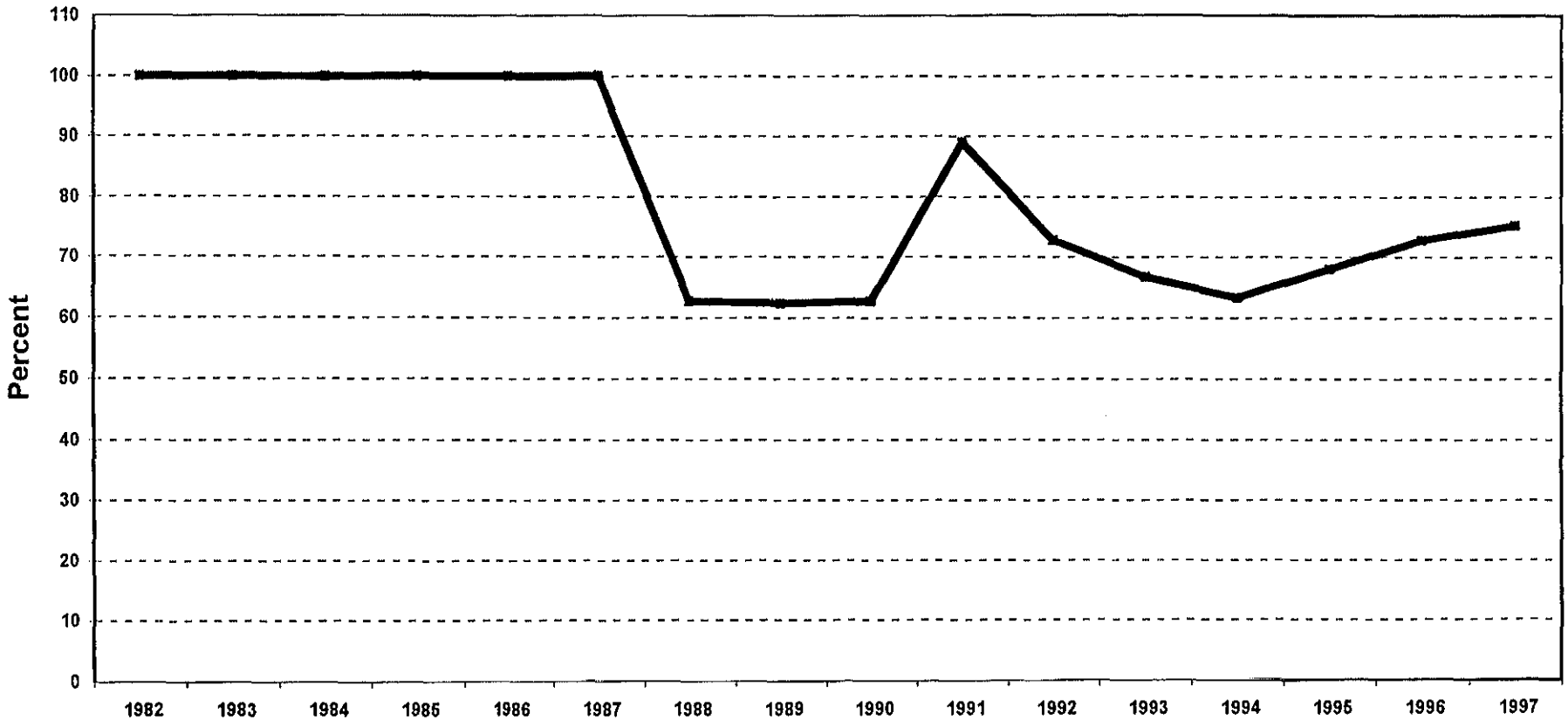


Table 1.3 : Operating Rate of Working Broiler Houses (million birds)

Year	Actual Production	Expected Production	Operation Rate
1982	276	276	100.0
83	253	253	100.0
84	319	319	99.9
85	303	303	100.0
86	288	288	99.9
87	281	281	99.9
88	197	314	62.7
89	124	199	62.3
90	129	206	62.7
91	141	159	89.0
92	161	221	72.8
93	184	276	66.7
94	183	289	63.3
95	212	312	68.0
96	238	327	72.8
1997	258	343	75.3

Source: Actual production is from table(1.2) and expected production is calculated by multipling the number of operating houses of Table1.1 by 5000 birds (the number of birds per house) and by 5 (the number of batches per year).

Figure 1.4 : Production Rate of Operated Houses, 1982-97



1.2.4. Private Sector Competitive Industry: Until the early 1970s the public sector dominated the broiler industry. The United Poultry Company, a public sector company, produced more than 70% of broilers and 15% of table eggs. As shown in Table 1.4, this company now produces only 5% of broilers and no table eggs. The industry is considered 95% private. There are no more subsidies, prices of inputs and outputs are determined in the free market and free entry and exit to the industry is assured. A very large numbers of producers are spread over the country. As shown in Table 1.4, 11,834 broiler farms are distributed among all governorates. Figure 1.5 ranks governorates according to actual production with Sharquiya ranked first with 15.2% of total production followed by Gharbiya (13%), Dakahliya (12.2%) and Beheira (8.9%).

1.2.5. Technical Efficiency: The technical efficiency of broiler activity is determined by three main factors: feed efficiency, mortality rate and marketable size at the end of a cycle. Values of these factors in Egypt compared to developed countries are:

- Feed efficiency or feed conversion rate is 1:2.4 in Egypt, 1:1.89 in developed countries and 1:1.85 in the U.S.
- Mortality rate is 12% in Egypt, 5% in developed countries.
- Marketable live-weight after 42 days is 1.4 kg in Egypt, 1.6 kg in the U.S.

Poultry specialists attribute the low feed efficiency and the high mortality rates to feed quality and nutritional value. As will be detailed in the next chapters, bad-quality imported feed[4] and feeds made on-farm may be major negative factors in broiler technical efficiency in Egypt.

1.2.6 Risk and Uncertainty: The broiler industry in Egypt is exposed to risk and uncertainty from bad weather, disequilibrium between demand and supply of main inputs, and acute price fluctuations in inputs and output markets.

1.2.6.1. Bad Weather: The broiler industry deals with live animals that are sensitive to weather conditions, especially when they are young. For example, during the summer of 1998, high temperatures and humidity continued for almost 75 days. Losses in broiler production were estimated at one-half of total production. On one particular Saturday, named "Sad Saturday," the relative humidity was 100% and the temperature was 42°C inside the houses. Almost 30% of the broilers were lost on that single day.

1.2.6.2 Imbalance between Supply of and Demand for Inputs: The broiler business is a complicated chain of integrated components responsible for grandparent stock, parent stock, broiler production, hatching, feed manufacturing and slaughtering.

If there is a shortage or a surplus in one of the products of any of those components, production activities may be disturbed along the entire chain. For example, the shortage of broiler chicks in the summer of 1998 badly affected the whole industry. Because broiler farms could not find chicks, many operated at less than full capacity and some dropped complete lots. The price of chicks increased substantially from less than PT 100/chick to PT

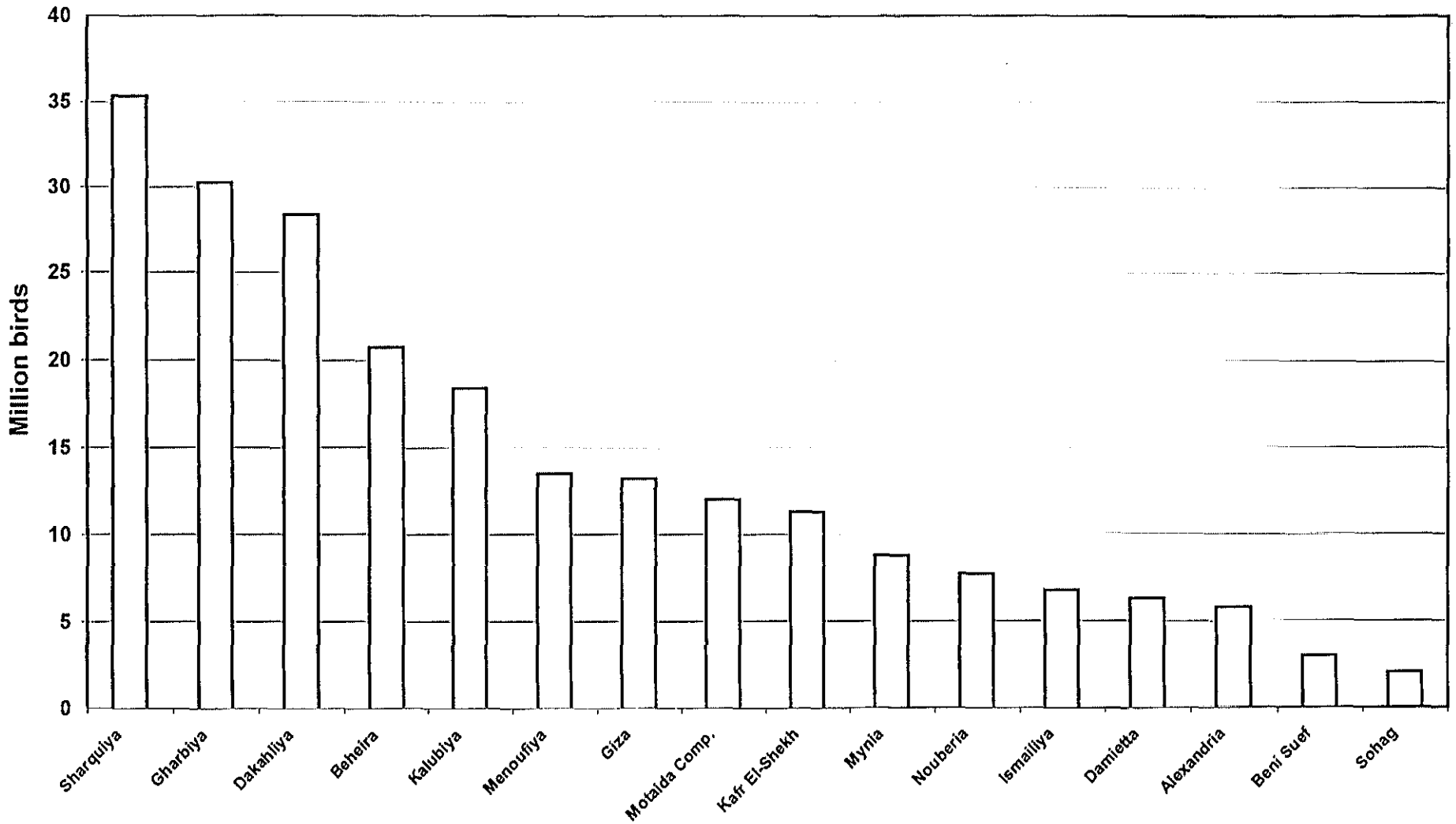
[4]Some big poultry companies suffered from the bad-quality grade 3 yellow corn imported from the U.S. that contained aflatoxine. See Ismailiya Misr Poultry Company, Desert Hens, September 1998, PP. 32-33.

Table 1.4 : Total and Actual Capacity of Broiler Production by Governorate (1000 birds), 1995-1997.

Governorate	1995		1996		1997		Average Capacity			
	Total Capacity	Actual Capacity	Total Capacity	Actual Capacity	Total Capacity	Actual Capacity	Total Capacity	Actual Capacity	Percentages	
									% of Total	% of Nation
Alexandria	11,684	5,022	11,893	5,053	14,474	7,383	12,684	5,819	45.9	2.5
Matrouh	1,977	582	3,150	914	2,550	730	2,559	742	29.0	0.3
Nouberia	4,931	3,611	9,790	7,231	14,764	12,400	9,828	7,747	78.8	3.3
Beheira	23,108	18,312	32,989	21,521	32,116	22,363	29,404	20,732	70.5	8.9
Kafr El-Shekh	15,589	10,142	16,896	10,974	17,584	12,687	16,690	11,268	67.5	4.9
Dakahliya	55,894	22,783	60,632	31,392	62,054	30,952	59,527	28,376	47.7	12.2
Damietta	7,345	5,225	9,436	6,086	9,497	7,593	8,759	6,301	71.9	2.7
Sharquiya	79,800	29,239	78,937	34,665	82,090	42,044	80,276	35,316	44.0	15.2
Port Said	2,125	765	1,963	585	1,973	320	2,020	557	27.6	0.2
Ismailliya	11,444	7,060	11,961	7,132	11,962	6,201	11,789	6,798	57.7	2.9
Suez	2,217	788	2,438	838	2,156	1,033	2,270	886	39.0	0.4
N.Senai	2,618	733	2,583	936	2,442	1,021	2,548	897	35.2	0.4
S.Senai	210	0	175	0	0	0	128	0	0.0	0.0
Gharbiya	41,995	25,582	43,751	30,916	48,831	34,222	44,859	30,240	67.4	13.0
Menoufiya	28,078	12,616	29,008	13,415	29,403	14,442	28,830	13,491	46.8	5.8
Kalubiya	65,396	19,340	65,358	17,511	65,594	18,345	65,449	18,399	28.1	7.9
Cairo	1,231	812	2,110	1,659	1,657	1,338	1,666	1,270	76.2	0.5
Giza	37,708	13,247	28,307	12,977	28,455	13,333	31,490	13,186	41.9	5.7
Fayoum	3,100	1,169	3,626	1,467	3,253	1,737	3,326	1,458	43.8	0.6
Beni Suef	5,260	3,202	5,308	2,892	5,445	2,936	5,338	3,010	56.4	1.3
Mynia	12,226	7,594	12,985	9,613	14,043	9,061	13,085	8,756	66.9	3.8
Assiout	4,163	1,634	4,106	1,751	4,152	1,828	4,140	1,738	42.0	0.7
Sohag	4,020	1,660	3,978	2,624	2,814	1,813	3,604	2,032	56.4	0.9
Luxor	0	0	0	0	0	0	0	0	0.0	0.0
Qena	760	672	863	978	1,114	1,007	912	886	97.1	0.4
Aswan	0	0	572	446	572	112	381	186	48.8	0.1
Red Sea	608	356	608	129	607	41	608	175	28.9	0.1
New Valley	280	0	345	0	415	24	347	8	2.3	0.0
Motaida Comp.	13,400	9,500	15,100	13,900	19,857	12,592	16,119	11,997	74.4	5.2
Total Egypt	437,167	201,646	458,868	237,605	479,874	257,558	458,636	232,270	50.6	100.0

Source: MALR, Central Administration of Agricultural Economics and Statistics (CAAES), several issues.

Figure 1.5 : Broiler Average Production by Governorate, 1995-97



150/chick. Feed prices decreased as a result of the reduced demand. Profits decreased for many involved in the industry.

In early 1999, the industry suffered a shortage in feed ingredients, especially imported yellow corn, after the Egyptian Central Bank decided that importers should cover 100% (previously 10-15%) of all imports. Previously importers covered only 10-15%.[5] To ameliorate the problem the government permitted letters of credit with only 10% coverage for intermediate commodities that were to be used specifically in feed mills.

A similar problem occurred in 1996 when the industry paid high prices for yellow corn and soybean meal—LE 800/MT and LE 1,200/MT, respectively.

Market imbalances in the summer of 1999 created an excess of broiler parent stock. Excessive import of broiler parent stock was a time-lagged reaction to last year's shortage caused by the bad weather. The broiler farms realized higher profits as a result of decreases in the price of broiler chicks, while broiler parent stock farms suffered. In fact, the price of broiler chicks dropped from LE 1.5 in 1998 to LE 0.7 in 1999.

1.2.6.3. Price Fluctuations: Given that broiler chicks need about 45 days to reach marketable weight, broiler houses can produce 5-6 cycles or lots each year. Capacity utilization and production rate in available broiler houses varies from cycle to cycle, depending on factors of profitability. Demand for poultry is seasonal, making markets for poultry inputs and outputs subject to fluctuation. These markets are subject to other regular and irregular fluctuations, but the seasonal ones are the most important as they have substantial effects on broiler production decisions. Seasonal fluctuations of live chickens will be measured in the broiler marketing section of this chapter and feed prices will be discussed in Chapter Two.

1.3. Marketing of Products

1.3.1. Marketing Channels for Meat Chickens: Figure 1.6 shows the four main marketing channels for live chickens and chicken products.

- Through commissioners to slaughterhouses, dealers, wholesalers and retailers
- Directly to slaughterhouses, dealers, wholesalers and retailers
- To consumers directly from farms in some rural areas
- To consumers directly from retailers

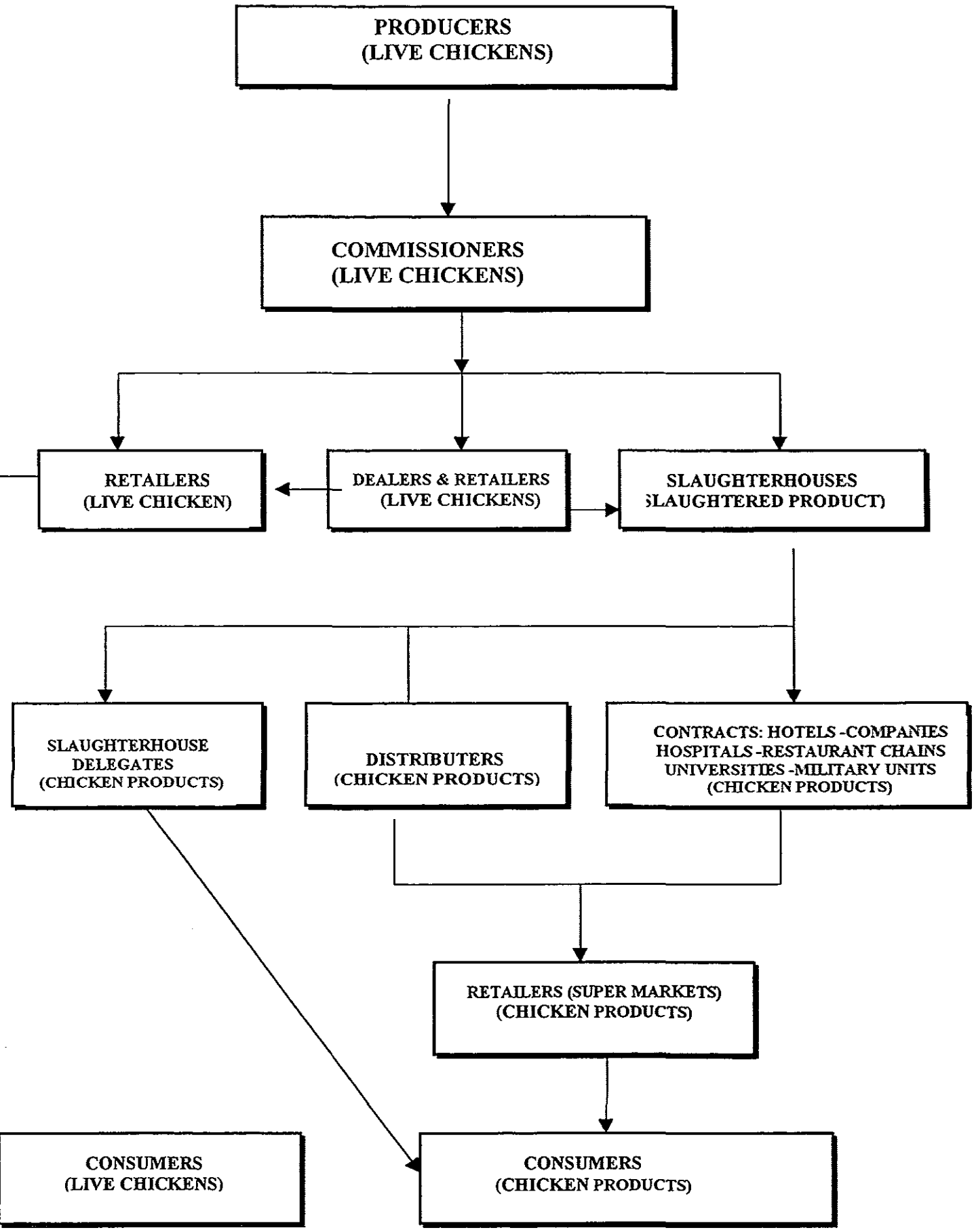
Slaughtered and processed chickens are distributed through two main channels.

- Various consumption communities such as hotels, hospitals, restaurant chains, university campuses, etc, may get whole slaughtered chickens or processed chicken products directly from slaughterhouses or indirectly through wholesalers.
- Slaughterhouse dealers and distributors may sell products to wholesalers and retailers who make them available to consumers.

Slaughtered chickens may be prepared for market as whole chicken (cooled or frozen), as fresh cuts or as semi-cooked processed cuts.

[5]This decision was made to correct for the excessive imports of sugar and steel that took place in late 1998.

Figure 1.6 : Marketing Channels for Broiler Products



1.3.2. Prices of Live Chickens

1.3.2.1. Price Spread: Table 1.5 and Figure 1.7 represent monthly prices of live chickens at different marketing stages between January 1994 and June 1997. The three price levels represent farmgate, wholesale and retail market stages. Estimates indicate the tendency for prices to increase over time and to fluctuate between seasons. Price and marketing margin estimates indicate that price changes at any stage are reflected at other stages; they represent the marketing margins and confirm that the live chicken market is really a competitive free market.

1.3.2.2. Marketing Margins: Marketing margins represent different price levels at different marketing stages and can be calculated for each stage separately or as a total of all stages. Marketing margins represent both actual marketing costs and a profit margin that goes to the middlemen or agencies.

Table 1.5 shows that total marketing margins were almost stable over time, which implies that middlemen get a fixed ratio of the price regardless of fluctuations in price levels. Estimates show also that the retail stage represents two-thirds of the total margins while the wholesale stage represents only one-third. The margins were estimated at LE 0.85/kg of live chicken as of 1996.

1.3.2.3. Middlemen Shares and Price Markup: Table 1.6 estimates the shares of retail prices of live chickens that are attributable to producers and middlemen. It also shows the price markup (consumer price compared to producer price) during the whole marketing process. Producers obtain 84% of consumer prices of live chicken while middlemen receive 16%.

On average, the percentage markup is low—118-120%—and relatively stable over time, regardless of price levels at different marketing stages.

1.3.2.4. Seasonal Pattern of Live Chicken Prices: The three-year moving average method is applied to monthly data for farmgate, wholesale and retail price time series in order to estimate the seasonal indices to plan production and marketing. Results are presented in Table 1.7 and Figure 1.8, and show that live chicken prices fluctuate significantly with the seasons. Prices are at their minimum (73-79% of the theoretical average month) between February and June and at their maximum (116-121%) between July and January, reflecting slack and peak demand.

Such a seasonal pattern is attributable to social and religious occasions during the year, especially Ramadan and Bairum. About two months before the beginning of Ramadan fasting, all broiler farms prepare to receive chicks and start the most important production cycle or batch in the year. Demand for chicks increases as does demand on all other broiler inputs. This period is the major season for the commercial and traditional poultry sectors.

Table 1.5 : Monthly Prices of Live Chickens at Different Marketing Channels, 1994-97, (PT/kg)

Month	Price			Marketing Margins		
	Farmgate	Wholesale	Retail	Farm-Wholesale	Wholesale-Retail	Farm-Retail
Jan.94	353	372	425	19	53	72
Feb.	370	390	434	20	44	64
Mar.	374	394	435	20	41	61
Apr.	335	349	396	14	47	61
May	326	340	385	14	45	59
June	326	343	397	17	54	71
Jul.	366	394	448	28	54	82
Aug.	400	422	486	22	64	86
Sept.	413	435	490	22	55	77
Oct.	390	410	461	20	51	71
Nov.	413	435	482	22	47	69
Dec.	398	419	456	21	37	58
Average	372	392	441	20	49	69
Jan.95	395	416	459	21	43	64
Feb.	397	418	457	21	39	60
Mar.	355	374	421	19	47	66
Apr.	341	363	405	22	42	64
May	345	359	399	14	40	54
June	356	379	432	23	53	76
Jul.	395	416	473	21	57	78
Aug.	395	416	473	21	57	78
Sept.	403	424	476	21	52	73
Oct.	392	424	478	32	54	86
Nov.	387	413	478	26	65	91
Dec.	380	417	470	37	53	90
Average	378	402	452	23	50	73
Jan.96	393	414	465	21	51	72
Feb.	416	438	486	22	48	70
Mar.	423	445	504	22	59	81
Apr.	427	450	506	23	56	79
May	420	447	510	27	63	90
June	422	449	515	27	66	93
Jul.	432	455	520	23	65	88
Aug.	432	455	529	23	74	97
Sept.	433	456	536	23	80	103
Oct.	433	456	521	23	65	88
Nov.	437	460	516	23	56	79
Dec.	437	460	517	23	57	80
Average	425	449	510	23	62	85
Jan.97	437	460	533	23	73	96
Feb.	458	483	537	25	54	79
Mar.	433	456	510	23	54	77
Apr.	419	446	482	27	36	63
May	400	430	473	30	43	73
June	420	449	501	29	52	81
Average	428	454	506	26	52	78

Source: Monthly Bulletin of Prices, several issues.

Figure 1.7: Chicken Liveweight Prices, 1994-97

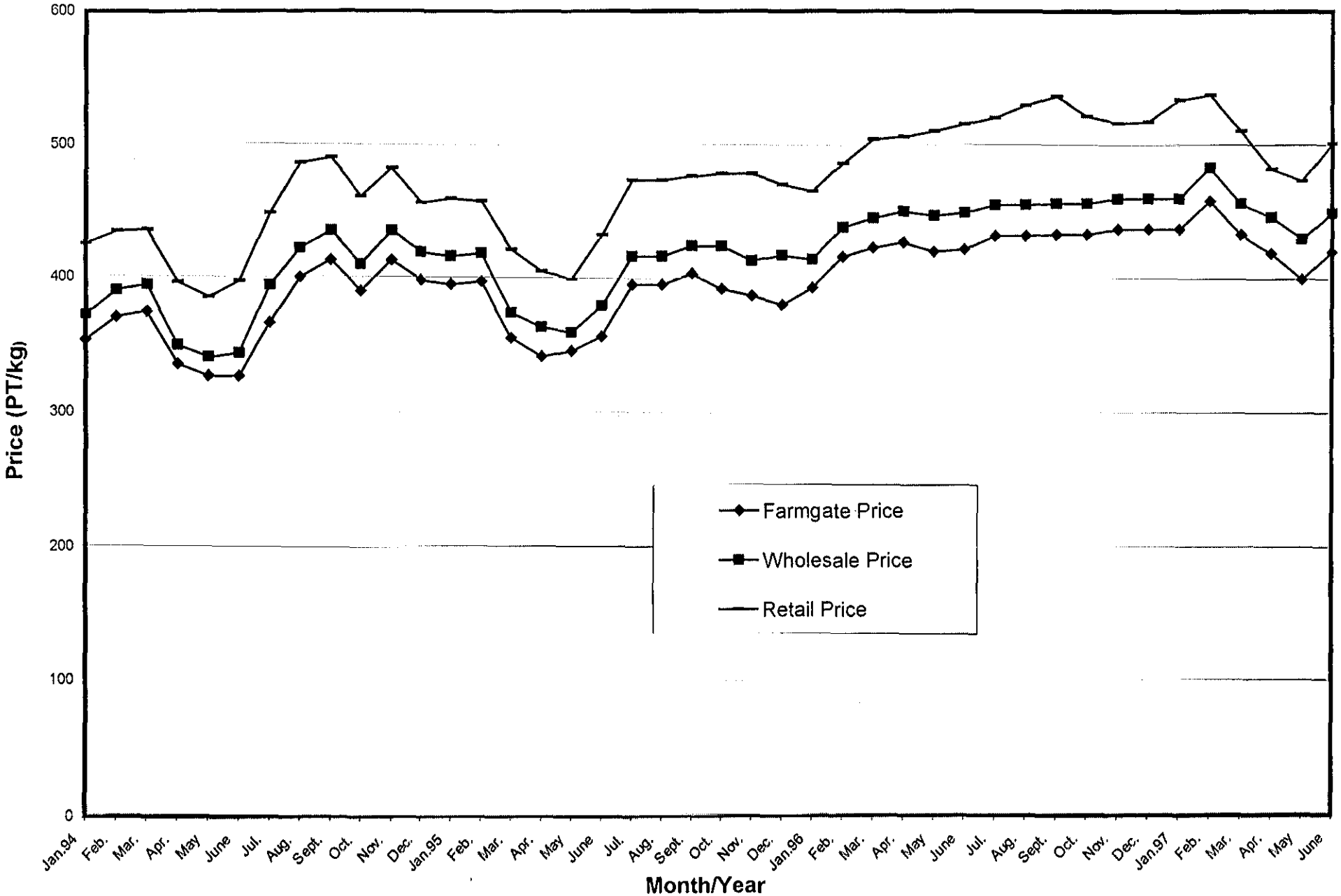


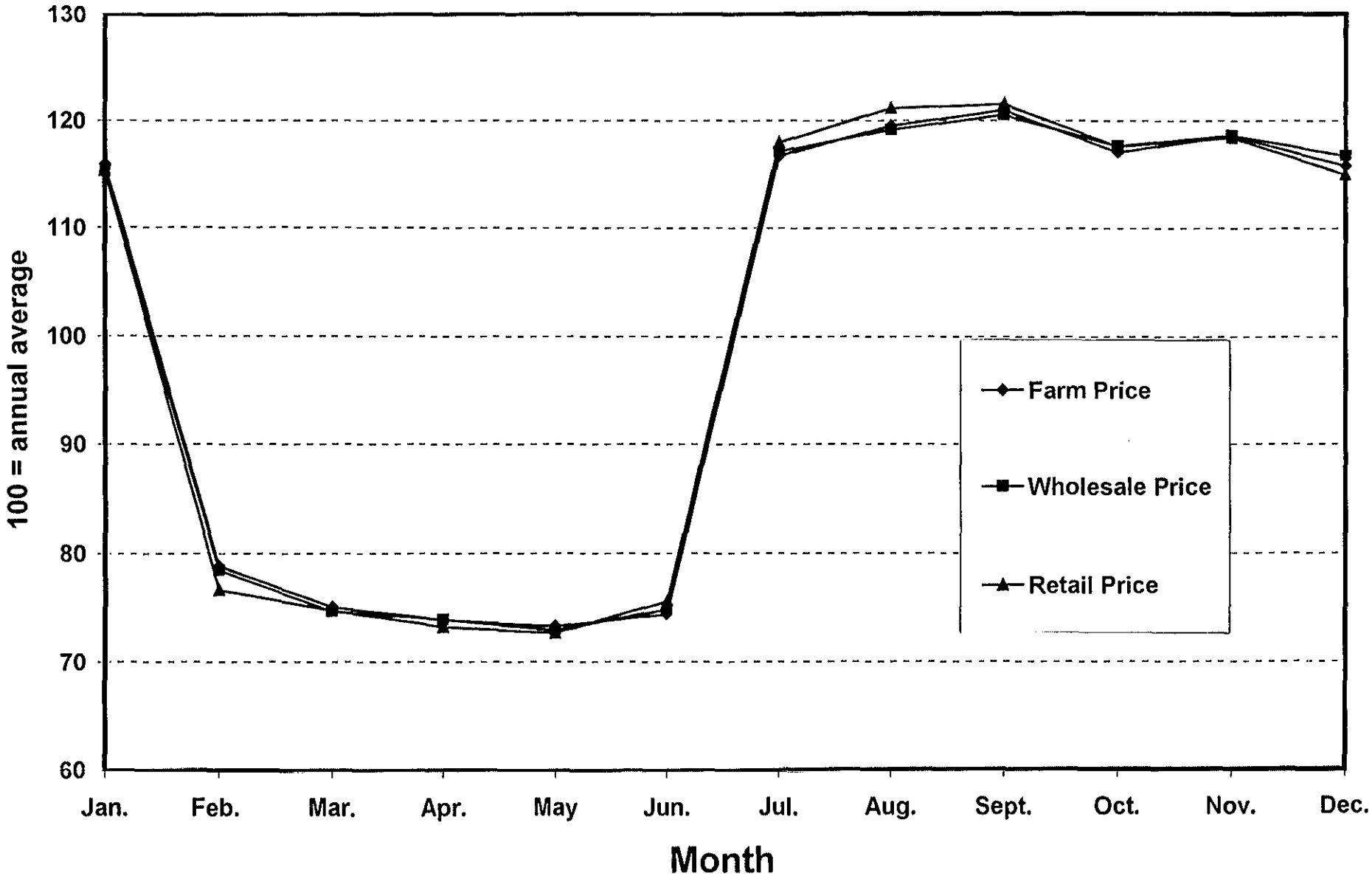
Table 1.6: Middlemen Shares and Price Markup for Live Chicken Market

Month	Price			% of consumer pr. obtained by Prod.	% of consumer pr. obtained by Midd.	Mark-Up Farmgate-Consum
	Farmgate	Wholesale	Retail			
Jan.94	353	372	425	83	17	120
Feb.	370	390	434	85	15	117
Mar.	374	394	435	86	14	116
Apr.	335	349	396	85	15	118
May	326	340	385	85	15	118
June	326	343	397	82	18	122
Jul.	366	394	448	82	18	122
Aug.	400	422	486	82	18	122
Sept.	413	435	490	84	16	119
Oct.	390	410	461	85	15	118
Nov.	413	435	482	86	14	117
Dec.	398	419	456	87	13	115
Average	372	392	441	84	16	119
Jan.95	395	416	459	86	14	116
Feb.	397	418	457	87	13	115
Mar.	355	374	421	84	16	119
Apr.	341	363	405	84	16	119
May	345	359	399	86	14	116
June	356	379	432	82	18	121
Jul.	395	416	473	84	16	120
Aug.	395	416	473	84	16	120
Sept.	403	424	476	85	15	118
Oct.	392	424	478	82	18	122
Nov.	387	413	478	81	19	124
Dec.	380	417	470	81	19	124
Average	378	402	452	84	16	119
Jan.96	393	414	465	85	15	118
Feb.	416	438	486	86	14	117
Mar.	423	445	504	84	16	119
Apr.	427	450	506	84	16	119
May	420	447	510	82	18	121
June	422	449	515	82	18	122
Jul.	432	455	520	83	17	120
Aug.	432	455	529	82	18	122
Sept.	433	456	536	81	19	124
Oct.	433	456	521	83	17	120
Nov.	437	460	516	85	15	118
Dec.	437	460	517	85	15	118
Average	425	449	510	83	17	120
Jan.97	437	460	533	82	18	122
Feb.	458	483	537	85	15	117
Mar.	433	456	510	85	15	118
Apr.	419	446	482	87	13	115
May	400	430	473	85	15	118
June	420	449	501	84	16	119
Average	428	454	506	85	15	118

Table 1.7: Seasonal Pattern for Chicken Prices at Different Marketing Channels(PT/kg)

Month	Prices			Marketing Margins		
	Farm	Wholesale	Retail	Farm-Whole	Whole-Retail	Farm-Retail
Jan.	116	115	115	105	115	112
Feb.	79	78	77	72	63	65
Mar.	75	75	75	68	76	73
Apr.	74	74	73	75	69	71
May	73	73	73	66	70	69
Jun.	74	75	76	82	82	82
Jul.	117	117	118	126	124	125
Aug.	119	119	121	114	137	130
Sept.	121	121	122	113	129	124
Oct.	117	118	118	127	117	120
Nov.	119	119	118	119	117	118
Dec.	116	117	115	132	101	111

Figure 1.8: Seasonal Pattern of Live Chicken Prices



Seasonal patterns should be recalculated every few years to take into consideration the 11-day lag between the Islamic year and the calendar year. Available data on prices are reported for the calendar year.

1.4. Chicken Meat Processing

1.4.1. Estimated Supply of Processing Services: Table 1.8 and Figure 1.9 represent total capacity, actual production and idle capacities of mechanical or modern slaughterhouses, by governorate, in 1997. There were 21 modern slaughterhouses in Egypt distributed among 12 governorates.

Sharquiya governorate ranked first with six slaughterhouses or 28.6% of the total number. There were two slaughterhouses each in Alexandria, Kalubiya, Cairo and Qena. There was one slaughterhouse in each of the other seven governorates.

The total capacity of modern slaughterhouses was 103.1 million birds/year. Actual production was 29.1 million birds/year, representing only 28.3% of total capacity. Idle capacity for the country as a whole was very high—71.7%. In some governorates, idle capacity was 100%. High idle capacity results in high costs per unit of slaughterhouse production.

There were 102 traditional slaughterhouses in Egypt concentrated in three governorates: Cairo, Giza and Kalubiya. The total capacity of traditional slaughterhouses was 10.59 million birds/year. Actual production or utilized capacity of these houses was 52.64%.

1.4.2. Estimated Demand for Processing Services: The demand for slaughtering services is derived from the demand for processed chicken products. **Total possible or maximum demand for slaughtering** is the total annual production of broilers (100% of total production to go through slaughtering process). A simple trend line for 1990-97 is used to predict the maximum demand for slaughtering services for the period 1998-2005. Demand is in terms of total annual production of broilers.

Year	1998	1999	2000	2001	2002	2003	2004	2005
Million birds	271	289	307	326	344	362	381	399

Estimates of potential demand assume that a certain percentage of broiler production will be marketed through slaughterhouses. If we assume a slaughtering percentage between 25% and 50%, future potential demand for slaughtering and processing services can be estimated.

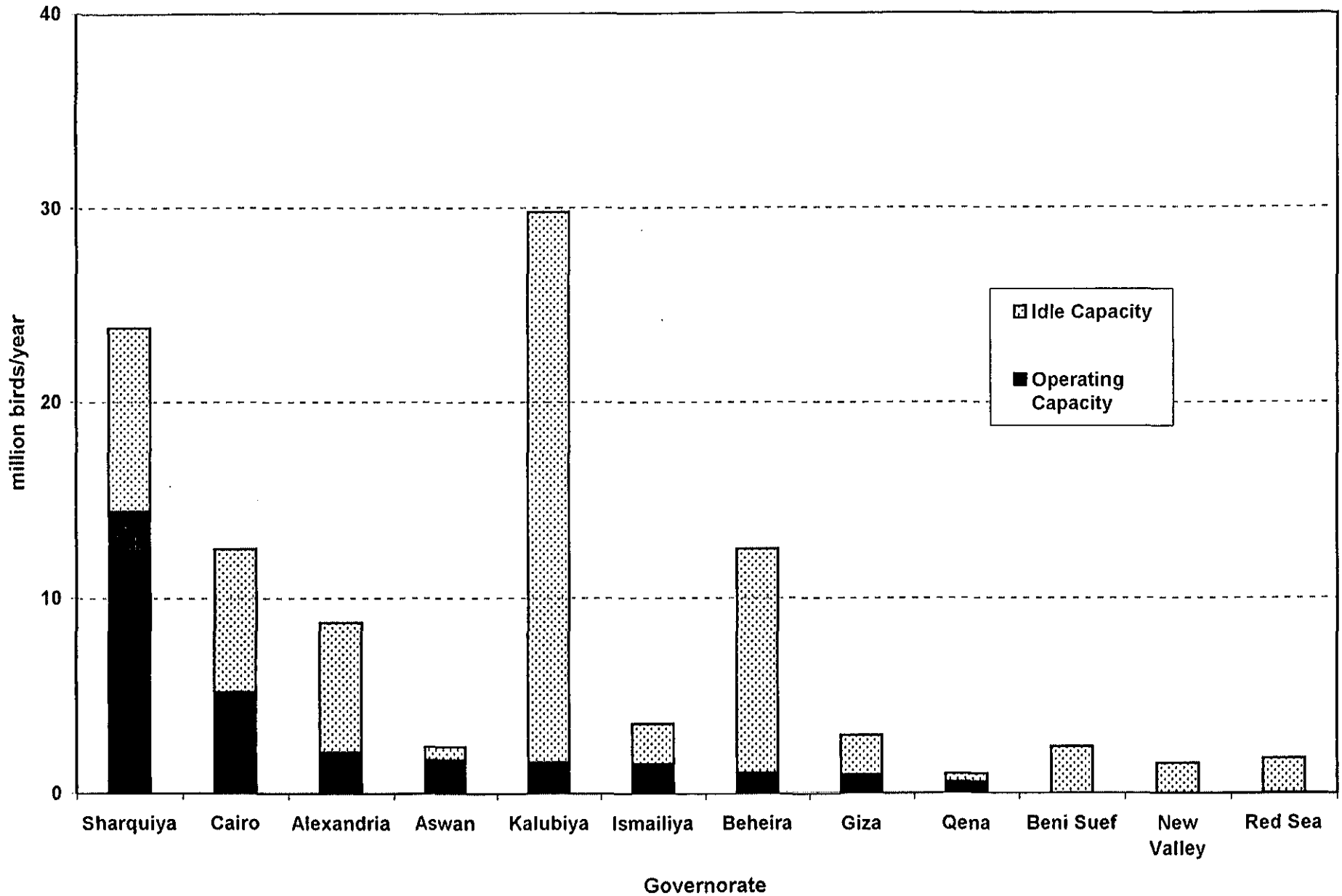
Year	1998	1999	2000	2001	2002	2003	2004	2005
Potential demand if slaughtering ratio is:	(In millions of birds)							
25%	68	72	77	82	86	91	95	100
30%	81	87	92	98	103	109	114	120
40%	108	116	123	130	138	145	152	160
50%	136	145	154	163	172	181	191	200

Table 1.8: Available and Actual Capacities of Mechanical Slaughterhouses, 1997.

Governorate	Number of Slaughter-houses	Available Cap.	Operating Capacity		Idle Capacity	
		1000 bird/year	1000 bird/year	% of Available Capacity	1000 bird/year	% of Available Capacity
Alexandria	2	8,740	2,116	24.21	6,624	75.79
Beheira	1	12,500	1,040	8.32	11,460	91.68
Sharquiya	6	23,770	14,416	60.65	9,354	39.35
Ismailiya	1	3,600	1,500	41.67	2,100	58.33
Kalubiya	2	29,780	1,603	5.38	28,177	94.62
Cairo	2	12,500	5,200	41.60	7,300	58.40
Giza	1	3,000	938	31.27	2,062	68.73
Beni Suef	1	2,400	0	0.00	2,400	100.00
New Valley	1	1,560	0	0.00	1,560	100.00
Qena	2	1,015	587	57.83	428	42.17
Red Sea	1	1,800	0	0.00	1,800	100.00
Aswan	1	2,400	1,729	72.04	671	27.96
Total Egypt	21	103,065	29,129	28.26	73,936	71.74

Source: MALR, Central Administration of Agricultural Economics and Statistics (CAAES), several issues.

Figure 1.9: Total, Actual and Idle Capacities of Modern Slaughterhouses



Projected demand for slaughtering and processing services through 2005 is estimated by applying the current slaughtering ratio, 12% of actual broiler production, after adjusting for possible increases. In fact, the slaughtering ratio is expected to increase in the future as a result of the ongoing modernization of poultry production and marketing, and the expected prohibition of marketing live birds in big cities. It may be reasonable to assume that the slaughtering and processing ratio will double by 2005. Increases of 1.5% each year starting in 1998 result in the following figures:

Year	2000	2001	2002	2003	2004	2005
Broiler production (million birds)	307	326	344	362	381	399
Slaughter ratio (%)	16.5	18.0	19.5	21.0	22.5	24.0
Demand for slaughtering services (million birds)	50.7	58.7	67.1	76.0	85.7	95.8

Estimates of demand for and supply of slaughtering and processing services indicate that existing capacity of slaughterhouses (103 million birds in 1997) is more than adequate through 2005, when demand is expected to be only 96 million birds.

While there is no need to add more slaughterhouse capacity, there will be a need for additional cooling and freezing, storage and transportation facilities.

1.5. Policies, International Trade and Protection

1.5.1. Strategies and Policy Reforms: Sharafeldin et al.,[6] describe the poultry sector's historical phases since 1964. Commercial poultry production began in 1964 with the establishment of the General Organization of Poultry Production, a public sector company that will be fully privatized by the 2000. Inputs and outputs were heavily subsidized and the government controlled markets. During this phase, a cadre of staff developed who were capable of handling large-scale poultry activities.

Between 1974 and 1986, the government's open door economic policy positively affected the poultry sector. Broiler production increased to 310 million birds/year and table eggs to 4.8 billion eggs/year. Inputs continued to be subsidized, while outputs were subject to market prices. The private sector took a growing interest in poultry activities.

However, the immediate and short-run impacts in the poultry sector of the policy reform program launched in 1986 were not positive. The industry shrank and capacity utilization decreased from 70% to 35% for table eggs and 28% for broilers. Table egg production decreased from 3.5 billion to 1.75 billion eggs/year and broiler production dropped from 320 million to 140 million birds/year. To bridge the consumption gap, imports of subsidized frozen chickens (100,000 MT/year) and table eggs were allowed. The main

[6] Sharafeldin, M.A. et all, Strategy for Developing the Animal Protein Sources in Egypt: 1997-2017, MALR, Cairo, 1998.
Sharafeldin, M.A., Development of Poultry Production in Egypt through Half a Century in Ismailiya Misr Poultry Company, Desert Hens, Sept. 1998.

factors responsible for the depressed industry were absence of a clear policy outlines, lack of professionalism, excessive credit and mismanagement, as well as subsidy elimination and application of the free market exchange rate.

To correct these problems, the MALR started to implement the strategy adopted in 1989 based on the following policies:

- Adjust size of broiler grandparent and parent stock to market needs.
- Ban imports of chickens, fertilized eggs and chicks.
- Improve production efficiency and reduce production waste.
- Encourage investments in infrastructure projects such as grandparent stock, vaccines, medicine, premixes and equipment.
- Increase national production of corn and soybeans according to their relative advantage.
- Establish a stratified 3-way contract system among broiler operators, input producers and slaughterhouse operators.
- Establish marketing cooperatives to limit market share of nonprofessional middlemen.
- Prohibit marketing of live chickens in big cities.
- Establish a national poultry board and a poultry database.
- Control quality of all poultry inputs and outputs.
- Improve training and extension services.

Implementation of these policies created positive results and substantial increases in production of broilers and table eggs between 1990 and 1997. Broiler production increased from 140 million birds in 1990 to 350 million birds in 1997 and table egg production increased from 1.75 billion to 3.2 billion.

If traditional production is added to commercial, total production is 450 million broilers and 5 billion table eggs. Per capita consumption increased from 50 to 80 eggs/person/year and from 4.2 to 7.2 kg of broilers/person/year. Part of the additional supply fed a growing population.

During the same period:

- Grandparent stock farms were introduced in Egypt. Three farms now produce 3.3 million parents annually.
- Some poultry medicines are now produced in Egypt.
- Projects aimed at producing vaccines for domestic use and export are expected in the near future.
- Seven plants produce premixed feed.
- Domestic production of concentrates covers 70% of demand.

Vitamins and minerals are still imported.

1.5.2. International Trade and Protection

The Egyptian government imposed a ban on chicken imports in 1989, completely protecting its poultry industry. According to the GATT agreement, import quotas should be converted to import taxes. In July 1997, Egypt canceled the ban and imposed an import tariff of 80%. This did not change the situation, as the tariff rate is prohibitive. Over and above the high import tariff, the government imposed three prerequisites on chicken imports:

- Chickens should be slaughtered according to Islamic rules.
- Imports should be in whole chickens, which means that imports of chicken cuts are prohibited.
- The information label of imported product should be included inside rather than outside the package.

Those prerequisites were announced for international bidding. Companies from Denmark, France and Brazil responded and offered prices. The average C&F price was $1,500/MT. This world price will be considered, along with two lower world prices, to calculate the border and import parity prices of whole chicken carcass.

To comply with the GATT agreement and the WTO, the upper limit of the tariff on poultry products should not exceed 50% starting in 2004. It is reasonable to examine the tariff range 80-50% in relation to world and domestic price levels as indicated in Table 1.9.

The import parity price is comparable to the wholesale price of the carcass of whole chicken domestically produced. However, as this price is subject to seasonal fluctuations, the estimated average in the first half of 1999 is LE 8,000/MT.

The simple break-even analysis in Table 1.9 shows that the break-even tariff rate lies between 20% and 50% and exactly equal to 29% if the world C&F price is $1,500/MT. If the C&F price decreases to $1,350/MT, the break-even tariff rate lies between 40% and 50% and exactly equal to 44%. If the C&F price further declines to $1,250/MT, the break-even tariff rate lies within the range 50% and 60%, or more precisely, 56%.

This analysis is based on the actual situation of the international and domestic markets. It is also based on the current situation of the poultry sector in Egypt, especially the level of technology and efficiency in all industries related to this sector. All such parameters may change by 2004. Thereby, it is not possible to determine the break-even tariff rate for the future. The 50% tariff rate determined according to the GATT agreement may or may not be preventive in 2004, but the industry should be prepared to be competitive. One way or another, the poultry industry will be exposed to international markets. If the tariff is to be reduced from 80% to 50%, it is better to do this gradually. It is also recommended to investigate the tariff rate that can assure the social welfare regardless of the limits that comply with the GATT agreement.

Table 1.9: Calculation of Break-Even Tariff Rate on Chicken Meat Imports

Item	Unit	Tariff when C&F price=$1250/MT			Tariff when C&F price=$1350/MT			Tariff when C&F price=$1500/MT		
		50%	56%	80%	44%	50%	80%	29%	50%	80%
C&F Price	$/MT	1250	1250	1250	1350	1350	1350	1500	1500	1500
Insurance (2%)	$/MT	25	25	25	27	27	27	30	30	30
CIF Price at Alexandria	$/MT	1275	1275	1275	1377	1377	1377	1530	1530	1530
Tariff Amount	**$/MT**	**625**	**700**	**1000**	**594**	**675**	**1080**	**435**	**750**	**1200**
Transportation to Slaughter house	$/MT	10	10	10	10	10	10	10	10	10
Other Charges Excluding Sale Tax (3%)	$/MT	38	38	38	41	41	41	45	45	45
Import Equivalent Price at Slaughter house	$/MT	1948	2023	2323	2022	2103	2508	2020	2335	2785
Profit Margin for Import Business (15%)	$/MT	292	303	348	303	315	376	303	350	418
Import Parity Price in US$	$/MT	2240	2326	2671	2325	2418	2884	2323	2685	3203
Exchange Rate	LE/$1	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45	3.45
Import Parity Price in LE	**LE/MT**	**7727**	**8024**	**9215**	**8020**	**8342**	**9949**	**8014**	**9264**	**11049**

Chapter II

Poultry Feed Marketing and Prices

2. Poultry Feed Marketing and Prices

2.1. Historical Background

The Egyptian feed industry is new; the first company to manufacture feed, Misr Company for Animal Feeds, was established in 1945. This company pioneered the scientific production of animal feeds at a time when most chickens were baladi and fed traditional farm feeds.

Law 21 of 1957 was the first law enacted by the Egyptian government to regulate feed production and distribution. Since then, the government has enacted different laws and ministerial decrees to organize the feed industry. Law 192 of 1959 was concerned with specifications and ingredients of unified feed for different kinds of animals. Ministerial decrees of 1984, 1985, 1990 and 1992 specified compositions of different kinds of feed according to availability of domestic products and ingredients.[7]

Feed manufacturing, pricing and distribution were liberalized in 1992. By then, PBDAC was phased out of the feed business, subsidies were eliminated and government control and the quota distribution system was abolished. Ministerial decree 119 of 1992 specified conditions and regulations concerning private sector activities in the feed business.

The current situation of feed manufacturing, distribution and quality control is regulated by Ministerial decree 1498 of 1996.

2.2. Production of Manufactured Poultry Feeds

2.2.1. Policy Reform Impact on Poultry Feeds: Table 2.1 and Figure 2.1 represent estimates of animal and poultry feeds manufactured between 1982 and 1997. Figures in last column indicate that total manufactured feeds averaged 2.23 million MT in each of the last three years. There are two periods—1982-89 when total feed production increased from 1.948 million MT to more than 4 million MT, and 1990-97 when production dropped to 1.93 million MT. The substantial decline in manufactured feeds is closely related to two main policy reforms made in the late 1980s. The first removed the government from production, distribution and marketing of inputs and outputs of most of agricultural activities, including animal and poultry feeds. The second removed feed subsidies and abolished the feed quota distribution system. Poultry and livestock farmers' response to those reforms was to stop buying as much manufactured feed. As import and trade of corn and soybean were liberalized, most farmers started to buy feed ingredients directly from suppliers and/or importers and do their own mixing on-farm. Thus, the decline of manufactured feed during the period of policy reform does not imply a decrease in livestock and poultry activities. Commercial broiler production more than doubled while manufactured feed production dropped to one-third of its initial volume between 1989 and 1997.

[7] Kamel, M., Animal Feed: Market Study, Cairo, 1998.
Afifi, M.A.M., Egyptian Feed Gap and Policies to Bridge It, Cairo, 1996.

Table 2.1: Evolution of Animal and Poultry Feed Production 1982-1997(MT)

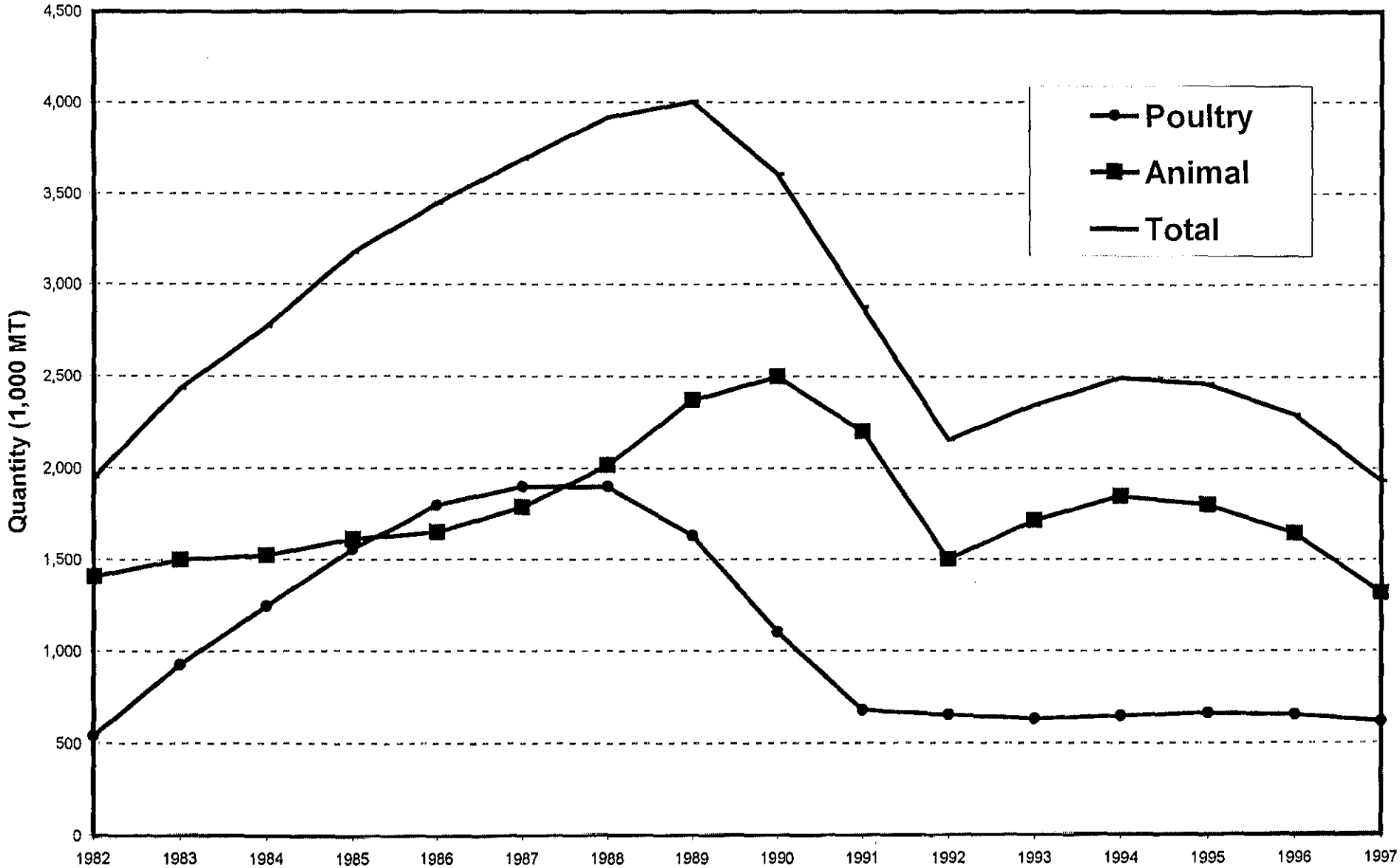
Year	Poultry Feed**		Animal Feed*		Total
	Quantity	% of total	Quantity	% of total	
1982	542,000	27.82	1,406,000	72.18	1,948,000
1983	931,000	38.30	1,500,000	61.70	2,431,000
1984	1,247,000	45.00	1,524,000	55.00	2,771,000
1985	1,558,000	49.13	1,613,000	50.87	3,171,000
1986	1,800,000	52.17	1,650,000	47.83	3,450,000
1987	1,900,000	51.55	1,786,000	48.45	3,686,000
1988	1,900,000	48.53	2,015,000	51.47	3,915,000
1989	1,630,000	40.73	2,372,000	59.27	4,002,000
1990	1,105,000	30.65	2,500,000	69.35	3,605,000
1991	680,000	23.61	2,200,000	76.39	2,880,000
1992	654,000	30.36	1,500,000	69.64	2,154,000
1993	631,970	26.93	1,715,000	73.07	2,346,970
1994	649,374	26.00	1,848,665	74.00	2,498,039
1995	662,888	26.90	1,801,083	73.10	2,463,971
1996	652,921	28.44	1,642,836	71.56	2,295,757
1997	616,143	31.92	1,314,391	68.08	1,930,534
Av.95-97	643,984	28.88	1,586,103	71.12	2,230,087

* Composition of animal feed is 97% cattle feed, 1.3% rabbit feed, and the rest is fish, camel, and horses feeds.

** Composition of 1996 poultry feed is 70 % yellow corn, 19% soymeal, 3.4% wheat bran, 1.9% broiler concentrates, 1.1% bone meal, 1% gelatin, 0.6% layer concentrate, and 2.6% other additives. Composition of 1997 production of poultry feed is 51.2% starter feed, 14.6% finishing feed and 34.2% layer feed.

Source: MALR, CAAES, as reported in Kamal, M., "Animal Feed: Market Study", Cairo, 1998.

Figure 2.1: Evolution of Poultry, Animal and Total Feed Production, 1982-97.



The same table and figure show that animal feed production represents more than 71% of total feed produced compared to 29% for poultry feeds, averaged over the last three years. By contrast, poultry feed represented almost half of the manufactured feeds during the second half of the 1980s. Poultry feed production increased from 542,000 MT in 1982 to 1.9 million in 1988, then decreased to 616,000 MT in 1997. Animal feed production increased from 1.406 million MT in 1982 to a maximum of 2.5 million MT in 1990, then declined to a new low of 1.314 million MT in 1997.

2.2.2. Regional Distribution and Capacities of Poultry Feed Mills: Data in Table 2.2 indicate the evolution of poultry feed industry through the last five years. Number of feed mills, design capacity and actual annual production by governorate and region are shown. Estimates in the last row show that the number of poultry feed mills at the national level increased from 58 in 1993 to 85 in 1997, a 47% increase. Total capacity increased from 702 MT/hour to 826 MT/hour, an increase of 18%. Actual production increased from 632,000 MT in 1993 to 650,000 MT and 663,000 MT in 1994 and 1995, respectively, then decreased to 653,000 MT and 616,000 MT in 1996 and 1997, respectively.

These figures show that the poultry feed industry operated with a huge idle capacity. In fact, if feed mills work only one shift a day and 300 days a year, potential production would be 1.98 million MT a year—the industry operated at one-third of its design capacity as of 1997. The idleness may be attributed to big, private poultry companies that prefer to have their own feed mills even if they cannot operate at full capacity. This may also explain why the number of feed mills increased at the same time the actual quantity produced remained stable or decreased slightly.

Lower Egypt had 67% of the mills, 70% of capacity and 52% of actual national production. Middle Egypt had 16% of the mills, 23% of capacity and 46% of production, compared to 15%, 7% and 2%, respectively, for Upper Egypt.

Capacity utilization in Middle Egypt was much higher than in Lower Egypt. In Middle Egypt, 23% of the national capacity (186 MT/hour) produced 46% (283,000 MT) of national production, while in Lower Egypt 70% of the national capacity (579 MT/hour) produced 52% of the total production (323,000 MT). Table 2.2 shows that actual production in Lower Egypt has been decreasing over the last five years from 365,000 MT in both 1993 and 1994 to 323,000 MT in 1997. By contrast, actual production in Middle Egypt has been increasing. Figure 2.2 shows that Giza ranks first with 46% of national production. Dakahliya, Cairo, Ismailiya, Kalubiya and Sharquiya produce important shares of the national manufactured feeds for poultry.

2.2.3. Poultry Feed Costs and Prices: Table 2.3 shows the composition of manufactured poultry feeds as of 1996. The total produced quantity consisted of 456,300 MT of yellow corn, 126,830 MT of soybean meal, 22,000 MT of wheat bran and 47,730 MT of concentrates and additives.

The two main components of poultry feeds, yellow corn (70%) and soybeans (20%), represent 90% of the quantity produced. Prices of finished feeds depend mainly on prices of these two ingredients. Estimates in 1997 indicated that almost 100% of the yellow corn and 80% of the soybeans were imported. Thus, the prices of finished feeds for poultry in Egypt were closely related to international prices of corn and soybean, as will be detailed in this study.

Table 2.2: Evolution of Poultry Feed Industry 1993-1997 by Governorate

Governorate	1993			1994			1995			1996			1997		
	No. of factories	capacity mt/h	production mt/year	No. of factories	capacity mt/h	production mt/year	No. of factories	capacity mt/h	production mt/year	No. of factories	capacity mt/h	production mt/year	No. of factories	capacity mt/h	production mt/year
Matrouh	0	0	0	0	0	0	1	1	0	1	1	0	1	1	0
Alexandria	3	25	24,994	3	25	25,558	3	36	16,458	4	26	14,904	4	26	9,105
Nouberia	3	25	24,782	3	25	8,518	3	45	7,824	4	55	5,990	4	55	43,109
Beheira	0	0	0	0	0	0	1	10	0	1	10	0	2	19	239
Kafr El Shek	4	17	22,589	4	17	8,016	4	18	17,328	4	18	12,763	4	18	9,564
Demietta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dakahliya	8	129	71,138	8	129	82,765	8	131	100,831	9	131	104,336	11	135	87,759
Sharquiya	5	54	34,934	5	54	28,606	7	62	35,890	9	71	26,907	11	85	24,966
Port Said	0	0	0	0	0	0	0	0	0	0	0	0	0		0
Ismailiya	1	20	39,065	1	20	45,678	1	20	48,201	1	20	46,604	1	20	38,480
Suez	0	0	0	0	0	0	1	4	0	1	4	0	1	4	0
Gharbiya	5	31	2,912	5	31	823	5	31	596	5	31	408	5	31	1,235
Menoufiya	4	23	431	4	23	1,663	1	1	1,879	1	1	1,402	2	5	1,759
Kalubiya	6	102	40,311	6	102	45,611	6	105	43,340	6	105	30,366	7	110	28,497
Cairo	4	80	103,021	4	80	118,462	4	70	84,052	4	70	102,016	4	70	78,422
T.L.Egypt	43	506	364,177	43	506	365,700	45	534	356,399	50	542	345,696	57	579	323,135
Giza	6	138	244,026	6	138	262,627	8	138	291,577	9	140	290,956	11	171	281,194
Fayoum	1	15	2,819	1	15	1,401	1	12	1,310	1	12	1,068	1	12	1,484
Beni Suef	0	0	0	0	0	0	2	3	44	2	3	113	2	3	44
Mynia	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.M.Egypt	7	153	246,845	7	153	264,028	11	153	292,931	12	155	292,137	14	186	282,722
Assiout	3	11	9,824	3	11	10,064	3	11	9,935	4	13	12,421	6	18	7,920
Sohag	1	5	367	1	5	348	1	5	274	1	5	738	2	9	1,400
Qena	1	20	10,757	1	20	7,340	1	20	2,522	1	20	1,824	2	25	861
Aswan	3	7	0	3	7	1,785	3	7	192	3	7	0	3	7	0
T.U.Egypt	8	43	20,948	8	43	19,537	8	43	12,923	9	45	14,983	13	58	10,181
N.Sinai	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S.Sinai	0	0	0	0	0	109	0	0	0	0	0	0	0	0	0
Red Sea	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
New Valley	0	0	0	0	0	0	1	3	635	1	3	105	1	3	105
Luxor	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T.Others	0	0	0	0	0	109	1	3	635	1	3	105	1	3	105
T.Egypt	58	702	631,970	58	702	649,374	65	733	662,888	72	745	652,921	85	826	616,143

Figure 2.2: Relative Importance of Different Governorates in Poultry Feed Prodution

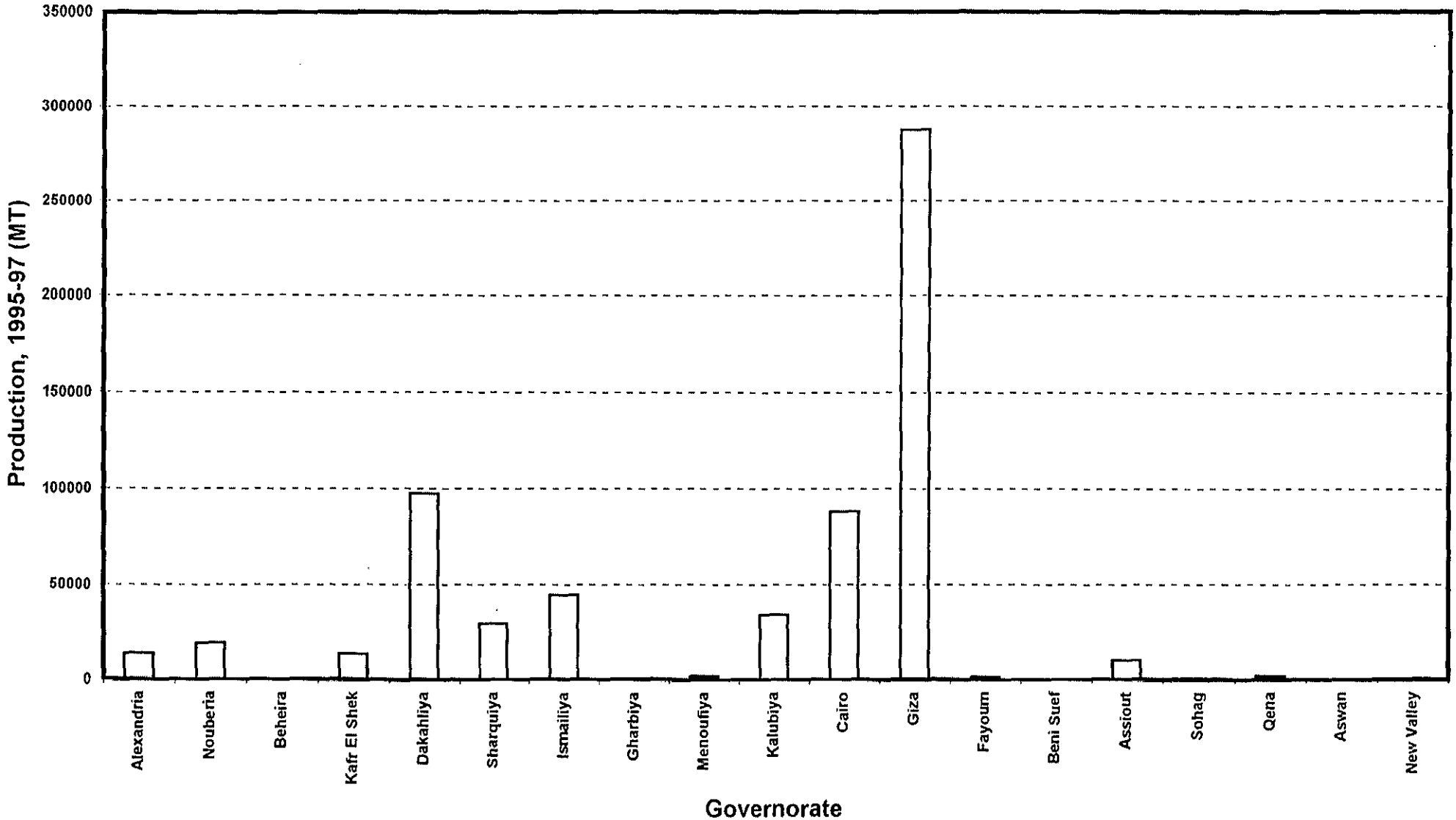


Table 2.3: Compositions and Prices of Poultry Feed in 1996

Component	Quantity		Price (LE/MT)		
	Ton	%	Lower Limit	Upper Limit	Average
Yellow corn	456,302	69.9	520	1100	810
Soybean meal	126,831	19.4	845	1250	1048
Wheat bran	22,060	3.4	400	620	510
Broiler concentrates	12,340	1.9	1800	2500	2150
Bones meals	6,964	1.1	290	800	545
Gelatin	6,705	1.0	700	1480	1090
Layer concentrates	3,993	0.6	1750	2700	2225
Fish meal	687	0.1	1200	3625	2413
Additives (pre-mixes)	17,039	2.6	na	na	na

Table 2.4: Prices of Different Poultry Feeds (LE/MT)

Year	Starter	Filling	Finishing	Layers
1993	775-900	630-67	735-860	690-795
1994	750-940	640-940	614-800	550-805
1995	850-916	775-880	710-880	680-950
1996	870-916	775-880	720-880	650-950
1997	870-925	765-891	715-880	670-960
Average 1995-97	863-919	772-884	715-880	667-953

As shown in Tables 2.3 and 2.4, prices of ingredients and different kinds of finished feeds for poultry fluctuated significantly. Corn price ranged between LE 520/MT and LE 1,100/MT, averaging LE 810/MT in 1996. Soybean meal price varied from LE 845/MT to LE 1,250/MT, averaging LE 1,048/MT. Changes in prices of ingredients directly affected prices of finished feeds. Average price of starter feed between 1995 and 1997 was LE 863-919/MT, compared to LE 772-884/MT for filling feed, LE 715-880/MT for finishing feed and LE 667-953/MT for layer feed.

2.3. Domestic Supply of and Demand for Corn and Soybean

2.3.1. Evolution of Domestic Production of Corn

2.3.1.1. Corn Acreage: Corn is an important summer crop in Egypt. As shown in Table 2.5 and Figure 2.3, the average area cultivated in corn in the last three years was 2.123 million feddan, compared to 1.9 million feddan in 1980, a 12% increase in 15 years.

White corn represented 95.8% of the area cultivated in corn, compared to 4.2% for yellow corn. In fact, yellow corn, so important to poultry production, is considered a new crop in Egypt. Although some trials were conducted during the first half of 1980s, the MALR did not introduce yellow corn until 1992. Area cultivated to yellow corn increased from only 860 feddan in 1992 to 91,000 feddan in 1997. This rapid increase in area cultivated to yellow corn is a normal response of farmers to policy reforms in poultry feeds production and marketing.

2.3.1.2. Corn Productivity: Although corn productivity in Egypt has increased substantially during the last two decades, there is still great potential for further increases.

Table 2.5 and Figure 2.4 show that the average yield of corn increased from 1.696 MT/feddan in 1980 to 2.994 MT/feddan in 1997, representing a 77% increase in 18 years. Yield of summer white corn increased from 1.844 MT/feddan to 3.146 MT/feddan during the same period. Shifts in corn productivity were mainly attributed to expanded use of new hybrids and high-yielding varieties. The MALR plans for the yield to reach 3.73 MT/feddan by the end of this century. If achieved, Egypt would be self-sufficient in corn, even with the plan to mix corn flour and wheat flour for the production of baladi bread.

Egypt is ranked fourth in the world with respect to corn yield with 7.5 MT/hectare in 1998. Italy is first with 9.47 MT/hectare, France is second with 9.13 MT and the U.S. is third with 7.97 MT. If Egypt realizes productivity similar to that of Italy, the potential increase in yield would be one-fourth its current level. This would be a 2 million MT increase in production without any increase in acreage.

There is no significant difference between cost of production of yellow and white corn. Farmgate price is therefore the main determining factor for relative profitability of corn to competing crops.

2.3.1.3. Corn Production: Table 2.5 and Figure 2.5 show the evolution of total domestic production of white and yellow corn in different seasons between 1980 and 1997. While total production of nili white corn was more or less stable over the study period, summer white corn increased 116% in 12 years, from 2.807 million MT to 6.075 million MT.

Table 2.5: Domestic Production of Corn, by Season and Type : 1980-1997

	White Corn									Yellow Corn									All Corn		
	Summer			Nili			Total			Summer			Nili			Total					
	area	yield	prod	area	yield	prod	area	yield	prod	area	yield	prod	area	yield	prod	area	yield	prod	area	yield	prod
Year	1000 F	Ton	1000T	1000F	Ton	1000T	1000 F	MT	1000 T	1000 F	MT	1000 T	1000 F	MT	1000 T	1000 F	MT	1000 T	1000 F	MT	1000 T
1980	1,433	1.84	2,642	473	1.25	589.9	1,906	1.70	3,232										1,906	1.70	3,232
1981	1,434	1.86	2,672	489	1.30	634.4	1,924	1.72	3,307										1,924	1.72	3,307
1982	1,452	1.87	2,712	483	1.32	636.2	1,935	1.73	3,348	0.36	0.17	0.062				0.36	0.17	0.06	1,936	1.73	3,348
1983	1,397	1.96	2,733	555	1.40	776	1,952	1.80	3,509										1,952	1.80	3,509
1984	1,449	2.02	2,933	526	1.46	765.2	1,975	1.87	3,698	3.18	0.14	0.458				3.18	0.14	0.46	1,978	1.87	3,699
1985	1,396	2.09	2,917	518	1.49	770.7	1,914	1.93	3,687										1,914	1.93	3,687
1986	1,122	2.02	2,271	361	1.49	536.2	1,483	1.89	2,807										1,483	1.89	2,807
1987	1,353	2.16	2,916	458	1.54	702.8	1,810	2.00	3,619										1,810	2.00	3,619
1988	1,480	2.24	3,315	480	1.61	772.2	1,960	2.09	4,087										1,960	2.09	4,087
1989	1,534	2.44	3,747	470	1.66	781.4	2,004	2.26	4,529										2,004	2.26	4,529
1990	1,547	2.62	4,050	428	1.75	749.3	1,976	2.43	4,799										1,976	2.43	4,799
1991	1,676	2.63	4,400	385	1.88	721.6	2,061	2.49	5,122										2,061	2.49	5,122
1992	1,649	2.69	4,431	317	2.01	638.4	1,966	2.58	5,070	0.86	2.75	2.362				0.86	2.75	2.4	1,967	2.58	5,072
1993	1,661	2.66	4,417	312	2.00	622.7	1,973	2.55	5,040	16.86	2.11	35.57				16.86	2.11	35.6	1,990	2.55	5,075
1994	1,740	2.87	4,992	317	2.10	666.6	2,057	2.75	5,659	45.98	2.97	136.3	5.58	2.14	11.9	51.56	2.88	148.2	2,108	2.75	5,807
1995	1,751	2.59	4,536	328	1.96	643.1	2,079	2.49	5,179	58.47	2.66	155.4	8.39	2.36	19.8	66.86	2.62	175.2	2,146	2.49	5,354
1996	1,768	2.92	5,167	318	2.08	659.4	2,086	2.79	5,826	93.16	2.81	261.8	14.55	2.20	32.0	107.7	2.73	293.8	2,194	2.79	6,120
1997	1,636	3.15	5,147	302	2.18	658.6	1,938	3.00	5,805	76.35	3.17	242.3	14.33	1.88	26.9	90.68	2.97	269.2	2,029	2.99	6,075
1998	1,698	3.19	5,432	324	2.22	719.5	2,022	3.04	6,151	57.67	3.03	174.6	7.90	1.63	12.9	65.57	2.86	187.5	2,088	3.04	6,339

Source: MALR, Central Administration for Agricultural Economics and Statistics, various issues.

Figure 2.3 : White,Yellow, and Total Acreage of Corn.

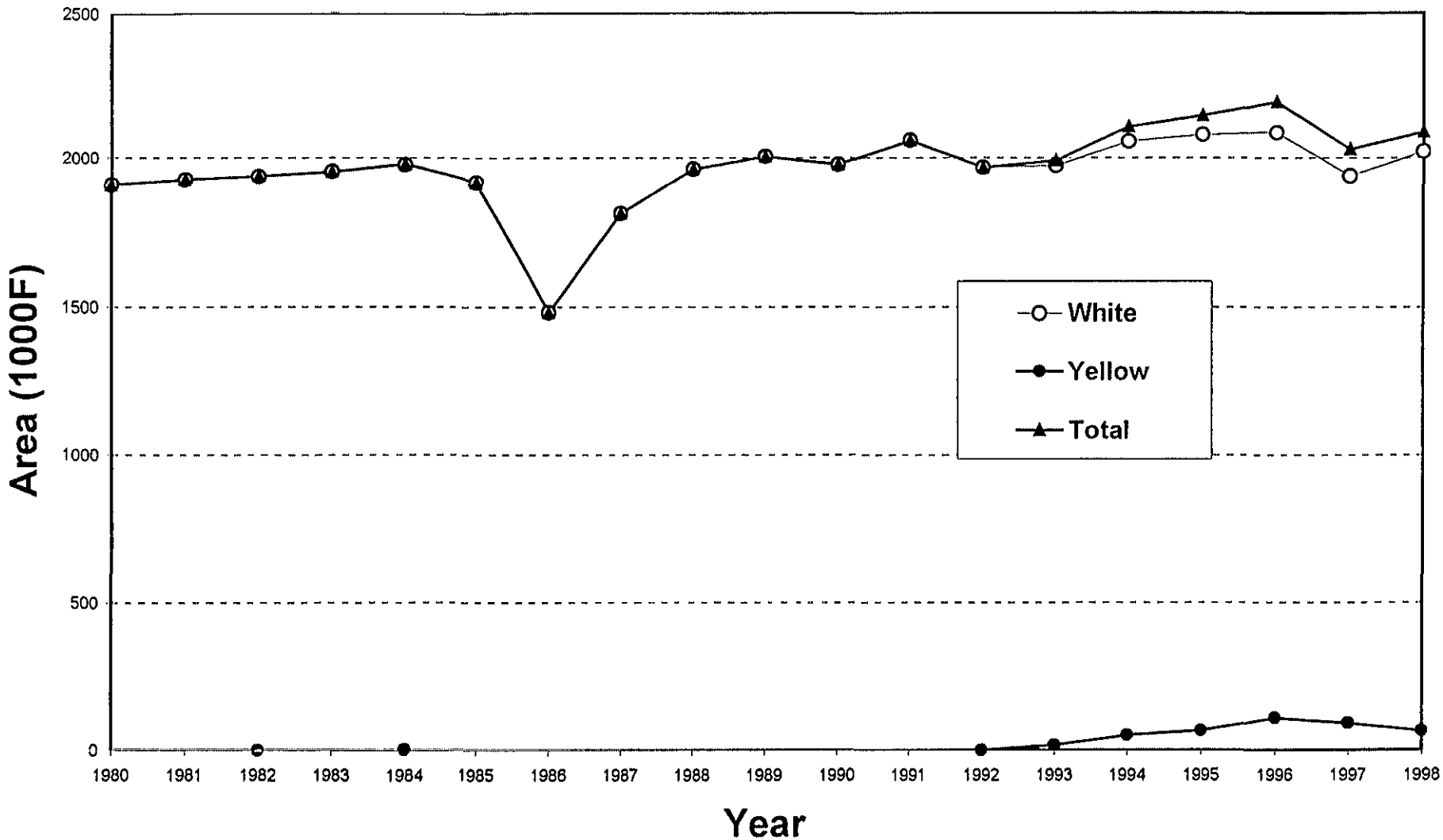


Figure 2.4: Trends of Corn Yields

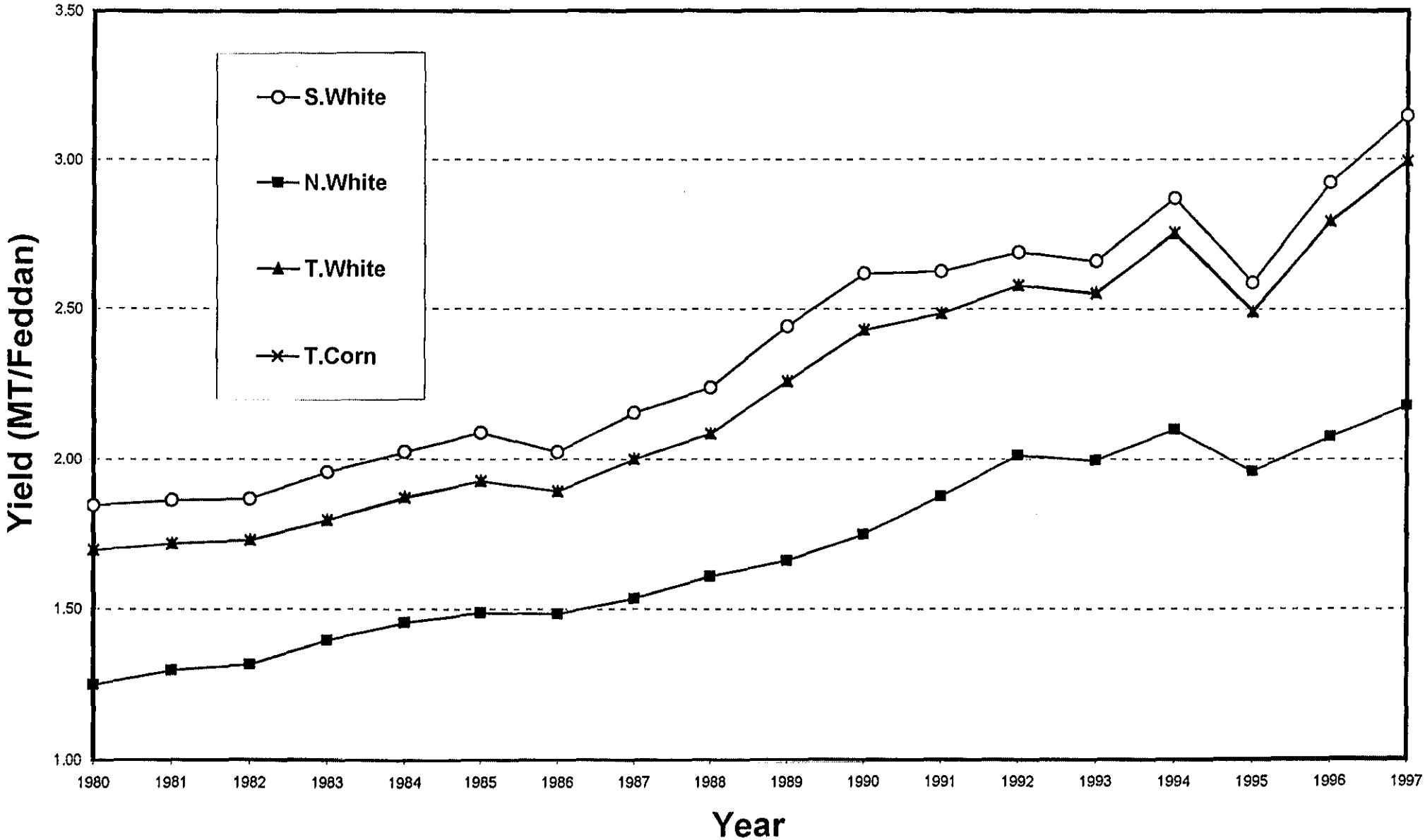
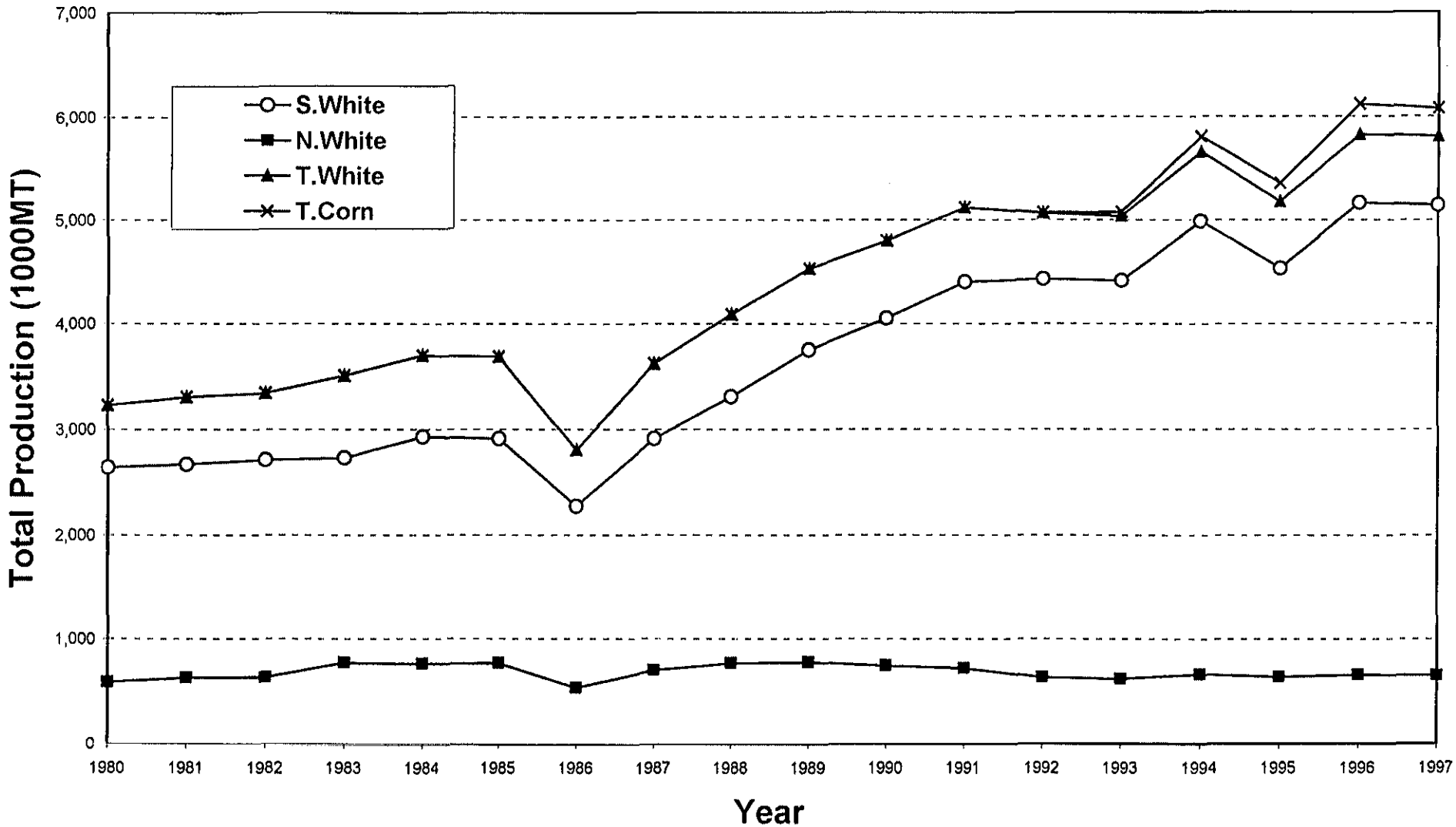


Figure 2.5: Trends of Corn Production



Some 61.3% of this increase was attributable to yield improvement and 38.8% to increase in cultivated acreage.

There are five main considerations for Egyptian corn production:

- Summer season cultivation is more productive than nili season.
- Cultivated acreage of yellow corn should expand to meet increasing demands of the poultry industry.
- Continuing efforts to invest in high-yielding varieties and hybrids are recommended to increase domestic supply.
- Newly reclaimed lands in big national projects such as Toshke offer excellent opportunities for corn expansion, especially yellow corn.
- As listed in Chapter Three, Egypt has a relative advantage in producing corn, and expansion of corn cultivation is mainly for import substitution rather than export.

Given that imports and distribution of yellow corn were completely under the control of the government before the policy reform, estimates in Table 2.6 can be relied on to represent that period.

2.3.2. Estimates of Demand for Corn for Poultry Feed: Estimates of available corn for all uses are easy to obtain. There are almost no contradictions between various statistical data sources regarding the different supply components, such as domestic production, stock changes, exports and imports.

By contrast, there are contradictions in estimates from different sources for demand for corn for feed, seed, industry and human consumption. In the following sections, different estimates will be compared in an effort to obtain accurate estimates for demand for corn for poultry feed. Because demand for corn is affected by agricultural policy, demand estimates will be presented in three historical periods: pre-policy, transition from a controlled to a free economic system and post-reform (the 1990s).

2.3.2.1. Estimates Before Policy Reform:[8] Data in Table 2.6 gives estimates from the period before agricultural policy reform of available supply of yellow corn, different uses and subsidies paid by the government for activities for which yellow corn is an important input, i.e., animal, poultry and industry.

Total imports of yellow corn, which represented the total available supply, increased from 493,500 MT in 1979 to 1.75 million MT in 1983-84. Value of these imports increased from LE 49 million to LE 279 million and total subsidy rose from LE 20 million to LE 174 million, a 777% increase in five years. About 630% of this increase was attributable to import expansion; 147% to price increases in international markets. Projections made in 1984 indicated that imports would have been 3.086 million MT and subsidies LE 956 million by 1988/89, if policy reform had not taken place.

With policy reform, yellow corn domestic price, originally fixed by the government at LE 60/MT, was allowed to increase by LE 62/MT/year for five years and reach LE 370/MT by 1988/89 to remove all subsidy and set the domestic price to equal the world price.

[8] El Kholei, O., El Guendy, M., Direct and Indirect Impacts of Yellow Corn Subsidy Removal, MALR, 1984.

Table 2.6: Estimates of Yellow Corn Uses in Poultry Feed Before Policy Reform

Year	Available Supply (1000 MT)	Uses (1000 MT)			Value LE Million	Price LE/MT	Subsidy	
		Animal Feed	Poultry Feed	Indust.			LE/MT	Total LE Million
1979	494	261.6	202.3	29.6	49.424	100.15	40.15	19.81
1980	622	329.5	254.9	37.3	70.576	113.54	53.54	33.28
1980/81	1,172	621.2	480.5	70.3	181.744	155.07	95.07	111.42
1981/82	1,136	602.1	465.8	68.2	157.438	138.59	78.59	89.28
1982/83	1,588	841.4	650.9	95.3	204.017	128.51	68.51	108.77
1983/84	1,750	927.5	717.5	105.0	278.770	159.30	99.30	173.78

Source: El Kholei, O., and El Guendy, M., Direct and Indirect Impacts of Yellow Corn Subsidy Removal, MALR, 1984.

Given that yellow corn represents two-thirds of poultry feed and 22% of animal feed, costs of feed production have increased. This in turn increased the costs of poultry production, and farmgate and consumer prices of poultry products and table eggs.

Estimates in Table 2.6 show that yellow corn used to produce commercial poultry feed increased from 202,300 MT in 1979 to 717,500 MT in 1983/84. About 41% of yellow corn was used for poultry feed, 53% for animal feed and 6% for industrial uses.

Given than imports and distribution of yellow corn were completely under the control of the government before the policy reform, estimates in Table 2.6 are accurate and can be relied on to represent that period.

2.3.2.2. Estimates in Policy Reform Transition Period: The late 1980s was a period of transition from a controlled to a free economic system. Reforms involved all agricultural activities, including feed manufacturing and poultry production.

According to some of the studies available[9] for 1986-1989, the total amount of yellow corn imported and distributed was estimated at an annual average of 1.419 million MT. The breakdown among different uses was:

Use	Percentage (%)
Human consumption	0.18
Livestock feed	16.54
Poultry feed mills	36.42
Poultry producers	19.76
Poultry companies	15.99
Rat control	0.01
Starch	11.1

Poultry feed is 72.17% of the demand for yellow corn—36.42% for poultry feed mills, 19.76% for poultry producers and 15.99% for poultry companies. This means that, with the policy reforms, the private poultry companies were allowed to import and/or buy corn as grain and use it to produce their own feed requirements. In fact, many poultry farms started to buy feed ingredients directly from suppliers or importers and mix their own feed on-farm.

2.3.2.3. Estimates in the Post-reform Period: By 1990, all subsidies on feed production and distribution were removed. Production and marketing of feed were liberalized, including all activities related to importing feed ingredients. Prices of feed started to be determined by the free market. The feed quota delivery system was abolished and poultry producers could buy their own finished feed requirements or feed ingredients on the market. The feed subsector turned out to be demand rather than supply oriented.

Estimates of the supply and uses of corn are made available by official institutions such as the Central Agency for Public Mobilization and Statistics (CAPMAS) and the MALR. Other estimates are available from studies and reports.

[9] USAID, Corn Subsector Policy Study, Integrated Development Consultants, Cairo, 1990.

Table 2.7 represents estimates published by CAPMAS that consider all corn, yellow and white, domestically produced and imported. Estimates in this table cover the years 1986/87, the beginning of the agriculture policy reform program, through 1995-96.

Estimates indicate that domestic production, mainly of white corn, amounted to 5.825 million MT in 1995/96. Imports, all yellow corn, amounted to 2.454 million MT in the same year. Thus, the total available supply, 8.279 million MT, consisted of 70% domestic white corn and 30% imported yellow corn.

Distribution of available quantities of corn among different uses in 1995-96 were: 2.426 million MT (29.3%) for feed, 5.397 million MT (65.2%) for human consumption and the rest for industry, seed and losses.

The amount of corn used for feed is almost equal to the total imports of yellow corn. This means that all domestic production, after deducting for seed and industry needs, is used for human consumption, implying that almost no domestically produced white corn is used for animal or poultry feed. This conclusion is probably not correct, given that low-cost and subsidized wheat has encouraged consumers to switch to pure wheat bread as the dietary staple, instead of the bread made from a combination of wheat and corn flour.

Some studies estimate human consumption of corn at only 20% of the total available supply.[10] Estimates made by other institutions[11]support the hypothesis that corn is used mainly for feed, as indicated in Table 2.8. In fact, averages for the period 1993-95 indicate that total available supply amounted to 7.427 million MT. This total was composed of 72% domestic production, 26% imports and 2% stock differential. Corn consumption amounted to 7.427 million MT, broken down to 78% for feed, 20% for human consumption and the rest for ending stock.

The Family Budget Survey of 1997, the most recent survey conducted by CAPMAS, gives another estimate for feed use of corn. According to this survey, total quantity of corn for human consumption for both rural and urban populations amounted to 473,299 MT/year. This represents only 5.5% of the total available supply of 8.629 million MT (6.075 million MT domestic production + 2.554 million MT imports). Human consumption seems to be underestimated in this survey.

2.3.2.4. Estimates by the RDI/APRP: Given the contradictions among the various estimates of uses of corn in Egypt, the RDI conducted its own study. The report of that study is available from RDI[12]. The main results of the study are summarized here. White corn is disposed as follows:

[10] Harrison, K., Agricultural Processing, Marketing and Trade in the Reform Era, in Fletcher, L.B., (ed.), Egypt's Agriculture in a Reform Era, 1996, pp. 223-253.

[11] American Embassy, Grain and Feed Annual Report, Cairo, March 1995, pp. 26-36.

[12] Krenz, R.D. El Guendy, M.M., Ariza-Nino, E., and Siddik, I., Utililization of Maize in Egypt, RDI, APRP, MALR & USAID, Cairo, June 1999

Table 2.7: Estimates of Available Supply and Uses of Corn: 1986-87
(CAPMAS estimates, in 1,000 MT)

(1000 Tons)

Year	Domest. Prod.	Stock		Foreign Trade		Available Supply	Uses					Per Capita Consumption (kg)
		Beg.	End	Export	Import		Feed	Seed	Indust.	Loss	Food	
1986-87	3619	173	55	-	1651	5388	1579	52	109	135	3513	72.6
1987-88	4088	55	79	-	1910	5974	1750	58	121	149	3896	78.3
1988-89	4529	79	114	-	1433	5927	1737	57	120	148	3865	75.6
1989-90	4799	114	24	-	1330	6219	1822	60	126	155	4056	77.2
1990-91	5122	24	67	-	1650	6729	1972	65	137	168	4387	81.3
1991-92	5069	67	80	3	1724	6777	1986	60	138	169	4424	79.7
1992-93	4943	80	-	2	1810	6831	2002	66	139	170	4454	78.2
1993-94	5550	-	-	11	1760	7299	2139	71	149	182	4758	83
1994-95	5178	-	-	1	2008	7185	2105	70	147	179	4684	79.4
1995-96	5825	-	-	-	2454	8279	2426	81	169	206	5397	91.1

Source: Central Agency for Public Mobilization and Statistics, Bulletin of Production, Foreign Trade and Consumption of Some Commodities, different issues.

Table 2.8: Estimates of Available Supply and Uses of Corn, 1993-95
(American Embassy estimates, in 1,000 MT)

Year	Available Supply				Uses			
	Production	Imports	Beginning Stock	Total	Feed	Non-Feed	Ending Stock	Total
1993	4980	2050	0	7030	5450	1480	100	7030
1994	5650	1800	200	7650	5830	1620	200	7650
1995	5500	1900	200	7600	5980	1420	200	7600
Average	5377	1917	133	7427	5753	1507	167	7427
%	72	26	2	100	78	20	2	100

Source: American Embassy, Grain and Feed Annual Report, Cairo, March 1995, pp. 26-36.

- 21.8% food consumption by farmers
- 14.1% farm animal feed
- 7.8% farm poultry feed
- 45.5% sold to private traders
- 7.5% sold to government
- 3.3% sold to other farmers

It is assumed that the quantity bought by the government is used for human consumption while the quantities sold to farmers and private traders are utilized in the same way the producer farmers use them. Thereby, the following estimates on utilization of white corn produced by farmers can be deduced:

- 53.6% for human consumption
- 29.9% for animal feed
- 16.5% for poultry feed

2.3.3. Domestic Supply and Use of Soybeans: Production of soybeans on a commercial scale in Egypt began in 1974 and is concentrated in Upper Egypt. In 1975, production of soybeans was less than 5,000 MT and imports were nearly seven times that. As shown in Table 2.9, cultivated acreage reached 82,770 feddan and production reached 92,380 MT in 1980. Production peaked at 165,970 MT in 1982 with 144,360 feddan under cultivation. During the 1980s, the higher returns from competing summer crops, corn and rice, and changes in relative output prices caused by changes in price support policies caused a decline in the area planted to soybean[13]. The area decreased from 147,150 feddan in 1983 to 98,520 feddan in 1990 and to 31,520 feddan in 1997 (Figure 2.6).

Soybean yields have been stable over the years, between 1 and 1.2 MT/feddan (Figure 2.7). The decline in acreage since 1983 accounts entirely for the decrease in total production. As shown in Figure 2.8, domestic production decreased from 161,760 MT in 1983 to 106,690 MT in 1990 and to 34,730 MT in 1997.

Soybeans are consumed as oil for food, feed and industrial products, and as meal in livestock feed rations. Direct human consumption or as processed foods accounts for a very small percentage of the total supply. However, there are many food uses for soybeans in raw and processed form that could improve the diet of Egyptian consumers and reduce the cost of a balanced diet.[14]

Demand for soybeans increased over the last few years. Total consumption of soybeans is estimated at 164,000 MT in 1996, of which 40,000 MT are domestically produced and 124,000 MT are imported. Egypt ranked second worldwide in soybean yield per hectare between 1994-95 with a yield of 2.913 MT/hectare. Only Italy with an average yield of 3.293 MT/hectare ranked higher than Egypt.

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[13] & 14 NARP, Economic Analysis of Soybean Production and Marketing. MALR & USAID, Cairo, 1994

Table 2.9: Domestic Production of Soybeans, 1980-1997

Year	Area	Yield	Production
	1000 F	MT	1000 MT
1980	82.77	1.12	92.38
1981	109.42	1.19	130.36
1982	144.36	1.15	165.97
1983	147.16	1.10	161.76
1984	124.54	1.15	142.70
1985	119.05	1.17	139.78
1986	109.71	1.22	133.35
1987	113.24	1.18	134.12
1988	117.40	1.10	129.01
1989	92.32	0.99	91.42
1990	98.52	1.08	106.69
1991	100.72	1.19	120.04
1992	51.99	1.13	58.94
1993	43.63	1.16	50.48
1994	55.52	1.21	67.25
1995	62.01	1.02	63.50
1996	36.22	1.10	39.72
1997	31.52	1.10	34.73

Figure 2.6: Cultivated Acreage of Soybeans

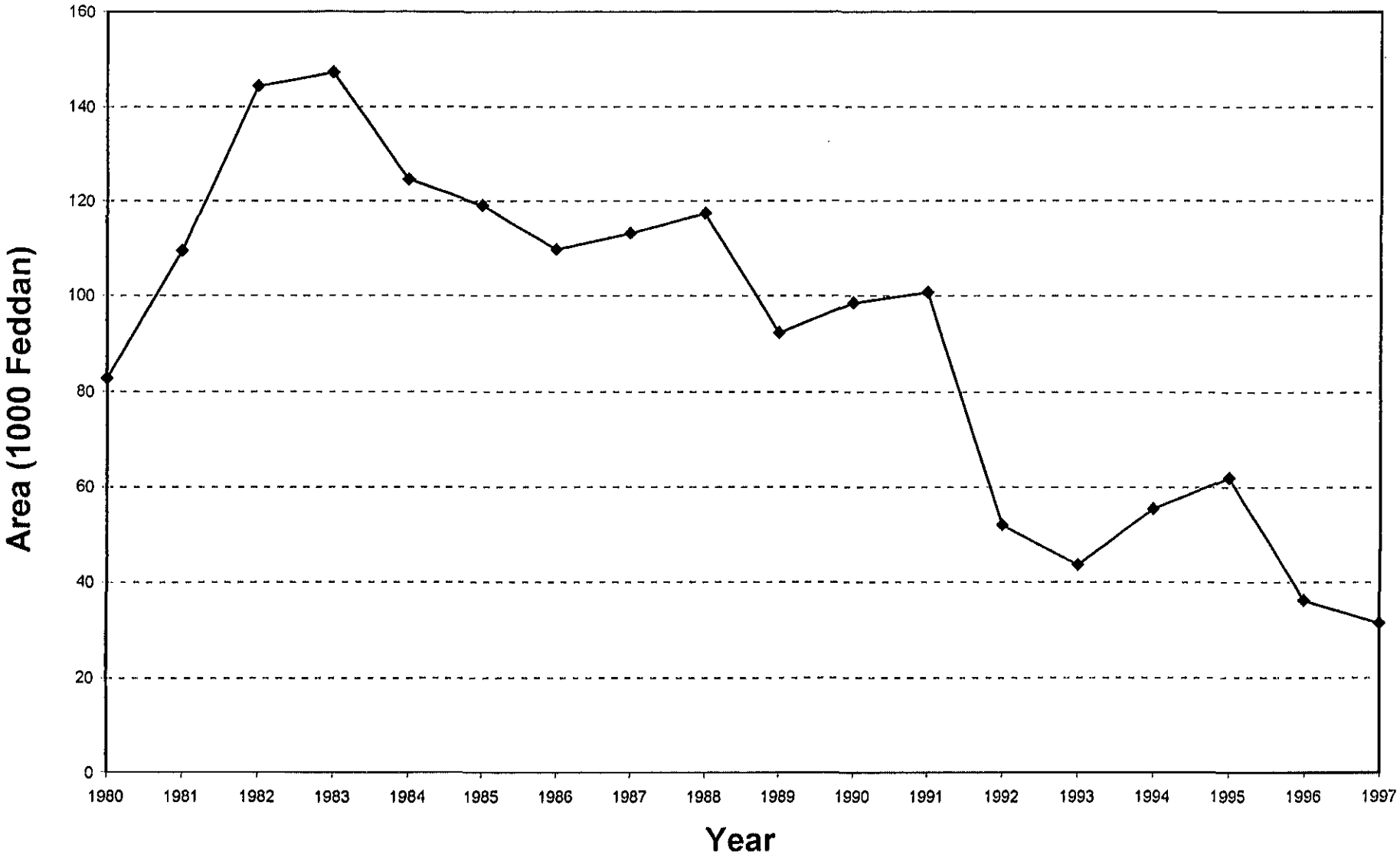


Figure 2.7: Trend of Soybean Yield

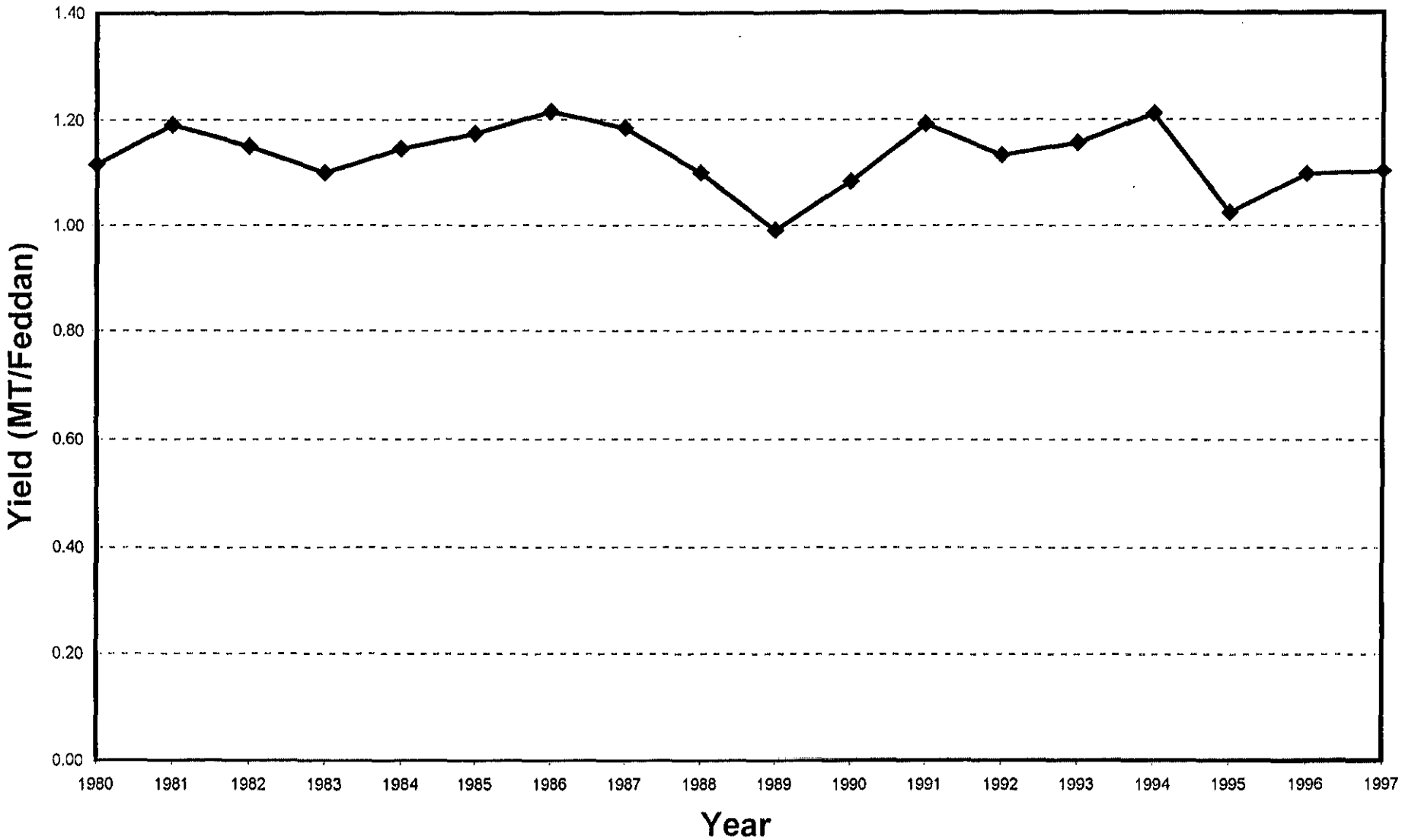
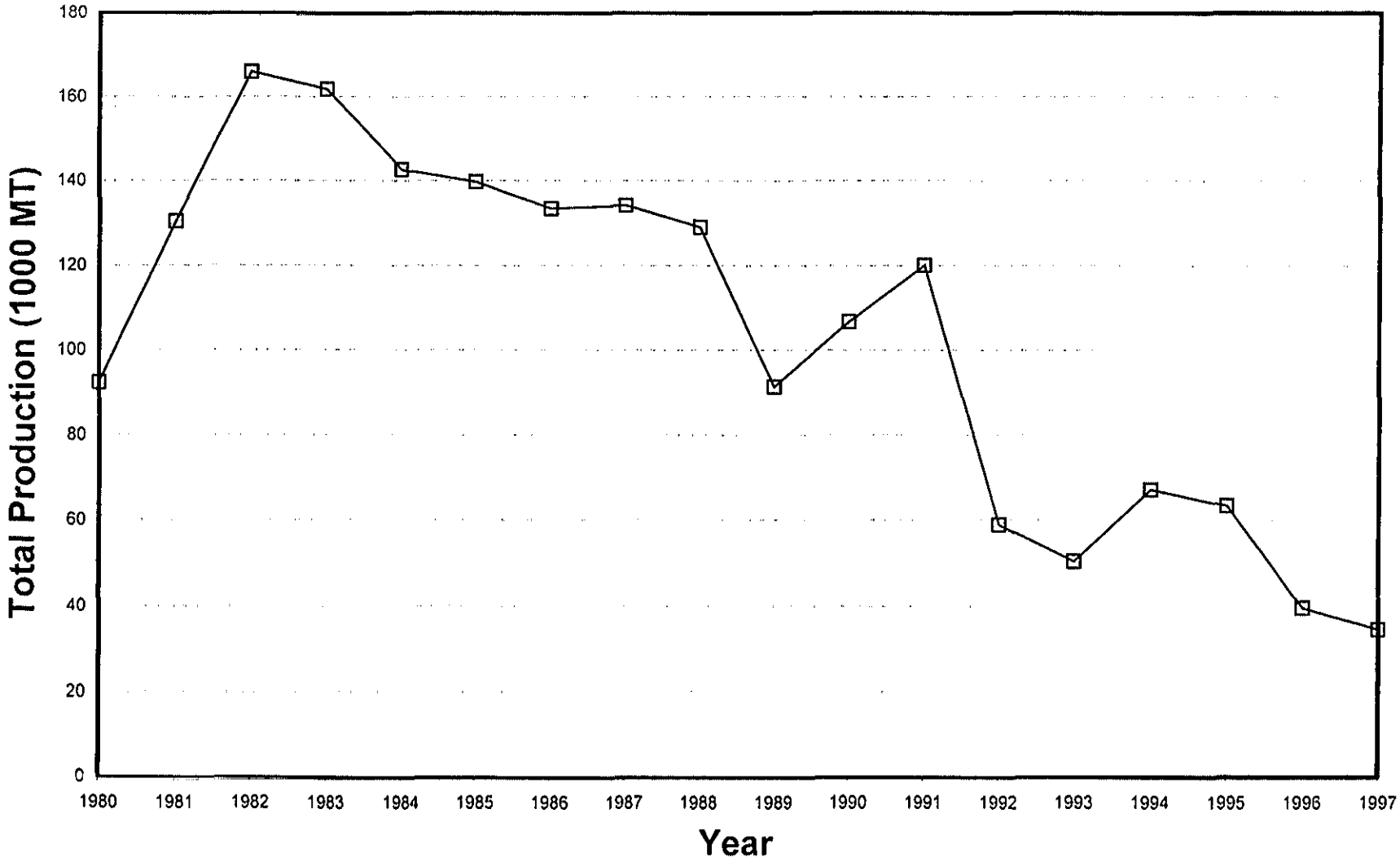


Figure 2.8: Trend of Soybean Production



2.4. International Poultry Feed Ingredient Markets

2.4.1. International Corn Markets: Tables 2.10 to 2.13 and Figures 2.9 to 2.12 summarize international corn markets for years 1993-94 through 1996-97.

The two largest producers were the U.S. and China. Out of 464.369 million MT (total average annual production of the 12 main producers). The U.S. produced 45% and China, 24%. Egypt is the eleventh largest producer with 1% of the total.

Of the eight largest users, consuming annually an average of 374.41 million MT, the U.S. consumed 46% and China, 28%. Egypt consumed 2%.

The three main corn exporters are the U.S., Argentina and China. They export 81%, 12% and 7%, respectively, of the total volume (59 million MT).

The five largest importers (35.8 million MT) are Japan, 45%; South Korea, 22%; Taiwan, 16%; Mexico, 10%; and Egypt, 7%

2.4.2. International Soybean Markets: Table 2.14 and Figure 2.13 show four main producers of soybean. Of the total world production, 136.615 million MT/year (annual average for 1994-95 through 1997-98) the U.S. produced 49%; Brazil, 20%; and Argentina and China, each 10%.

When estimating international imports and exports, one must distinguish between whole soybeans, soybean oil and soybean meal. Table 2.15 and Figures 2.14 and 2.15 describe international imports and exports of different soy products during 1996/97 and 1997/98 and expectations for 1998-99 and 1999-2000.

Whole soybean exports amounted to38.8 million MT. The U.S. exported more than two-thirds of the total. Brazil is second with 19.6%, Argentina third with 4.1%.

The largest importers of whole soybeans are the European Union countries, 41% of the total imports; Japan, 12.7%; Mexico, 8.6%; China, 8%; Taiwan, 6.5%; South Korea, 4%; and Indonesia, 2.4%.

Total export of soybean oil is 6.3 million MT. Argentina is the largest exporter, accounting for 30.7% of the total; followed by Brazil, 21.5%; European Union countries, 20.3%; and the U.S., 17.5%.

China is the largest importer. It produces 29% of the total traded, followed by North Africa and Middle East countries, 18.8%; Latin American countries, 17.3%; and European Union countries, 8.6%.

Total exports of soy meal are 35.5 million MT annually. Brazil exports 30.5% of the total; Argentina, 25.9%; the U.S. 19.1%; European Union countries, 11.6%; and India, 8.5%.

Main importers of soy meal are European Union countries, 43.7%; Southeast Asia, 10.9%; North Africa and Middle East countries, 10%; China, 9.7%; Latin American countries, 8.8%; Eastern European countries, 6.1%; Japan, 2.6%; and Canada, 1.8%.

Table 2.10: Main Corn Producing Countries (1000 MT)

Country	1993/94	1994/95	1995/96	1996/97	Average	% of Total
USA	160,954	256,621	187,305	236,064	210,236	**45.3**
China	102,700	99,280	112,000	127,470	110,363	**23.8**
Brazil	33,250	36,158	36,780	37,200	35,847	**7.7**
EU	32,934	37,440	32,480	35,000	34,464	**7.4**
Mexico	19,141	17,005	17,180	18,922	18,062	**3.9**
South Africa	13,275	4,845	10,200	9,012	9,333	**2.0**
Argentina	10,000	11,360	11,100	15,500	11,990	**2.6**
India	9,600	9,120	9,440	10,612	9,693	**2.1**
Canada	6,501	7,043	7,271	7,380	7,049	**1.5**
Yugoslavia	5,912	7,500	7,700	7,600	7,178	**1.5**
Egypt	4,980	5,650	5,353	5,825	5,452	**1.2**
Hungary	4,012	4,300	4,600	5,900	4,703	**1.0**
Total	**403,259**	**496,322**	**441,409**	**516,485**	**464,369**	**100.0**

Table 2.11: Main Corn Consuming Countries (1000 MT)

Country	1993/94	1994/95	1995/96	1996/97	Average	% of Total
USA	159,819	183,577	159,887	179,190	170,618	**45.6**
China	92,904	99,654	108,049	115,353	103,990	**27.8**
Brazil	33,250	36,158	36,780	37,200	35,847	**9.6**
Mexico	20,477	20,250	23,159	22,170	21,514	**5.7**
Japan	16,450	16,450	16,100	16,100	16,275	**4.3**
Romania	8,097	8,503	8,900	9,080	8,645	**2.3**
India	9,550	9,120	9,436	10,312	9,605	**2.6**
Egypt	6,915	7,939	7,790	9,000	7,911	**2.1**
Total	**347,462**	**381,651**	**370,101**	**398,405**	**374,405**	**100.0**

Table 2.12: Main Corn Exporting Countries (1000 MT)

Country	1993/94	1994/95	1995/96	1996/97	Average	% of Total
USA	33,148	58,645	52,681	46,579	47,763	**81.0**
Argentina	4,230	6,046	6,949	10,203	6,857	**11.6**
China	11,796	1,413	227	3,892	4,332	**7.3**
Total	**49,174**	**66,104**	**59,857**	**60,674**	**58,952**	**100.0**

Table 2.13: Main Corn Importing Countries (1000 MT)

Country	1993/94	1994/95	1995/96	1996/97	Average	% of Total
Japan	16,165	16,481	15,976	15,963	16,146	**45.1**
South Korea	5,696	8,223	8,963	8,336	7,805	**21.8**
Taiwan	5,316	6,287	5,733	5,744	5,770	**16.1**
Mexico	1,691	3,166	6,379	3,141	3,594	**10.0**
Egypt	2,135	2,589	2,225	3,123	2,518	**7.0**
Total	**31,003**	**36,746**	**39,276**	**36,307**	**35,833**	**100.0**

Figure 2.9: Main Corn Producing Countries (Average 1993/94-96/97)

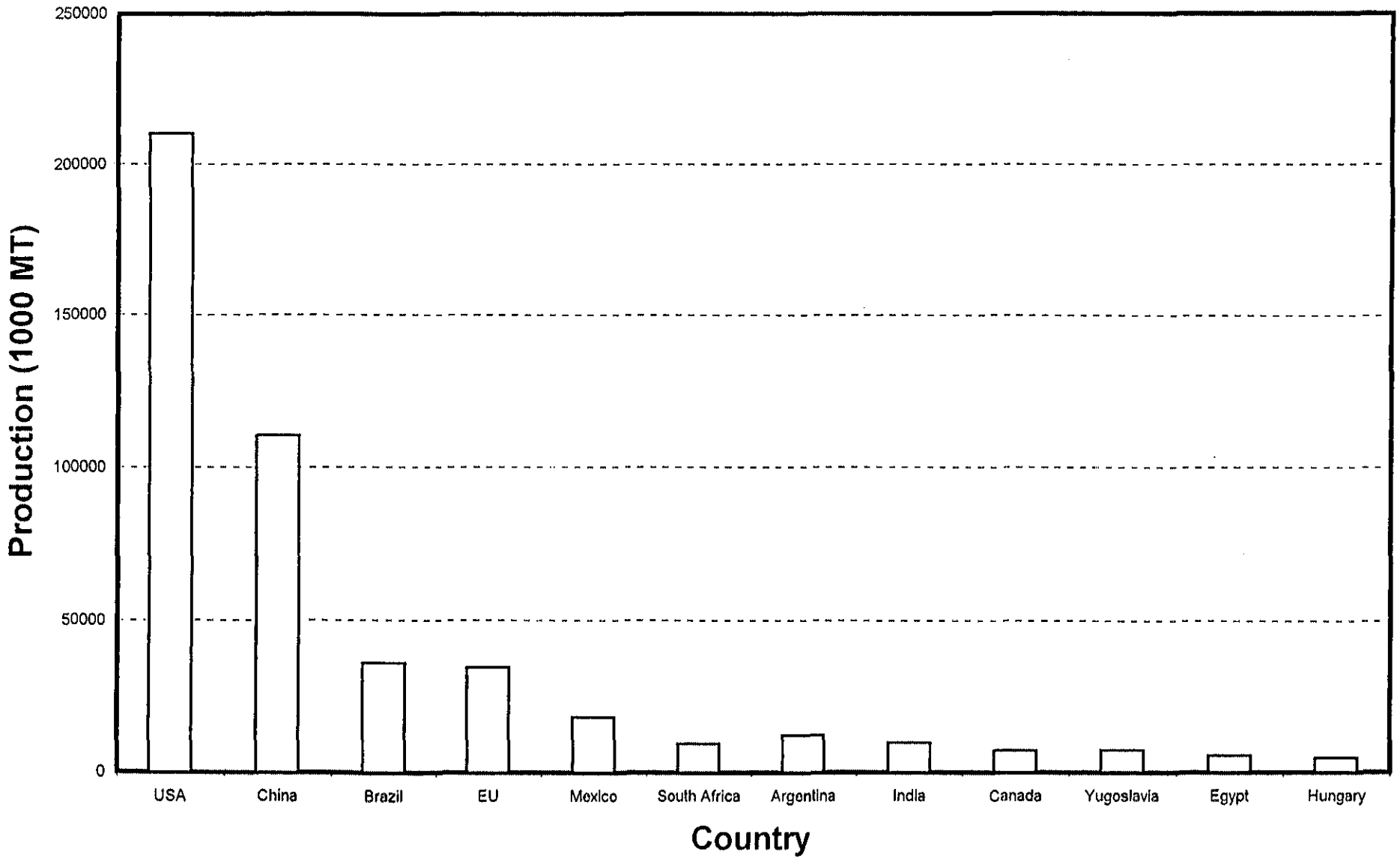


Figure 2.10: Main Corn Consuming Countries (Average 1993/93-96/97)

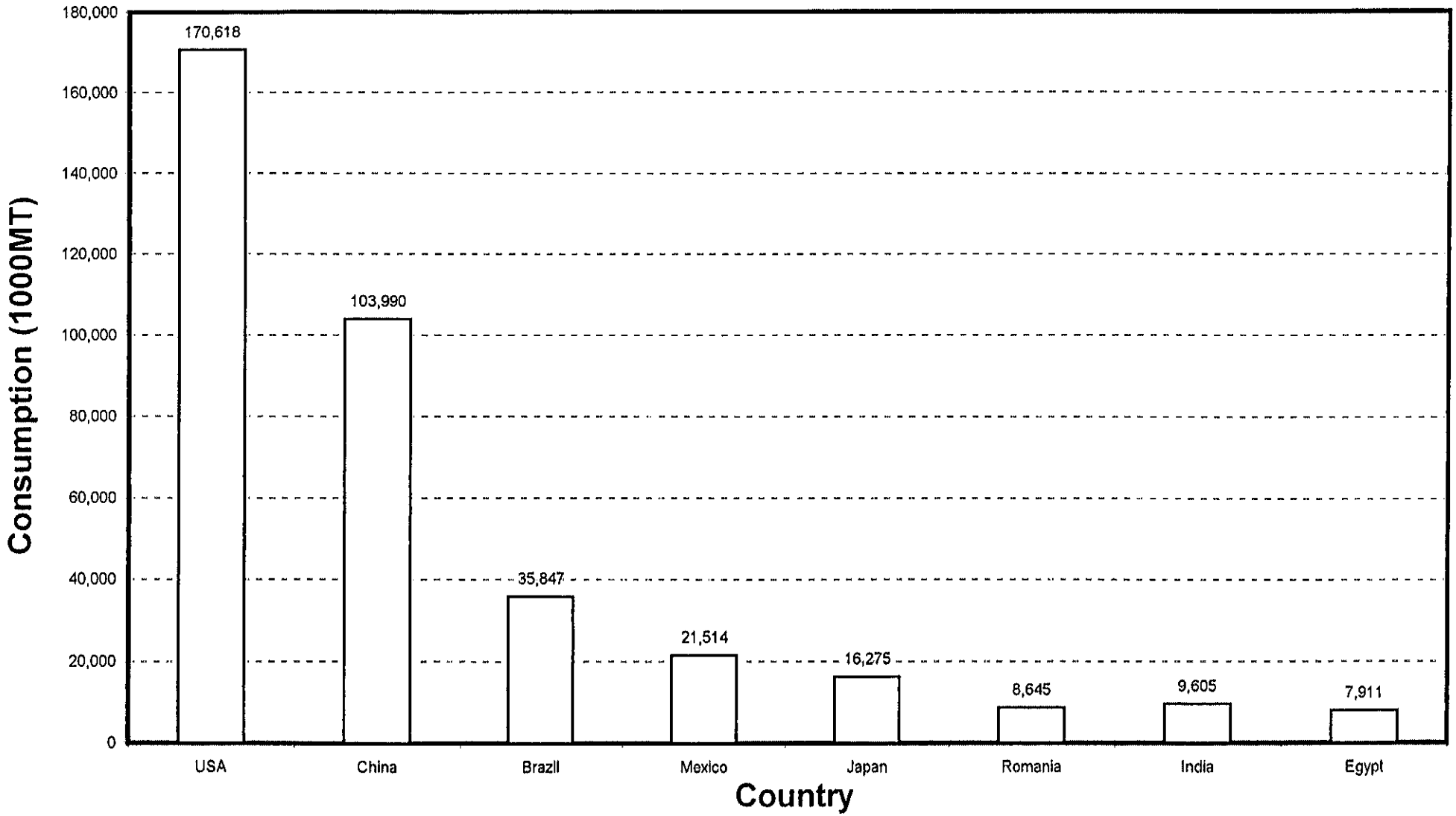


Figure 2.11: Main Corn Exporting Countries (Average 1993/94-96/97)

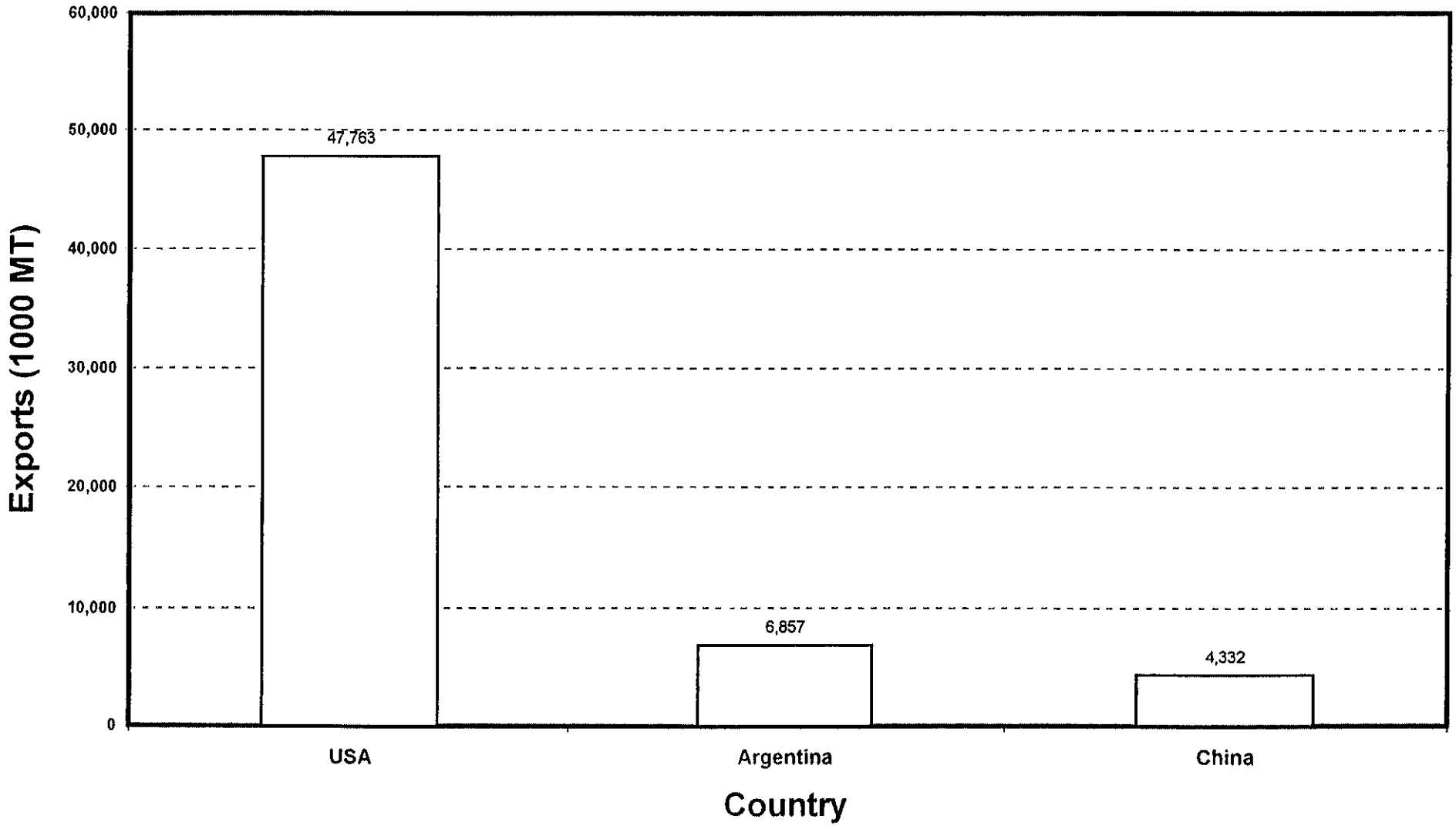


Figure 2.12: Main Corn Importing Countries (Average 1993/94-96/97)

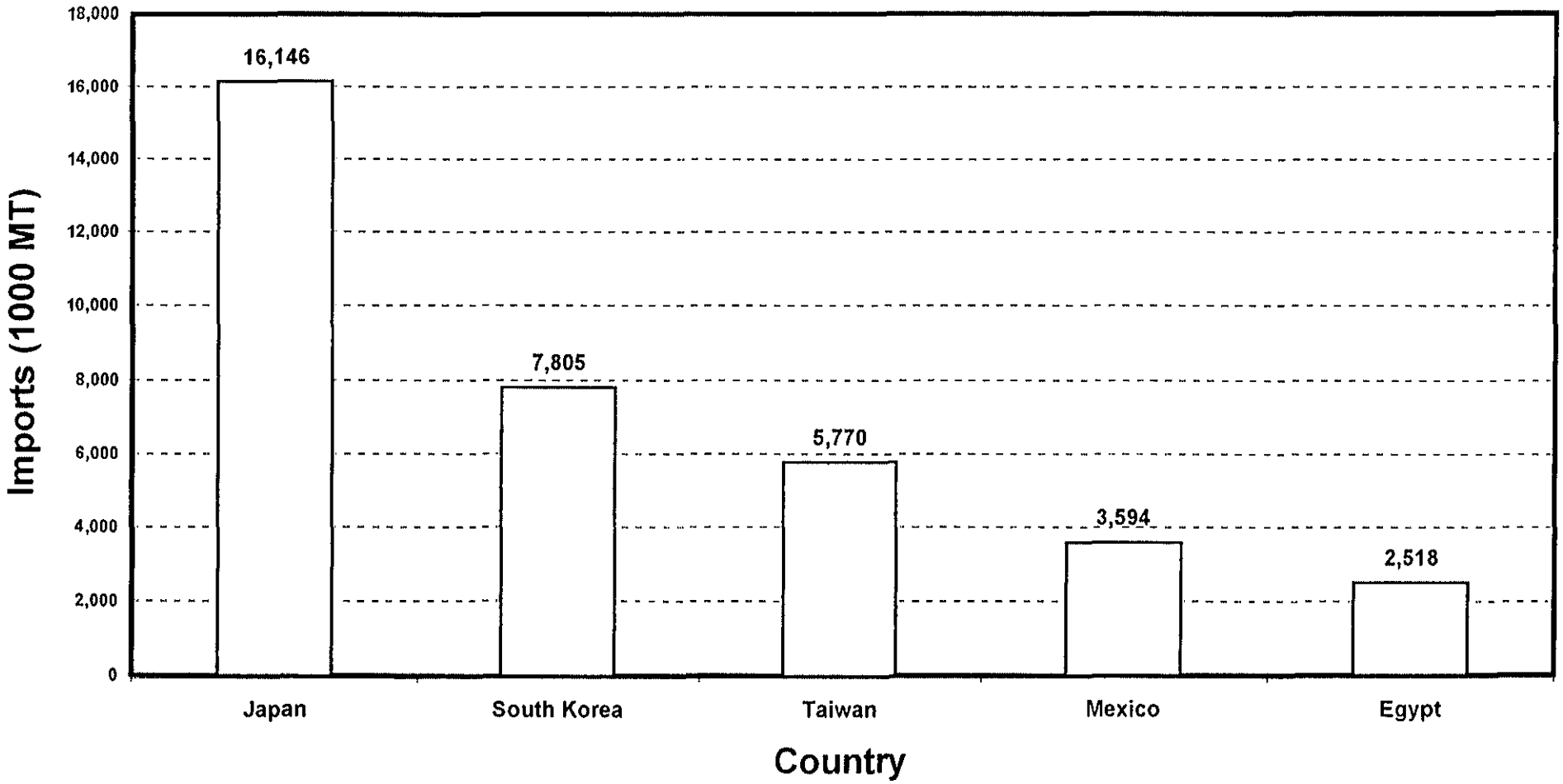


Table 2.14: Main Soybean Producing Countries (1000 MT)

Country	1994/95	1995/96	1996/97	1997/98	Average	% of Total
Argentina	12,500	12,430	11,200	16,000	13,033	**9.5**
Bolivia	810	900	1,000	1,260	993	**0.7**
Brazil	25,900	24,150	26,800	30,000	26,713	**19.6**
Canada	2,251	2,293	2,165	2,700	2,352	**1.7**
China	16,000	13,500	13,220	13,800	14,130	**10.3**
India	3,236	4,476	4,100	5,350	4,291	**3.1**
Indonesia	1,680	1,517	1,400	1,400	1,499	**1.1**
Italy	652	638	870	1,100	815	**0.6**
Paraguay	2,200	2,400	2,700	2,900	2,550	**1.9**
USA	68,493	59,243	64,837	74,224	66,699	**48.8**
Others	3,994	3,410	3,288	3,474	3,542	**2.6**
Total	**137,716**	**124,957**	**131,580**	**152,208**	**136,615**	**100.0**

Figure 2.13: Main Soybean Producing Countries (Average 1994/95-97/98)

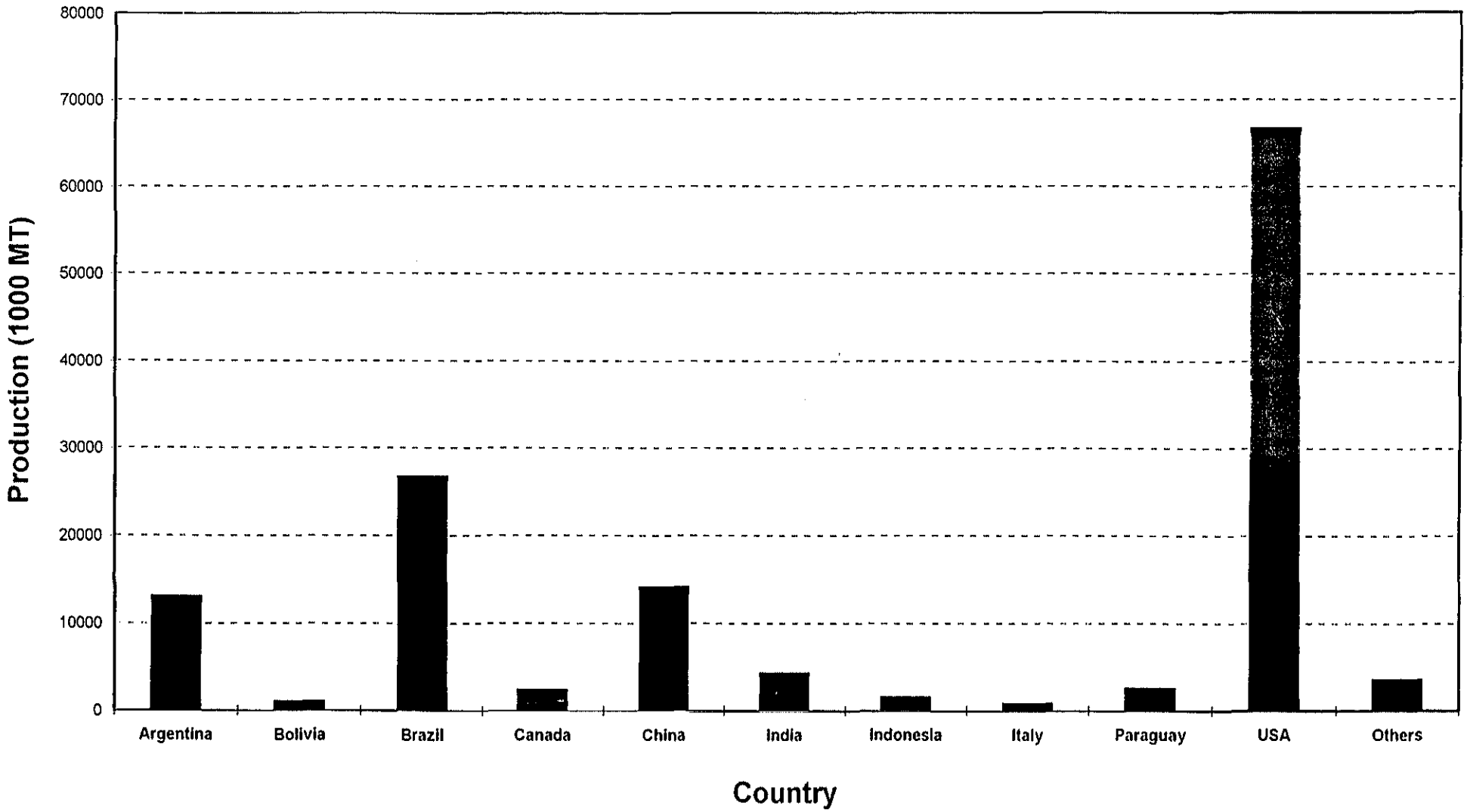


Table 2.15: Main Countries Participating in Soybean International Trade (Million MT).

Country	Soybeans						Soybean Oil						Soybean Meal					
	1996/97	1997/98	1998/99	1999/00	Average	%	1996/97	1997/98	1998/99	1999/00	Average	%	1996/97	1997/98	1998/99	1999/00	Average	%
Importers:																		
European Union	15.4	15.5	16.3	16.6	16.0	**41.2**	0.5	0.5	0.6	0.6	0.6	**8.6**	14.8	15.2	15.5	15.5	15.3	**43.7**
Japan	5.0	4.9	4.9	4.9	4.9	**12.7**							0.8	0.8	0.6	0.6	0.7	**2.0**
South Korea	1.6	1.6	1.5	1.5	1.6	**4.0**												
Taiwan	2.4	2.5	2.5	2.6	2.5	**6.5**												
Mexico	3.1	3.1	3.5	3.6	3.3	**8.6**												
FSU	0.1	0.1	0.1	0.1	0.1	**0.3**	0.1	0.1	0.1	0.1	0.1	**1.6**	0.4	0.4	0.4	0.4	0.4	**1.1**
Eastern Europe	0.2	0.3	0.3	0.3	0.3	**0.7**	0.1	0.1	0.1	0.1	0.1	**1.6**	2.0	2.1	2.2	2.2	2.1	**6.1**
China	2.3	3.0	3.5	3.6	3.1	**8.0**	1.7	1.8	1.9	2.0	1.9	**29.0**	3.8	4.5	4.6	0.6	3.4	**9.7**
Malaysia	0.7	0.7	0.7	0.7	0.7	**1.8**												
Indonesia	0.8	0.9	1.0	1.0	0.9	**2.4**												
Canada													0.7	0.6	0.6	0.6	0.6	**1.8**
Southeast Asia													3.6	3.6	3.9	4.1	3.8	**10.9**
North Africa&Middle East							1.1	1.2	1.2	1.3	1.2	**18.8**	3.3	3.4	3.6	3.7	3.5	**10.0**
Latin America							1.1	1.1	1.1	1.1	1.1	**17.3**	3.0	3.1	3.1	3.1	3.1	**8.8**
Others	6.4	5.1	5.1	5.0	5.4	**13.9**	1.4	1.5	1.5	1.5	1.5	**23.1**	2.0	2.0	2.1	2.1	2.1	**5.9**
Total	**38.0**	**37.7**	**39.4**	**39.9**	**38.8**	**100.0**	**6.0**	**6.3**	**6.5**	**6.7**	**6.4**	**100.0**	**34.4**	**35.7**	**36.6**	**32.9**	**34.9**	**100.0**
Exporters:																		
United States	24.0	26.7	26.9	27.1	26.2	**67.5**	0.9	1.1	1.2	1.2	1.1	**17.5**	6.4	6.8	6.9	7.0	6.8	**19.1**
Argentina	0.8	2.1	1.8	1.6	1.6	**4.1**	1.7	1.9	2.0	2.1	1.9	**30.7**	8.1	9.2	9.7	9.8	9.2	**25.9**
Brazil	8.3	7.0	7.3	7.8	7.6	**19.6**	1.2	1.4	1.4	1.4	1.4	**21.5**	10.1	10.9	11.0	11.3	10.8	**30.5**
China	0.2	0.2	0.2	0.2	0.2	**0.5**												
India													2.5	3.0	3.1	3.4	3.0	**8.5**
European Union							1.2	1.2	1.3	1.4	1.3	**20.3**	4.2	4.1	4.1	4.1	4.1	**11.6**
Others	3.0	3.5	3.2	3.2	3.2	**8.3**	0.7	0.6	0.6	0.6	0.6	**10.0**	1.5	1.6	1.6	1.6	1.6	**4.4**
Total	**36.3**	**39.5**	**39.4**	**39.9**	**38.8**	**100.0**	**5.7**	**6.2**	**6.5**	**6.7**	**6.3**	**100.0**	**32.8**	**35.6**	**36.4**	**37.2**	**35.5**	**100.0**

Figure 2.14: Main Importing Countries of Soy Products (million MT)

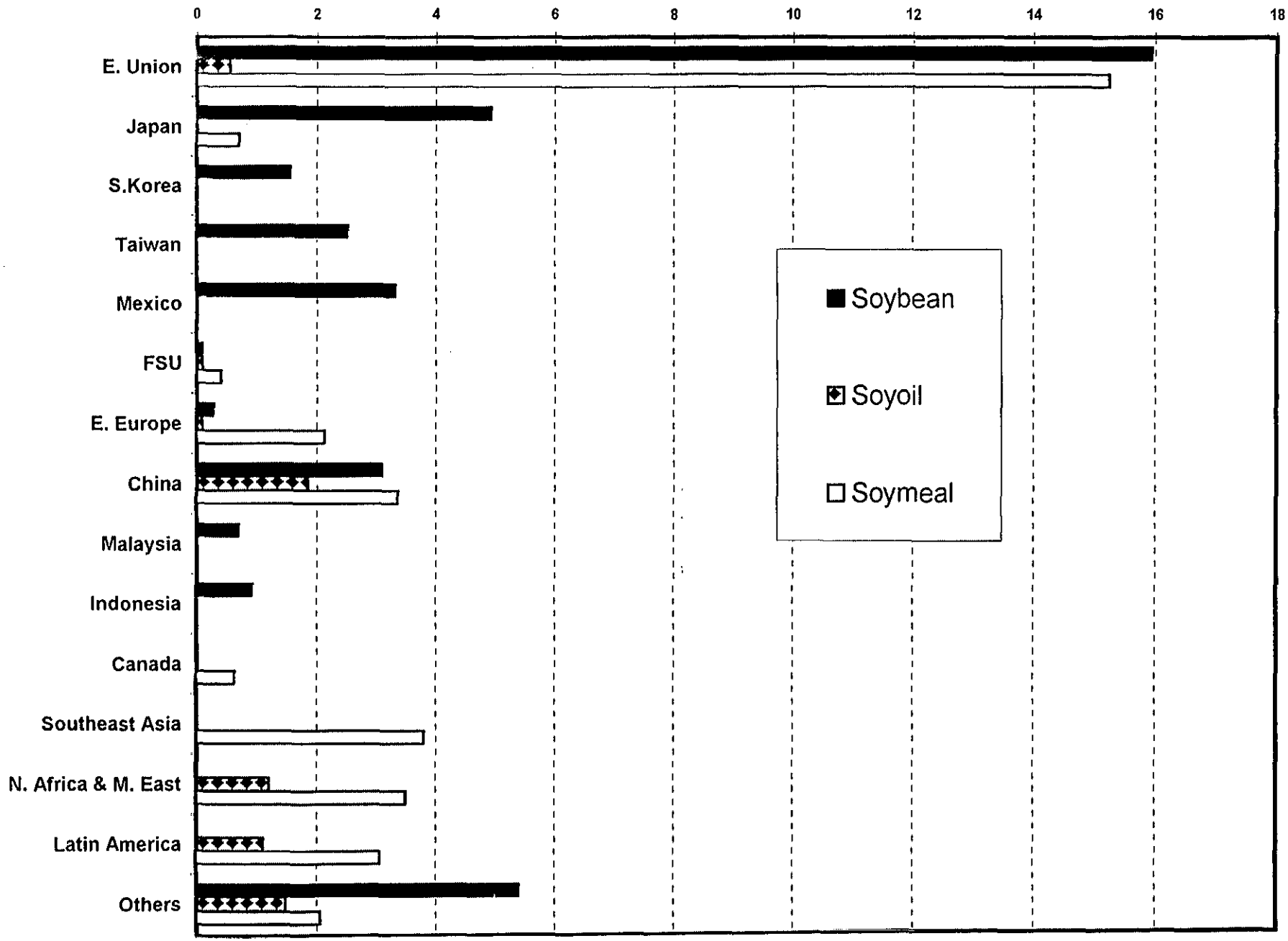
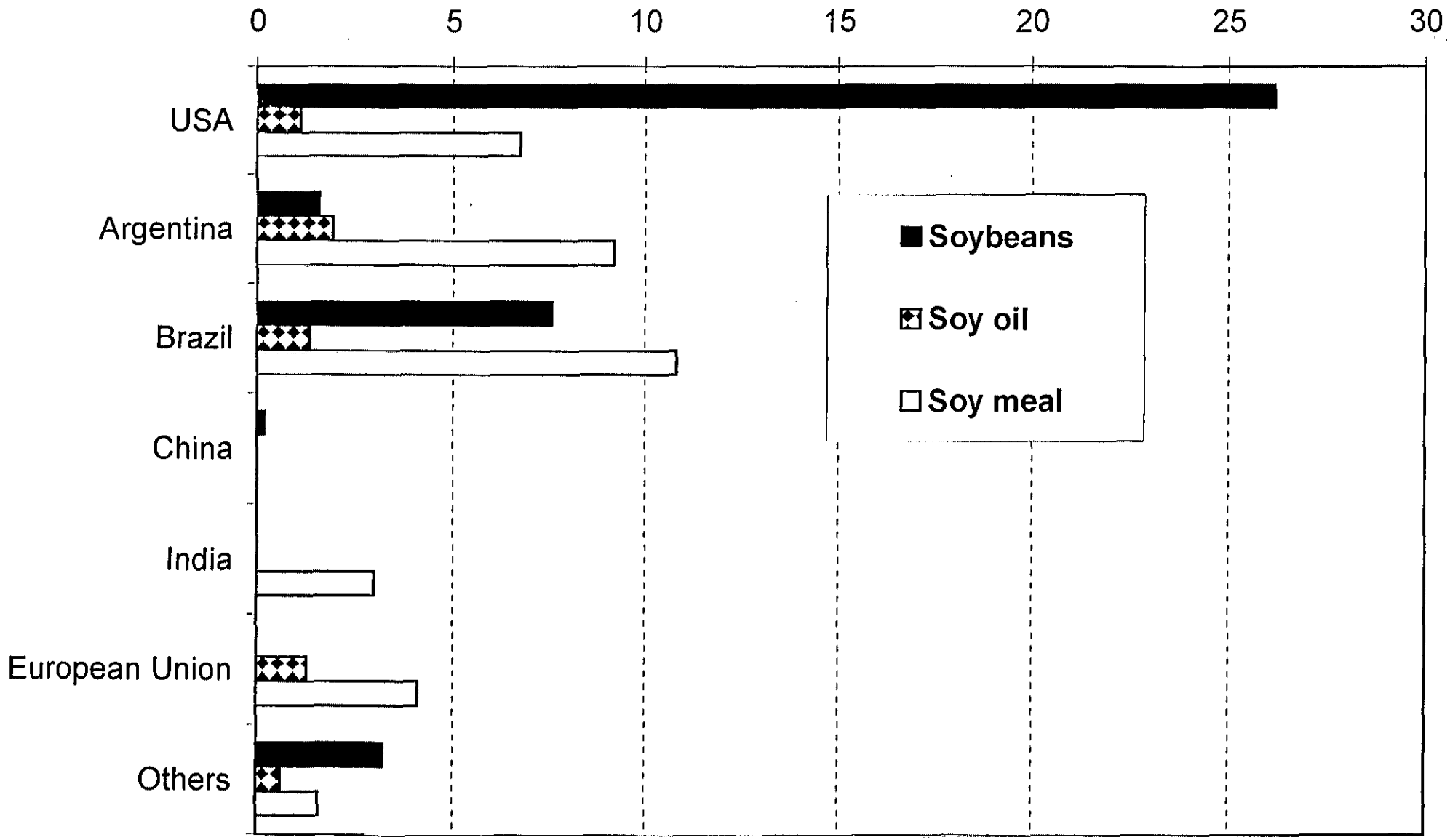


Figure 2.15: Soy Main Exporters (Average 1996/97-1999/2000), (million MT)



2.5. Egypt Dependence on International Markets

2.5.1. Domestic and International Prices of Corn and Soybeans: Data in Table 2.16 estimates farmgate domestic prices, f.o.b. world prices and world price equivalent at farmgate for corn and soybeans from 1970-98.

A comparison of farmgate price and world equivalent price of corn, Figure 2.16, shows that the two prices are not very different. Both price series show an increasing trend. The relation between the two price series was estimated as follows:

$$Y_c = \underset{(2.751)}{40.1} + \underset{(17.994)}{0.8\,X_c} \qquad I = 1,\ldots,27 \qquad R^2 = 0.926 \qquad F = 323.8$$

Where:

Y_c	=	Farmgate domestic price of corn (LE/MT)
X_c	=	World equivalent price at farmgate for corn (LE/MT)
R^2	=	Adjusted R square
F	=	Fisher test value
( )	=	Numbers between brackets are T test values

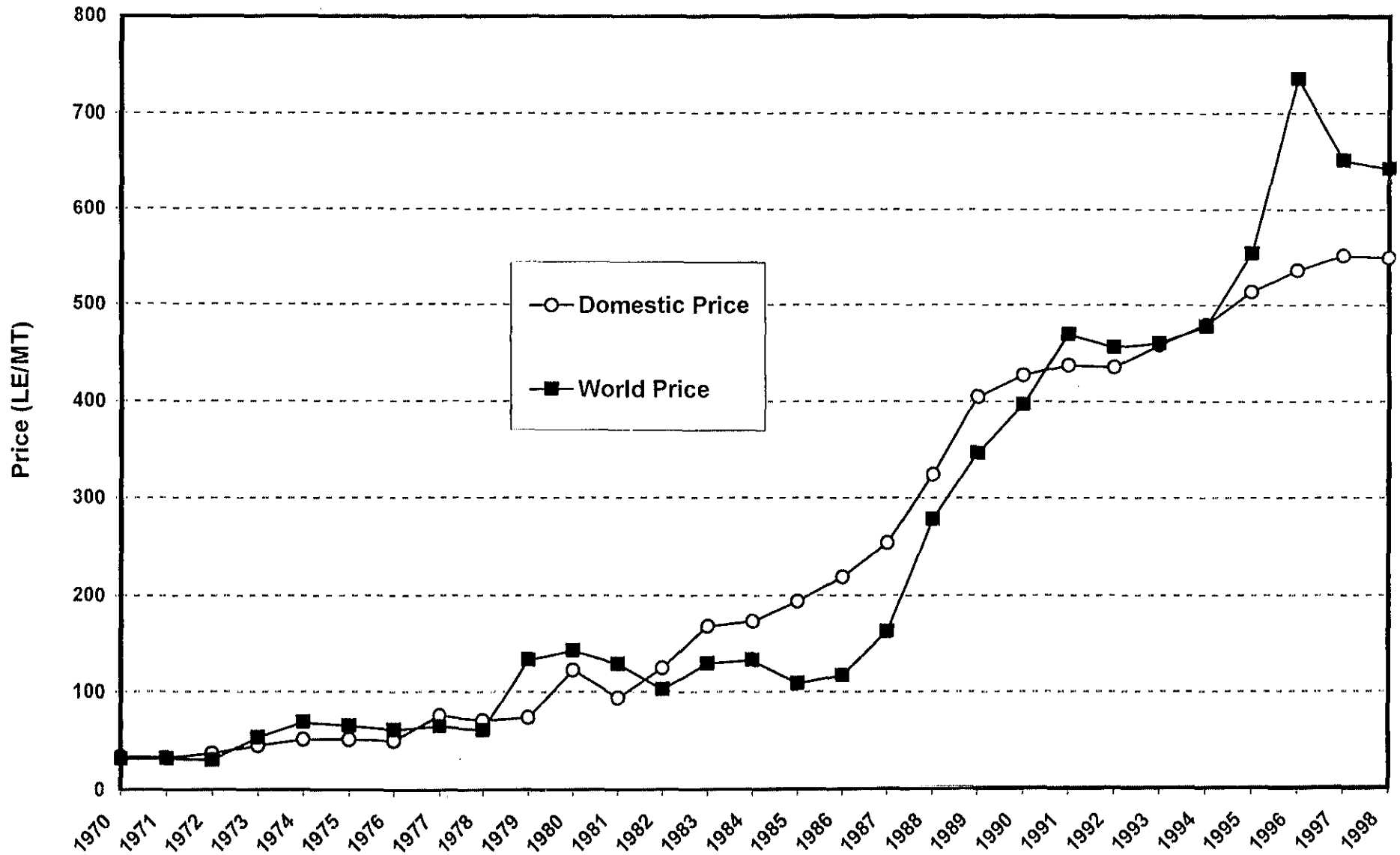
These results indicate a significant relation between the domestic price of corn and the import parity price. According to this relationship, a change of LE 1 in the world price (converted to import parity price) would cause an LE 0.8 change in the same direction in the domestic price of corn. This means that even before the economic reform launched in 1986, the corn subsector in Egypt was closely related to international markets. In other words, the pricing policy of corn was sensitive to changes in price levels prevailing in world markets. This may be due to the fact that Egyptian poultry industry has depended on imports of yellow corn.

Figure 2.17 indicates similar trends in soybean prices. In fact, the domestic farmgate price and the world equivalent price of soybean fluctuated within a small range between 1972 and 1991. Starting in 1992, the two prices diverged and domestic price fell below the world equivalent. Figure 2.17 indicates a shift in both world and domestic prices. This shift coincides with the start of the policy reform program in 1986. This shift may be attributable to the impact of the reforms in the case of domestic prices of soybeans. When it comes to world equivalent price, the shift may be explained by substantial increases in soybean price levels on the international markets. One can observe also that both price levels increase after 1986 at rates higher than those that prevailed before 1986. While domestic price in 1985 amounted to LE 285/MT (285% of its 1972 level) it reached LE 1,050/MT in 1998 (368% of its 1985 level). The world price increased from LE 164/MT to LE 248/MT (51%) between 1973 and 1985, while it increased from LE 248/MT to LE 1,066/MT (330%) between 1985 and 1998.

Table 2.16 : Domestic and World Prices of Main Ingrediants of Poultry Feeds.

YEAR	CORN			SOYBEANS		
	Farmgate domestic price LE/MT	FOB World Price $/MT	World Price at Farm LE/MT	Farmgate domestic price LE/MT	FOB World Price $/MT	World Price at Farm LE/MT
1970	34	58.3	31.3	NA	116.9	67.57
1971	33	58.3	31.7	NA	125.6	74.09
1972	37	55.9	30.4	100	140	82.57
1973	45	57.6	52.9	140	290	164.18
1974	51	132.3	69	140	276.9	148.27
1975	51	119.7	65.5	180	221.7	125.06
1976	50	112.2	61.1	180	231.2	128.23
1977	76	95.3	65	180	280.2	185.72
1978	71	100.8	60.9	200	268.3	158.11
1979	74	115.7	133.5	200	297.8	293.75
1980	123	125.6	142.9	210	296.3	313.76
1981	94	130.7	129.1	230	288.4	298.11
1982	125	108.3	102.9	260	244.5	261.68
1983	168	135.8	129.6	260	281.7	257.89
1984	173	135.8	132.9	285	282.1	300.25
1985	194	112.2	108.6	285	224.4	247.95
1986	219	87.8	117.3	375	208.4	306.89
1987	254	75.6	162.2	425	215.8	454.09
1988	324	107.1	278.5	500	303.5	759.13
1989	405	111.4	346	850	275	770.51
1990	427	109.4	396.8	800	246.8	806.15
1991	437	107.5	469.3	850	239.6	930.72
1992	435	104.3	455.5	811	235.5	982.38
1993	458	102	460.1	800	255.3	1098.51
1994	479	107.9	477.3	875	248	1053.51
1995	514	123.6	554.5	1050	304	1317.52
1996	537	194.6	735.6	1050	301	1314.51
1997	552	127	650.7	1050	270	1179.45
1998	550	125	642	1050	244	1066.17

Figure 2.16: Corn Domestic Price Versus Import Parity Price at Farm



Egypt's domestic market of soybeans is closely related to international markets. The extent to which domestic market changes are affected by foreign trade can be captured through estimation of the following:

$$Y_s = \underset{(1.816)}{45.7} + \underset{(22.227)}{0.8\,X_c} \qquad i = 1,\ldots 27, \qquad R^2 = 0.95, \qquad F = 494,$$

where Y_s = Estimated farmgate domestic price of soybeans (LE/MT)

C_s = World equivalent price at farmgate for soybean (LE/MT)

R^2 = Adjusted R square

F = Fisher test value

( ) = Numbers between brackets are T test values

The estimated relation indicates the existence of significant positive dependence of domestic price of soybeans on the world price equivalent. The effect of world market on the domestic one is such that 95% of changes in domestic price are attributed to changes in the world price. Also, an LE 1 change in the import parity price translates to an LE 0.8 change in the price/MT in the domestic market of soybeans.

2.5.2. Egyptian Self-sufficiency: Data in Table 2.17 summarize Egypt's self-sufficiency in corn and soybeans between 1985 and 1997. The table indicates also the value of imports of both products.

Domestic production of corn increased from 3.687 million MT to 6.075 million MT, imports from 1.907 million MT to 2.554 million MT and total supply from 5.594 million MT to 8.629 million MT. The self-sufficiency coefficient improved over that period, from 62% in 1985-87 to 70% in 1995-97.

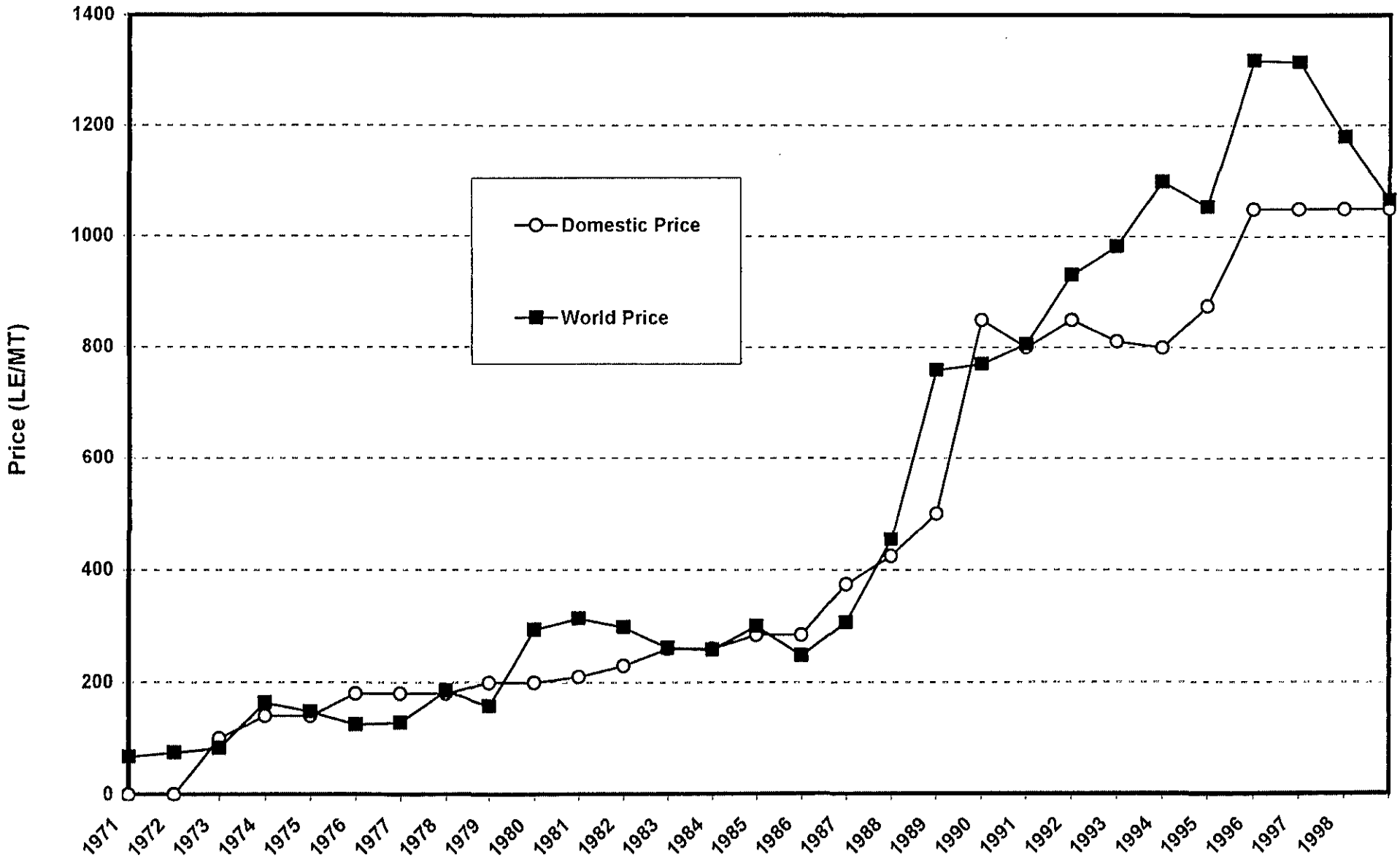
The value of corn imports increased by 50%,from $290 million to $435 million between 1985 and 1996. About 65% of that increase was due to quantity imported, while 35% is attributable to increases in international prices.

The annual total supply of soybeans increased from 145,000 MT to 175,000 MT, domestic production decreased from 140,000 MT to 35,000 MT and imports increased from 5,000 MT to 140,000 MT between 1985 and 1997. So, while imports increased by 211%, domestic production decreased by 74%.

The value of soybean imports increased from LE 10.8 million to LE 37.9 million between 1986 and 1996. Almost all the increase of import value is due to quantity increases.

Imports of soybean are expected to increase rapidly in the future to reach 200,000 MT in 1999.

Figure 2.17: Soybean Domestic Price Versus Import Parity Price at Farm



Chapter III

Policy Effects on Protection and Competitiveness of Feed Crops

Table 2.17: Egypt Dependence on International Trade for Corn and Soybeans, 1985-1999

Year	Corn					Soybeans				
	Domestic Production 1000 MT	Imports 1000 MT	Domestic Production plus Imports 1000 MT	Self-sufficiency %	Value of Imports $million	Domestic Production 1000 MT	Imports 1000 MT	Domestic Production plus Imports 1000 MT	Self-sufficiency %	Value of Imports $million
1985	3,687	1,907	5,594	66	290	140	5	145	97	1.6
1986	2,807	2,028	4,835	58	239	133	45	178	75	10.8
1987	3,619	2,200	5,819	62	189	134	55	189	71	12.2
1988	4,087	1,300	5,387	76	143	129	39	168	77	7.7
1989	4,529	1,433	5,962	76	210	91	46	137	66	14.8
1990	4,799	1,900	6,699	72	249	107	25	132	81	4.0
1991	5,122	1,300	6,422	80	174	120	NA	NA	NA	NA
1992	5,072	1,444	6,516	78	178	59	NA	NA	NA	NA
1993	5,075	2,148	7,223	70	240	51	63	114	45	16.0
1994	5,807	2,021	7,828	74	263	67	80	147	84	21.5
1995	5,354	2,425	7,779	69	349	64	85	149	43	21.6
1996	6,120	2,472	8,592	71	435	40	124	164	24	37.9
1997	6,075	2,554	8,629	70	NA	35	140*	175	20	NA
1998	NA	NA	NA	NA	NA	NA	175*	NA	NA	NA
1999	NA	NA	NA	NA	NA	NA	200**	NA	NA	NA

* Estimated ** Expected NA = Not-Available

Source: (1) Internet: FAOSTAT Database Results.
(2) Tables 2.5 and 2.9

3. Policy Effects on Protection and Competitiveness of Feed Crops

3.1. The Policy Analysis Matrix: A Tool For Policy Analysis

3.1.1. The Matrix: Agricultural policy can be defined as government intervention in the agricultural sector. Governments impose policies on their agricultural sectors to accelerate economic growth and correct market failures. The Policy Analysis Matrix, PAM, is one of the most important tools for agricultural policy analysis.

Developed by Monke and Pearson,[13] PAM is a type of double-entry bookkeeping. It consists of two accounting identities: one defines profitability as the difference between revenues and costs, the other measures the effects of divergences (distorting policies and market failures) as the difference between observed parameters and parameters that would exist if the divergences were removed.

As a policy analysis tool, PAM is used to study the effects of: 1) competitiveness and profits, 2) investment on economic efficiency and comparative advantage and 3) agricultural investment on technological change.

Table 3.1 represents the general structure of the PAM, including definitions of all elements used and all policy indicators that can be deduced from the matrix elements. The following is a brief explanation of the main elements of the PAM.[14]

3.1.2. Profitability: Profitability, the difference between total or per unit revenues and total or per unit costs, is calculated twice. In the first row of the matrix is private profitability and in the second row is social profitability. Private profitability is calculated using market or financial prices to evaluate both outputs and inputs. Social profitability is calculated by using a set of social, economic or efficiency prices to evaluate the same outputs and inputs. In either case, total cost is classified in two categories: those related to tradable inputs and those concerned with domestic factors.

Private profitability reflects the competitive power of the agricultural system being considered. Positive private profits (D>0) means that the system could be expanded, depending on relative importance of the system's private profits to those of competing systems.

When comparing private profits of systems producing different commodities with different capital intensity, e.g., cantaloupe and corn, a new indicator is more suitable. It is the private cost ratio, PCR=C/(A-B), which is the ratio of domestic factor cost, C, to value added in private prices (A-B). The indicator can be used for comparisons because it is formulated as a ratio, free of specific units.

Social profits, H, are an efficiency measure because outputs, E, and inputs, F+G, are valued in prices that reflect social opportunity costs. When calculating shadow prices for different outputs and inputs that are involved in the agricultural system, treatment differs according to tradables and nontradables. If a commodity or input is tradable, one should calculate the adjusted border price—the world price converted to domestic currency at an

[13] Monke, E.A. and Pearson, S.R., *The Policy Analysis Matrix for Agricultural Development*, Cornell University Press, 1989.

[14] For more details, see Monke, E.A., and Pearson, S.R., 1989, Op. Cit..
Ibrahim, A.A., *The Policy Analysis Matrix for Crop Rotations in Egypt*, United Nations Economic and Social Council, Economic and Social Commission for Western Asia, 1993.

exchange rate that correctly reflects its scarcity value to the economy. Import and export parity prices should be calculated for importable outputs and inputs (adjusted c.i.f. import price) and exportable outputs and inputs (adjusted f.o.b. export price). The adjustments are necessary to estimate the price level the farmer would get for the sale of an export, given the f.o.b. price, and for the sale of an import substitute at the wholesale market, given the c.i.f. price.

Shadow prices for domestic factors, nontradable inputs such as labor, capital and land, are calculated as the net income foregone because the factor is not employed in its best alternative use. This means that if a feddan of land is cultivated with corn, it cannot grow soybeans during the same crop season. The opportunity cost of a feddan planted to corn is the net income sacrificed because the land cannot be used to grow soybean.

If the comparison of social profitability is between crops that are not identical, the domestic resource cost (DRC) is the appropriate measure for relative efficiency. The DRC equals one when social profitability equals zero. The maximization of social profits implies the minimization of the DRC.

Table 3.1: Structure of Policy Analysis Matrix (Monke, E.A., and Pearson, S.R., 1989)

	Revenues	Costs		Profits
		Tradable Inputs	Domestic Factors	
Private Prices	A	B	C	D
Social Prices	E	F	G	H
Divergences	I	J	K	L

Definitions

Private Profits D = A–B–C
Social Profits H = E–F–G
Output Transfers I = A–E
Input Transfers J = B–F
Net Transfers L = D–H=I–J–K

Ratio Indicators for Comparison of Unlike Outputs

Nominal Protection Coefficient (NPC)
On Tradable Outputs (NPCO) = A/E
On Tradable Inputs (NPCI) = B/F
Effective Protection Coefficient (EPC)= (A-B)/(E-F)
Domestic Resource Cost Ratio (DRC) = G/(E-F)
Private Cost Ratio (PCR) = C/(A-B)
Profitability Coefficient (PC) = D/H = (A-B-C)/(E-F-G)
Subsidy Ratio to Producers (SRP) = L/E = (D-H)/E

Effects of Divergences

The divergences identity involves three main effects: market failure, distorting policy and efficiency policy.

3.1.3. Divergences: As shown in Table 3.1, divergences or transfers represent the difference between private and social valuation of the PAM elements.

Divergences reflect two main impacts: 1) The effect of distorting policies that move production away from this economically efficient use of domestic resources and trade opportunities. Those distorting policies represent the partial efficiency sacrificed for other objectives such as price stabilization, food security, taxes or subsidies and income redistribution. 2) The effect when markets fail to bring about an efficient allocation of commodities or factors of production. Markets fail when they do not efficiently allocate products or factors as a result of monopolies or monopsonies (seller or buyer control over market prices), externalities (costs for which the imposer cannot be charged or benefits for which the provider cannot receive compensation) or factor market imperfections (inadequate development of institutions to provide competitive services and full information). To bring about perfect efficiency, a government would introduce efficient policies to offset the effects of market failures and eliminate distorting policies, thereby ensuring the equality of private and social prices. In other words, divergences, which cause private valuations to depart from their social counterparts, are always the result of distorting policies or market failure.[15]

3.1.4. Protection: Government protectionist intervention in agricultural commodity markets takes the form of setting certain levels of producer and consumer prices that differ from their social counterparts. This leads to distortion in production and consumption.

The total effect of intervention includes the direct or explicit effect of price policies and the indirect or implicit effect of exchange rate and trade policies on relative producers and consumer prices.[16]

Given the system of fiscal and monetary reforms that have taken place in Egypt, total intervention effect is identical to the explicit effect, measured by using the nominal protection coefficient (NPC) or nominal protection rate (NPR) that equals (NPC-1)*100. These measures reflect the deviation of the average (producer or consumer) prices from the social prices evaluated at the farmgate (producer) or at the point of consumption (consumer).

The NPC may be calculated for outputs and for inputs. The nominal protection coefficient on tradable outputs, NPCO, is the ratio of revenues evaluated at private prices to that calculated at social prices. The coefficient may reflect positive, negative or neutral protection:

- Positive protection, NPCO>1, means that domestic producers or intermediaries receive a higher price with intervention than without. From the consumer's point of view, this means negative protection—consumers pay higher price with intervention. A positive NPCO implies implicit subsidy to producers and tax on consumers.
- Negative protection, NPCO<1, means a reverse for producer and consumer.
- Neutral protection describes the case of an NPCO of 1, indicating no distsortion of prices

A nominal protection coefficient for tradable inputs, NPCI, compares agricultural systems that produce dissimilar outputs. It is calculated as the ratio of the cost of tradable

[15] Monke, E.A., and Pearson, S.R., 1989, Op.Cit.

[16] For the decomposition of the two effects, see Dethier, J.J., *Trade, Exchange Rate, and Agricultural Pricing Policies*, World Bank, 1989.

inputs at private prices relative to that cost at social prices. Implications drawn from the values of the NPCI are opposite from those of the NPCO. Higher private prices of output (NPCO>1) and lower private costs of tradable inputs (NCPI<1) both lead to greater private profits. Hence the larger the NPCO and the smaller the NPCI, the greater the transfers to agricultural producers and marketers.

The effective protection coefficient, EPC, combines the separate influences of commodity price policies represented by NPCO and NPCI. This coefficient reflects the extent of incentives or disincentives from agricultural policies. It is calculated as the ratio of value added, evaluated at market prices, (A-B), to that evaluated at social prices, (E-F). The EPC considers the values of both outputs and inputs. It is positively affected by nominal tariff rates on both final goods and imported inputs and negatively related to the share of imported inputs in the final value.[17]

Positive effective protection, EPC>1, means farmers are receiving a greater return on their resources (returns to nontraded inputs) with intervention than without, i.e., the combined effect of transfers on output and traded inputs increases private profits above competitive market levels. Consumers are benefitted when the effective protection is negative, i.e., EPC<1. Whenever EPC=1, no net transfers occur and protection is said to be neutral.

While the values of the nominal protection coefficients cannot be negative, EPC can. If the value added to private prices (the numerator) is negative, producers would not remain in the unprofitable business without government subsidy. Conversely, when the value added to social prices (the denominator) is negative, the economy is losing foreign exchange by domestically producing the commodity.[18]

The EPC does not consider the transfer effects of domestic factor markets. Hence, it is not a complete indicator of policy incentives. An extension of the EPC to include transfer factors is the profitability coefficient, PC, the ratio of private and social profits. The PC measures the incentive effects of all policies, i.e., net policy transfer, including those influencing domestic factor markets.[19]

The subsidy ratio to producers, SRP, is also an indicator that measures net transfers (L) across dissimilar agricultural systems. It is defined as the ratio of net transfer to the social value of revenues(E)—SRP=L/E. In other words, it quantifies the level of transfers from divergences as a proportion of the undistorted value of the systems' revenue. The smaller the SRP, the less distorted the agricultural system. The importance of the SRP is that it shows the output tariff equivalent required to maintain existing private profits if all other policy distortions and market failures are eliminated.[20]

3.1.5 Relative Efficiency and Relative Advantage: An economy has a comparative advantage in the production of a tradable commodity if that production is low

[17] For the derivations of these relationships, see Greenaway, D., *International Trade Policy*, St. Martin's Press, New York, 1983

[18] Tsakok, I., *Agricultural Price Policy: A Practitioner's Guide to Partial Equilibrium Analysis*, Cornell University Press, 1990.

[19] Monke, E.A., and Pearson, S.R, 1989, Op. Cit.

[20] Monke, E.A., and Pearson, S.R., Op.Cit.

cost relative to the production of the same commodity in another country. If not, it has a comparative disadvantage.[21]

The previously discussed measures are not adequate to determine comparative advantage because they are only relative incentive measures.

The DRC, a measure of relative efficiency, may be used to measure comparative advantage. The DRC is a cost/benefit ratio. It measures the incremental increase in primary inputs (land, labor and capital) valued at their shadow prices necessary to obtain an incremental increase in net output (social value added). In other words, it is the rate at which a country is substituting domestic resources to produce one unit of a commodity compared to foreign exchange gained by exporting or saved by not importing that commodity.[22]

A country's international competitiveness is due to its:

- Higher productivity
- Exchange rate.
- Ability to:
  - use fewer traded inputs per unit of output.
  - use fewer domestic resources per unit of output.
  - lower opportunity costs of domestic resources.

A DRC less than one (negative domestic resource cost) for a given commodity in a given economy, means that the economy has an international comparative advantage. In such a situation, less than one unit of domestic resource is needed to generate more than one unit of foreign exchange and the economy is better off producing the commodity domestically. When DRC is equal to or great than one (neutral or positive domestic resource cost, respectively), the country does not have comparative advantage.

3.2. Data Used

This study focuses on poultry feed ingredients, specifically corn and soybean. However, to analyze policy effects and Egypt's international competitiveness in growing those crops, the study must include the competing crops grown in the same season. Crops grown during different seasons also are considered so that results can be based on the cropping patterns, crop rotations and agronomic considerations. Cotton, in particular, places substantial demand on soil and is rotated with crops that maintain soil fertility (short berseem). Calculations of private profit, social profit and divergences for crop rotations are required because farmers face rotational constraints diversify rather than specialize.

The following information, statistics and estimates were entered into linked Microsoft Excel spreadsheets for the PAM analysis.

[21] Tsakok, I., 1990, Op.Cit.
[22] Ibrahim, A.A., 1993, Op.Cit.

- Farm-level input/output data in physical terms (technical coefficients) per feddan for corn, soybean, bean, rice, wheat, cotton, sugar cane, short berseem and long berseem.[23] The inputs are classified as tradable inputs or domestic factors.
- Market or private prices of both outputs and inputs for different crops.
- Social prices of both inputs and outputs. Estimates of shadow prices have been used for different inputs[24] and outputs.[25]

Based on the information above, the five PAM indicators (NPCO, NPCI, EPC, SRP and DRC) are estimated for nine single crops (pure-stand-equivalent approach) and for nine cropping patterns (sustainable-unit-area approach).

Three scenarios are considered based on different ways of estimating shadow prices of the two main domestic resources: land and water. The best way to estimate the shadow price of water is to use the results of cost/benefit analysis for irrigation projects. The analysis will consider two alternative shadow prices in two scenarios.[26] A third value—reflecting the private price of water—is used in a third scenario.

The different scenarios can be considered as a sensitivity analysis to show to what extent water, as a scarce resource, can change the results.

The calculation of the shadow price of land is problematic. The theoretical way to estimate the shadow price of irrigation water is through opportunity cost (the income foregone in the second best use of the water). Application of this approach to land depends on the availability of information on the distribution of net returns among factors of production: management, capital and water. If the share of one or more of such factors is disregarded, the shadow price of land calculated by this method may be overestimated.

Accordingly, in the first two scenarios the opportunity cost of land is the seasonal free market rent. The third scenario depends on the use of private value for land.

3.3. Results of the Analysis

Estimates of different indicators of PAM are summarized in Table 3.2. To facilitate comparisons across different crops and/or cropping patterns under different scenarios, all results are juxtaposed onto the same page.

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[23] Technical coefficients are taken from several surveys. See, for example: Selzer, Th., *Results of the 1997 farm survey in Dakahleya and Beni Suef*, Egyptian German Cotton Sector Promotion Program, MAI-R & GTZ, Cairo, September 1998.

[24] See: El Guindy M., Siddik, I., and Ariza-Nino, E., *Marketing and Price Policies for Nitrogenous Fertilizers in Egypt*, MALR & USAID, APRP, Cairo, 1997.

[28] See: Omran, M.A.R.S. *The Impact of the Liberalization of Agricultural Input and Output Prices on the Cropping Pattern*, unpublished Ph.D. dissertation, Suez Canal University, 1997.

[29] Omran, M.A.R.S., 1997, Op.Cit., IFPRI, *Maintaining Food Security in Egypt during and after Agricultural and Food Policy Reform*, Washington, D.C., USA, 1994.
Abou Saad, H.N., *Investigacion Economica para la Evaluacion del Agua de Riego (Gestion Y Uso) En Egipto*, Tesis Doctoral, Universidad Politecnica de Valencia, Valencia, Spain, 1998.

Table 3.2. Summary of PAM Estimates According to Different Scenarios

CROPS	Scenario 1					Scenario 2					Scenario 3				
	NPCO	NPCI	EPC	DRC	SRP	NPCO	NPCI	EPC	DRC	SRP	NPCO	NPCI	EPC	DRC	SRP
Beans	0.89	0.75	0.92	1.10	0.50	0.89	0.75	0.92	1.11	0.52	0.89	0.75	0.92	0.56	0.04
Rice	0.79	0.75	0.79	0.64	0.14	0.79	0.75	0.79	0.65	0.15	0.79	0.75	0.79	0.36	-0.11
Wehat	0.77	0.69	0.78	0.70	0.17	0.77	0.69	0.78	0.71	0.18	0.77	0.69	0.78	0.36	-0.13
cotton	1.51	0.76	1.62	1.31	1.18	1.51	0.76	1.62	1.33	1.20	1.51	0.76	1.62	0.75	0.70
Corn	0.68	0.76	0.66	0.79	0.13	0.68	0.76	0.66	0.80	0.14	0.68	0.76	0.66	0.39	-0.22
S. Cane	0.92	0.64	0.97	1.05	0.47	0.92	0.64	0.97	1.07	0.50	0.92	0.64	0.97	0.64	0.13
S. Bersim	1.00	1.00	1.00	1.26	0.73	1.00	1.00	1.00	1.28	0.75	1.00	1.00	1.00	0.54	0.10
L. Bersim	1.00	0.86	1.01	0.74	0.34	1.00	0.86	1.01	0.75	0.35	1.00	0.86	1.01	0.46	0.09
Soybeans	0.82	0.77	0.82	1.41	0.57	0.82	0.77	0.82	1.43	0.58	0.82	0.77	0.82	0.71	-0.02
Wh+Cot	0.72	0.73	0.72	0.73	0.14	0.72	0.73	0.72	0.74	0.15	0.72	0.73	0.72	0.36	-0.19
Wh+Ric	0.78	0.72	0.79	0.66	0.15	0.78	0.72	0.79	0.67	0.16	0.78	0.72	0.79	0.36	-0.13
Bean+Corn	0.77	0.76	0.77	0.90	0.27	0.77	0.76	0.77	0.92	0.28	0.77	0.76	0.77	0.44	-0.12
Bean+Rice	0.83	0.75	0.84	0.79	0.26	0.83	0.75	0.84	0.80	0.27	0.83	0.75	0.84	0.42	-0.07
S. Cane	0.92	0.64	0.97	1.05	0.47	0.92	0.64	0.97	1.07	0.50	0.92	0.64	0.97	0.64	0.13
S. Bers+Cott	1.37	0.82	1.45	1.25	1.01	1.37	0.82	1.45	1.27	1.03	1.37	0.82	1.45	0.64	0.49
L. Bers+Corn	0.82	0.79	0.83	0.76	0.22	0.82	0.79	0.83	0.77	0.23	0.82	0.79	0.83	0.41	-0.09
L. Bers+Soy	0.93	0.81	0.94	0.98	0.42	0.93	0.81	0.94	1.00	0.43	0.93	0.81	0.94	0.55	0.03
Wh+Soy	0.79	0.73	0.79	0.92	0.30	0.79	0.73	0.79	0.94	0.31	0.79	0.73	0.79	0.46	-0.11

Source: Summary results of Appendix Tables A.1 through C.2.

3.3.1. Basic Case: First Scenario

3.3.1.1. Single Crops: Reading the PAM results for single crops under first scenario shows that:

- According to the values of different protection or relative incentive measures—NPCO, NPCI, EPC and SRP—the nine studied crops can be classified into three main groups.

A. The first group includes the majority of these crops and is characterized by distortions because the values of the three protection indicators are less than one. Those crops are bean, rice, wheat, corn and soybean.

Farmers of these crops are subject to negative protection—some sort of taxes that favor consumers and/or users of such crops. Negative effective protection (EPC<1), which is -44% and -18% for corn and soybean, respectively, means that the combined effect of transfers on output and traded inputs decrease private profits under socially optimum levels.

Estimates of NPCO and NPCI are 0.68 and 0.76, respectively, for corn which means that farmers are implicitly taxed, i.e., negatively affected by 32% in the existing market situation. At the same time, an NPCI less than one means that tradable input markets are distorted—agricultural tradable inputs are subsidized by 24%. This may be due to the open international trade for corn where, in 1998, imported corn sold domestically for LE 440/MT while domestically produced corn sold for LE 550/MT. The imported corn is yellow, which is better for animal and poultry feeds because of the carotene content and the suitability of its crush for chicken feed.

The prices of imported fertilizers, the main tradable input, are 30% lower than their domestic counterparts. This explains the implicit subsidy on inputs.

II. The second group, exclusively cotton, is distorted toward positive protection for both output (farmers) and tradable inputs. The NPCO is 1.51 and the NPCI is 0.76, which means farmers are 51% subsidized and tradable inputs are 24% subsidized. The combined policy effect of both NPCO and NPCI results in an EPC of 1.21, meaning that private profits are 21% higher than the socially optimum levels.

Although the cotton trade is liberalized, farmers are getting prices higher than the international equivalent.

C. The third group of crops includes short and long berseem and sugar cane. Since berseem is strictly a domestic crop, there is almost no distortion in its production and marketing. With the exception of tradable input markets in the cases of long berseem and sugar cane—mainly the use of more fertilizer—NPCO, NPCI and EPC are almost equal to one.[27]

[27] Our estimates are for 1996-97 and are comparable to those conducted by Omran that covered 1995. By contrast, our estimates are not comparable to those conducted by Nassar because they cover years of early agricultural policy reform, i.e., pre-1991.

Omran, M.A.R.S., 1997, Op.Cit.

Nassar, S.Z., *The Economic Impact of Reform Programs in Agricultural Sector in Egypt*, MALR Economic Affaires Sector Cairo, 1993.

The subsidy ratio to producers, SRP, for corn and soybean is estimated at 0.13 and 0.57, respectively. The corn system is less distorted than soybean, i.e., the increased gross subsidy is only 13% of the undistorted value of the corn system revenues compared to 57% for soybean.[28]

As the majority of grain or cereal markets are characterized by policy distortion rather than market failure, the SRP shows the extent to which a system's revenue increased (if SRP is positive, i.e., greater than zero) or decreased (if SRP is negative, i.e., less than zero).

- According to the DRC, the seven tradable crops, berseems excluded, can be classified into two main groups.

I. The first group, rice, wheat and corn, is characterized by a negative DRC. This means that Egypt has comparative advantage in producing those crops. Ranked according to comparative advantage, rice is first with a DRC of 0.64; wheat, 0.70; and corn, 0.79.

In the case of corn, only 79% of a unit of domestic resources is needed to generate more than one unit of foreign exchange through import substitution; expansion may be recommended. Although Egypt has more comparative advantage in producing rice, it may be better to expand corn production for import substitution, rather than rice production for export. Import substitution is a more secure policy than export, which may encounter problems of competition and shares on international markets.

B. The second group, soybean, cotton, broad beans and sugar cane, is characterized by a positive DRC of 1.41 for soybean, 1.31 for cotton, 1.10 for broad beans and 1.05 for sugar cane.

The PAM analysis implies that Egypt has no comparative advantage in producing these crops. However, cotton's positive DRC is due mainly to the deficiency payments policy implemented by the government to remedy the negative effects of its policy reform program on farmers. The value of DRC in sugar cane is almost at the margin, i.e., neutral.

It takes 1.41 units of domestic resources to generate one unit of foreign exchange through import substitution of soybean. Agricultural policy and farmers' response to that policy reflect Egypt's comparative disadvantage in soybeans. Acreage of soybeans decreased from 100,000 feddan in 1991 to 31,000 feddan in 1997—a 67% decrease in seven years.

The Egyptian poultry industry will continue to depend on imported soybeans. Improving domestic production of soybeans is a technology issue rather than a policy one. The technology of soybean production needs to be improved to encourage farmers to grow it. This may be realized in new national projects such as in Toshke.

<u>3.3.1.2. Cropping Patterns:</u> The PAM results for cropping patterns under the first scenario, according to the values of different protection or relative incentive measures— (NPCO, NPCI, EPC and SRP), suggest:

Nassar, S.Z., *Some Issues of Agricultural Trade Policies in Egypt*, L'Egypte Contemporainne, 1990.

[28] See Monke, E.A., and Pearson, S.R., 1989, Op.Cit, p.235.

- At the empirical level, the cropping pattern (two crops added together) will have PAM estimates as weighted averages. The combined distortion existing in the markets of the two crops would be less than that of the crop with higher distortion and more than that of the crop with lower distortion.
- Farmers rotating wheat and corn would have an NPCO of 0.72, compared to 0.77 and 0.68 if wheat and corn are evaluated separately. If corn is rotated with beans, the NPCO would be 0.77, compared to 0.82 if corn is rotated with long berseem.
- For soybean, the EPC is 0.82 if it is evaluated separately and 0.94 when it is rotated with wheat.
- With the exception of short berseem + cotton for which NPCO and EPC are 1.37 and 1.45, respectively, all cropping patterns are characterized by negative protection where all values of NPCO, NPCI and EPC are less than one. The short berseem + cotton problem is transitory. Administered floor prices and deficiency payments are temporary remedies for the negative impacts of agricultural policy reforms. The DRC of sugarcane is almost neutral.
- Results of DRC estimates indicate that Egypt has comparative advantage in most cropping patterns. Ranked according to comparative advantage, wheat + rice is first with a DRC of 0.66; wheat + corn = 0.73; long berseem + corn = 0.76; broad bean + rice = 0.79; broad bean + corn = 0.90; wheat + soybean = 0.92; and long berseem + soybean = 0.98.
  - Corn's DRC of .79 becomes 0.73 when rotated with wheat.
  - Soybean's DRC of 1.41 becomes 0.92 when rotated with wheat.

<u>3.3.2. Sensitivity Analysis: Second and Third Scenarios:</u> The second and third scenarios are undertaken as sensitivity analysis.

In the second scenario, the social price of water is increased while in the third scenario the opportunity cost of private land is determined by free market rent.

In both scenarios estimates of NPCO, NPCI and EPC are not affected, while estimates of DRC and SRP are affected. In fact, increases in social price of water translate into increases in value of both DRC and SRP. Devaluation of the costs of the services rendered by land, as a domestic production factor, leads to substantial declines in the values of both DRC and SRP. The PAM results appear to be sensitive to changes in domestic land and water factor values, especially land and water.

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Annex

Policy Analysis Matrix Tables for Single Crops and for Cropping Patterns

Table A.1: Results of Policy Analysis Matrix for Single Crops (First Scenario)

CROP	Revenue	Costs					Profits	PAM Results	
		Tradable Inputs	Domestic Factors						
			H.Labor	M.Labor	Water	Land		Symbols	Value
BEANS								NPCO	0.89
Pr.Prices	1583.47	186.73	224	146	0	283.1	743.64	NPCI	0.75
So.Prices	1769.5	248.88	280	146	142.8	1100	-148.18	EPC	0.92
Divergence	-186.03	-62.15	-56	0	-142.8	-816.9	891.82	DRC	1.1
								SRP	0.5
RICE								NPCO	0.79
Pr.Prices	2534.58	193.17	288	268.5	0	280	1504.91	NPCI	0.75
So.Prices	3204.38	258.89	360	268.5	166.6	1100	1050.4	EPC	0.79
Divergence	-669.8	-65.72	-72	0	-166.6	-820	454.52	DRC	0.64
								SRP	0.14
WHEAT								NPCO	0.77
Pr.Prices	2006.25	172.94	224	145	0	305.3	1159.01	NPCI	0.69
So.Prices	2603.61	250.41	280	145	119	1100	709.19	EPC	0.78
Divergence	-597.36	-77.47	-56	0	-119	-794.7	449.82	DRC	0.7
								SRP	0.17
COTTON								NPCO	1.51
Pr.Prices	3274.46	223.53	504	141	0	425.3	1980.63	NPCI	0.76
So.Prices	2172.7	294.77	630	141	214.2	1474	-581.27	EPC	1.62
Divergence	1101.76	-71.24	-126	0	-214.2	-1048.7	2561.89	DRC	1.31
								SRP	1.18
CORN								NPCO	0.68
Pr.Prices	1674.64	253.23	264	156.5	0	227.8	773.11	NPCI	0.76
So.Prices	2478.73	331.14	330	156.5	119	1100	442.09	EPC	0.66
Divergence	-804.09	-77.91	-66	0	-119	-872.2	331.02	DRC	0.79
								SRP	0.13
S.CANE								NPCO	0.92
Pr.Prices	4205.61	432.45	640	507.5	0	632.3	1993.36	NPCI	0.64
So.Prices	4579.44	679.3	800	507.5	571.2	2200	-178.55	EPC	0.97
Divergence	-373.83	-246.85	-160	0	-571.2	-1567.7	2171.91	DRC	1.05
								SRP	0.47
S.BERSEEM								NPCO	1
Pr.Prices	840	105	48	70	0	193.3	423.7	NPCI	1
So.Prices	840	105	60	70	71.4	726	-192.4	EPC	1
Divergence	0	0	-12	0	-71.4	-532.7	616.1	DRC	1.26
								SRP	0.73
L.BERSEEM								NPCO	1
Pr.Prices	2100	135	72	99	0	566.3	1227.7	NPCI	0.86
So.Prices	2100	157.5	90	99	142.8	1100	510.7	EPC	1.01
Divergence	0	-22.5	-18	0	-142.8	-533.7	717	DRC	0.74
								SRP	0.34
SOYBEANS								NPCO	0.82
Pr.Prices	1176	185.1	264	150	0	259.2	317.7	NPCI	0.77
So.Prices	1441.44	239.74	330	150	119	1100	-497.3	EPC	0.82
Divergence	-265.44	-54.64	-66	0	-119	-840.8	815	DRC	1.41
								SRP	0.57

First Scenario: (1) Social price of land is its opportunity cost measured as seasonal market rent and
(2) Social price of water is a shadow price of LE 0.0476/M3.

Source: Computerized estimates through a programmed PAM on Microsoft Excel specially prepared for this study.

Table A.2: Results of Policy Analysis Matrix for Cropping Patterns (First Scenario)

CROPPING PATTERN	Revenue	Costs					Profits	PAM Results	
		Tradable Inputs	Domestic Factors						
			H.Labor	M.Labor	Water	Land		Symbols	Value
Wh&Cor								NPCO	0.72
Pr.Prices	3680.89	426.17	488	301.5	0	533.1	1932.12	NPCI	0.73
So.Prices	5082.33	581.56	550	301.5	238	2200	1211.28	EPC	0.72
Divergence	-1401.45	-155.39	-62	0	-238	-1666.9	720.84	DRC	0.73
								SRP	0.14
Wh&Ric								NPCO	0.78
Pr.Prices	4540.83	366.11	512	413.5	0	585.3	2663.92	NPCI	0.72
So.Prices	5807.99	509.3	600	413.5	285.6	2200	1799.59	EPC	0.79
Divergence	-1267.16	-143.19	-88	0	-285.6	-1614.7	864.33	DRC	0.66
								SRP	0.15
Bea&Cor								NPCO	0.77
Pr.Prices	3258.11	439.96	488	302.5	0	510.9	1516.75	NPCI	0.76
So.Prices	4248.23	580.03	550	302.5	261.8	2200	353.9	EPC	0.77
Divergence	-990.12	-140.07	-62	0	-261.8	-1689.1	1162.85	DRC	0.9
								SRP	0.27
Bea&Ric								NPCO	0.83
Pr.Prices	4118.05	379.9	512	414.5	0	563.1	2248.55	NPCI	0.75
So.Prices	4973.88	507.77	600	414.5	309.4	2200	942.21	EPC	0.84
Divergence	-855.83	-127.87	-88	0	-309.4	-1636.9	1306.34	DRC	0.79
								SRP	0.26
S.Cane								NPCO	0.92
Pr.Prices	4205.61	432.45	640	507.5	0	632.3	1993.36	NPCI	0.64
So.Prices	4579.44	679.3	800	507.5	571.2	2200	-178.55	EPC	0.97
Divergence	-373.83	-246.85	-160	0	-571.2	-1567.7	2171.91	DRC	1.05
								SRP	0.47
S.Bers&Cott								NPCO	1.37
Pr.Prices	4114.46	328.53	552	211	0	618.6	2404.33	NPCI	0.82
So.Prices	3012.7	399.77	560	211	285.6	2200	-643.67	EPC	1.45
Divergence	1101.76	-71.24	-8	0	-285.6	-1581.4	3047.99	DRC	1.25
								SRP	1.01
L.Bers&Corn								NPCO	0.82
Pr.Prices	3774.64	388.23	336	255.5	0	794.1	2000.81	NPCI	0.79
So.Prices	4578.73	488.64	380	255.5	261.8	2200	992.79	EPC	0.83
Divergence	-804.09	-100.41	-44	0	-261.8	-1405.9	1008.02	DRC	0.76
								SRP	0.22
L.Bers&Soy								NPCO	0.93
Pr.Prices	3276	320.1	336	249	0	825.5	1545.4	NPCI	0.81
So.Prices	3541.44	397.24	380	249	261.8	2200	53.4	EPC	0.94
Divergence	-265.44	-77.14	-44	0	-261.8	-1374.5	1492	DRC	0.98
								SRP	0.42
Wh&Soy								NPCO	0.79
Pr.Prices	3182.25	358.04	488	295	0	564.5	1476.71	NPCI	0.73
So.Prices	4045.05	490.15	550	295	238	2200	271.89	EPC	0.79
Divergence	-862.8	-132.11	-62	0	-238	-1635.5	1204.82	DRC	0.92
								SRP	0.3

First Scenario: (1) Social price of land is its opportunity cost measured as seasonal market rent and
(2) Social price of water is a shadow price of LE 0.0476/M3.

Source: Computerized estimates through a programmed PAM on Microsoft Excel specially prepared for this study.

Table B.1 : Results of Policy Analysis Matrix for Single Crops (Second Scenario)									
CROP	Revenue	Costs					Profits	PAM Results	
		Tradable Inputs	Domestic Factors						
			H.Labor	M.Labor	Water	Land		Symbols	Value
BEANS								NPCO	0.89
Pr.Prices	1583.47	186.73	224	146	0	283.1	743.64	NPCI	0.75
So.Prices	1769.5	248.88	280	146	168	1100	-173.38	EPC	0.92
Divergence	-186.03	-62.15	-56	0	-168	-816.9	917.02	DRC	1.11
								SRP	0.52
RICE								NPCO	0.79
Pr.Prices	2534.58	193.17	288	268.5	0	280	1504.91	NPCI	0.75
So.Prices	3204.38	258.89	360	268.5	196	1100	1021	EPC	0.79
Divergence	-669.8	-65.72	-72	0	-196	-820	483.92	DRC	0.65
								SRP	0.15
WHEAT								NPCO	0.77
Pr.Prices	2006.25	172.94	224	145	0	305.3	1159.01	NPCI	0.69
So.Prices	2603.61	250.41	280	145	140	1100	688.19	EPC	0.78
Divergence	-597.36	-77.47	-56	0	-140	-794.7	470.82	DRC	0.71
								SRP	0.18
COTTON								NPCO	1.51
Pr.Prices	3274.46	223.53	504	141	0	425.3	1980.63	NPCI	0.76
So.Prices	2172.7	294.77	630	141	252	1474	-619.07	EPC	1.62
Divergence	1101.76	-71.24	-126	0	-252	-1048.7	2599.69	DRC	1.33
								SRP	1.2
CORN								NPCO	0.68
Pr.Prices	1674.64	253.23	264	156.5	0	227.8	773.11	NPCI	0.76
So.Prices	2478.73	331.14	330	156.5	140	1100	421.09	EPC	0.66
Divergence	-804.09	-77.91	-66	0	-140	-872.2	352.02	DRC	0.8
								SRP	0.14
S.CANE								NPCO	0.92
Pr.Prices	4205.61	432.45	640	507.5	0	632.3	1993.36	NPCI	0.64
So.Prices	4579.44	679.3	800	507.5	672	2200	-279.35	EPC	0.97
Divergence	-373.83	-246.85	-160	0	-672	-1567.7	2272.71	DRC	1.07
								SRP	0.5
S.BERSEEM								NPCO	1
Pr.Prices	840	105	48	70	0	193.3	423.7	NPCI	1
So.Prices	840	105	60	70	84	726	-205	EPC	1
Divergence	0	0	-12	0	-84	-532.7	628.7	DRC	1.28
								SRP	0.75
L.BERSEEM								NPCO	1
Pr.Prices	2100	135	72	99	0	566.3	1227.7	NPCI	0.86
So.Prices	2100	157.5	90	99	168	1100	485.5	EPC	1.01
Divergence	0	-22.5	-18	0	-168	-533.7	742.2	DRC	0.75
								SRP	0.35
SOYBEANS								NPCO	0.82
Pr.Prices	1176	185.1	264	150	0	259.2	317.7	NPCI	0.77
So.Prices	1441.44	239.74	330	150	140	1100	-518.3	EPC	0.82
Divergence	-265.44	-54.64	-66	0	-140	-840.8	836	DRC	1.43
								SRP	0.58

Second Scenario: (1) Social price of land is its opportunity cost measured as seasonal market rent and
(2) Social price of water is a shadow price of LE 0.056/M3.

Source: Computerized estimates through a programmed PAM on Microsoft Excel specially prepared for this study.

Table B.2: Results of Policy Analysis Matrix for Cropping Patterns (Second Scenario).

CROPPING PATTERN	Revenue	Costs					Profits	PAM Results	
		Tradable Inputs	Domestic Factors						
			H.Labor	M.Labor	Water	Land		Symbols	Value
Wh&Cor								NPCO	0.72
Pr.Prices	3680.89	426.17	488	301.5	0	533.1	1932.12	NPCI	0.73
So.Prices	5082.33	581.56	550	301.5	280	2200	1169.28	EPC	0.72
Divergence	-1401.45	-155.39	-62	0	-280	-1666.9	762.84	DRC	0.74
								SRP	0.15
Wh&Ric								NPCO	0.78
Pr.Prices	4540.83	366.11	512	413.5	0	585.3	2663.92	NPCI	0.72
So.Prices	5807.99	509.3	600	413.5	336	2200	1749.19	EPC	0.79
Divergence	-1267.16	-143.19	-88	0	-336	-1614.7	914.73	DRC	0.67
								SRP	0.16
Bea&Cor								NPCO	0.77
Pr.Prices	3258.11	439.96	488	302.5	0	510.9	1516.75	NPCI	0.76
So.Prices	4248.23	580.03	550	302.5	308	2200	307.7	EPC	0.77
Divergence	-990.12	-140.07	-62	0	-308	-1689.1	1209.05	DRC	0.92
								SRP	0.28
Bea&Ric								NPCO	0.83
Pr.Prices	4118.05	379.9	512	414.5	0	563.1	2248.55	NPCI	0.75
So.Prices	4973.88	507.77	600	414.5	364	2200	887.61	EPC	0.84
Divergence	-855.83	-127.87	-88	0	-364	-1636.9	1360.94	DRC	0.8
								SRP	0.27
S.Cane								NPCO	0.92
Pr.Prices	4205.61	432.45	640	507.5	0	632.3	1993.36	NPCI	0.64
So.Prices	4579.44	679.3	800	507.5	672	2200	-279.35	EPC	0.97
Divergence	-373.83	-246.85	-160	0	-672	-1567.7	2272.71	DRC	1.07
								SRP	0.5
S.Bers&Cott								NPCO	1.37
Pr.Prices	4114.46	328.53	552	211	0	618.6	2404.33	NPCI	0.82
So.Prices	3012.7	399.77	560	211	336	2200	-694.07	EPC	1.45
Divergence	1101.76	-71.24	-8	0	-336	-1581.4	3098.39	DRC	1.27
								SRP	1.03
L.Bers&Corn								NPCO	0.82
Pr.Prices	3774.64	388.23	336	255.5	0	794.1	2000.81	NPCI	0.79
So.Prices	4578.73	488.64	380	255.5	308	2200	946.59	EPC	0.83
Divergence	-804.09	-100.41	-44	0	-308	-1405.9	1054.22	DRC	0.77
								SRP	0.23
L.Bers&Soy								NPCO	0.93
Pr.Prices	3276	320.1	336	249	0	825.5	1545.4	NPCI	0.81
So.Prices	3541.44	397.24	380	249	308	2200	7.2	EPC	0.94
Divergence	-265.44	-77.14	-44	0	-308	-1374.5	1538.2	DRC	1
								SRP	0.43
Wh&Soy								NPCO	0.79
Pr.Prices	3182.25	358.04	488	295	0	564.5	1476.71	NPCI	0.73
So.Prices	4045.05	490.15	550	295	280	2200	229.89	EPC	0.79
Divergence	-862.8	-132.11	-62	0	-280	-1635.5	1246.82	DRC	0.94
								SRP	0.31

Second Scenario: (1) Social price of land is its opportunity cost measured as seasonal market rent and
(2) Social price of water is a shadow price of LE 0.056/M3.

Source: Computerized estimates through a programmed PAM on Microsoft Excel specially prepared for this study.

Table C.1: Results of Policy Analysis Matrix for Single Crops (Third Scenario)									
CROP	Revenue	Costs					Profits	PAM Results	
		Tradable	Domestic Factors						
		Inputs	H.Labor	M.Labor	Water	Land		Symbols	Value
BEANS								NPCO	0.89
Pr.Prices	1583.47	186.73	224	146	0	283.1	743.64	NPCI	0.75
So.Prices	1769.5	248.88	280	146	142.8	283.1	668.72	EPC	0.92
Divergence	-186.03	-62.15	-56	0	-142.8	0	74.92	DRC	0.56
								SRP	0.04
RICE								NPCO	0.79
Pr.Prices	2534.58	193.17	288	268.5	0	280	1504.91	NPCI	0.75
So.Prices	3204.38	258.89	360	268.5	166.6	280	1870.4	EPC	0.79
Divergence	-669.8	-65.72	-72	0	-166.6	0	-365.48	DRC	0.36
								SRP	-0.11
WHEAT								NPCO	0.77
Pr.Prices	2006.25	172.94	224	145	0	305.3	1159.01	NPCI	0.69
So.Prices	2603.61	250.41	280	145	119	305.3	1503.89	EPC	0.78
Divergence	-597.36	-77.47	-56	0	-119	0	-344.89	DRC	0.36
								SRP	-0.13
COTTON								NPCO	1.51
Pr.Prices	3274.46	223.53	504	141	0	425.3	1980.63	NPCI	0.76
So.Prices	2172.7	294.77	630	141	214.2	425.3	467.43	EPC	1.62
Divergence	1101.76	-71.24	-126	0	-214.2	0	1513.19	DRC	0.75
								SRP	0.7
CORN								NPCO	0.68
Pr.Prices	1674.64	253.23	264	156.5	0	227.8	773.11	NPCI	0.76
So.Prices	2478.73	331.14	330	156.5	119	227.8	1314.29	EPC	0.66
Divergence	-804.09	-77.91	-66	0	-119	0	-541.18	DRC	0.39
								SRP	-0.22
S.CANE								NPCO	0.92
Pr.Prices	4205.61	432.45	640	507.5	0	632.3	1993.36	NPCI	0.64
So.Prices	4579.44	679.3	800	507.5	571.2	632.3	1389.15	EPC	0.97
Divergence	-373.83	-246.85	-160	0	-571.2	0	604.21	DRC	0.64
								SRP	0.13
S.BERSEEM								NPCO	1
Pr.Prices	840	105	48	70	0	193.3	423.7	NPCI	1
So.Prices	840	105	60	70	71.4	193.3	340.3	EPC	1
Divergence	0	0	-12	0	-71.4	0	83.4	DRC	0.54
								SRP	0.1
L.BERSEEM								NPCO	1
Pr.Prices	2100	135	72	99	0	566.3	1227.7	NPCI	0.86
So.Prices	2100	157.5	90	99	142.8	566.3	1044.4	EPC	1.01
Divergence	0	-22.5	-18	0	-142.8	0	183.3	DRC	0.46
								SRP	0.09
SOYBEANS								NPCO	0.82
Pr.Prices	1176	185.1	264	150	0	259.2	317.7	NPCI	0.77
So.Prices	1441.44	239.74	330	150	119	259.2	343.5	EPC	0.82
Divergence	-265.44	-54.64	-66	0	-119	0	-25.8	DRC	0.71
								SRP	-0.02

Third Scenario: (1) Financial price of land estimated by MALR as the private market seasonal rent, and
(2) Social price of water is a shadow price of LE 0.0476/M3.

Source: Computerized estimates through a programmed PAM on Microsoft Excel specially prepared for this study.

Table C.2: Results of Policy Analysis Matrix for Cropping Patterns (Third Scenario)

CROPPING PATTERN	Revenue	Costs					Profits	PAM Results	
		Tradable Inputs	Domestic Factors						
			H.Labor	M.Labor	Water	Land		Symbols	Value
Wh&Cor								NPCO	0.72
Pr.Prices	3680.89	426.17	488	301.5	0	533.1	1932.12	NPCI	0.73
So.Prices	5082.33	581.56	550	301.5	238	533.1	2878.18	EPC	0.72
Divergence	-1401.45	-155.39	-62	0	-238	0	-946.06	DRC	0.36
								SRP	-0.19
Wh&Ric								NPCO	0.78
Pr.Prices	4540.83	366.11	512	413.5	0	585.3	2663.92	NPCI	0.72
So.Prices	5807.99	509.3	600	413.5	285.6	585.3	3414.29	EPC	0.79
Divergence	-1267.16	-143.19	-88	0	-285.6	0	-750.37	DRC	0.36
								SRP	-0.13
Bea&Cor								NPCO	0.77
Pr.Prices	3258.11	439.96	488	302.5	0	510.9	1516.75	NPCI	0.76
So.Prices	4248.23	580.03	550	302.5	261.8	510.9	2043	EPC	0.77
Divergence	-990.12	-140.07	-62	0	-261.8	0	-526.25	DRC	0.44
								SRP	-0.12
Bea&Ric								NPCO	0.83
Pr.Prices	4118.05	379.9	512	414.5	0	563.1	2248.55	NPCI	0.75
So.Prices	4973.88	507.77	600	414.5	309.4	563.1	2679.11	EPC	0.84
Divergence	-855.83	-127.87	-88	0	-309.4	0	-330.56	DRC	0.42
								SRP	-0.07
S.Cane								NPCO	0.92
Pr.Prices	4205.61	432.45	640	507.5	0	632.3	1993.36	NPCI	0.64
So.Prices	4579.44	679.3	800	507.5	571.2	632.3	1389.15	EPC	0.97
Divergence	-373.83	-246.85	-160	0	-571.2	0	604.21	DRC	0.64
								SRP	0.13
S.Bers&Cott								NPCO	1.37
Pr.Prices	4114.46	328.53	552	211	0	618.6	2404.33	NPCI	0.82
So.Prices	3012.7	399.77	560	211	285.6	618.6	937.73	EPC	1.45
Divergence	1101.76	-71.24	-8	0	-285.6	0	1466.59	DRC	0.64
								SRP	0.49
L.Bers&Corn								NPCO	0.82
Pr.Prices	3774.64	388.23	336	255.5	0	794.1	2000.81	NPCI	0.79
So.Prices	4578.73	488.64	380	255.5	261.8	794.1	2398.69	EPC	0.83
Divergence	-804.09	-100.41	-44	0	-261.8	0	-397.88	DRC	0.41
								SRP	-0.09
L.Bers&Soy								NPCO	0.93
Pr.Prices	3276	320.1	336	249	0	825.5	1545.4	NPCI	0.81
So.Prices	3541.44	397.24	380	249	261.8	825.5	1427.9	EPC	0.94
Divergence	-265.44	-77.14	-44	0	-261.8	0	117.5	DRC	0.55
								SRP	0.03
Wh&Soy								NPCO	0.79
Pr.Prices	3182.25	358.04	488	295	0	564.5	1476.71	NPCI	0.73
So.Prices	4045.05	490.15	550	295	238	564.5	1907.39	EPC	0.79
Divergence	-862.8	-132.11	-62	0	-238	0	-430.69	DRC	0.46
								SRP	-0.11

Third Scenario: (1) Financial price of land estimated by MALR as the private market seasonal rent, and
(2) Social price of water is a shadow price of LE 0.0476/M3.

Source: Computerized estimates through a programmed PAM on Microsoft Excel specially prepared for this study.