THE PAKISTAN POULTRY INDUSTRY A POLICY ANALYSIS FRAMEWORK

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THE PAKISTAN POULTRY INDUSTRY:

A POLICY ANALYSIS FRAMEWORK

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EXECUTIVE SUMMARY

A viable poultry industry is essential to national food security as the effective domestic demand for meat continues to grow in step with increasing per capita income. The poultry sector is currently a competitive business that is relatively free from government price and marketing restrictions and barriers to entry or exit. In this unrestrained environment, the private sector has made substantial investments in commercial poultry production. As a result, production in the early seventies grew in the range of 20 to 30 percent per annum, and in the eighties, the annual growth rate was between 10 and 15 percent. This increased production filled the growing gap between consumer demands for meat and protein and domestic supplies of beef, buffalo, goat, and mutton meat.

The report's econometric analysis indicates that poultry prices, production, and consumption react to the usual economic forces associated with a competitive industry. Variations in egg consumption are significantly associated with real egg prices and income changes. At current prices, per capita income and inflation rates, a one percent decrease in the egg price is assocaited with a .5 percent increase in consumption. A one percent increase in income is associated with a two percent increase in per captia consumption of eggs. On the supply side, a one percent increase in price elicits a one percent increase in the quantity of eggs supplied per capita. The analysis also shows that the farm price of eggs relative to the price of wheat, a proxy for returns relative to feed costs, is a significant supply variable for egg production.

Variations in chicken meat consumption are significantly associated with the real price of broilers, the per capita consumption of beef and buffalo meat, and per capita income. For instance, a one percen increase in broiler prices results in a .9 percent decrease in per capita consumption of chicken meat at current levels of red meat consumption, prices, income, and inflation. Conversely, a one percent increase in income is associated with a 2.2 percen increase in chicken meat consumption. Apparently, beef and buffalo meat substitutes for chicken meat consumption on a one-for-one basis. However, the substitutability of goat/-mutton for poultry meat proved statistically insignificant. On the supply side, a one percent increase in broiler prices stimulated a .7 percent increase in the quantity of chicken meat supplied per capita.

These demand and supply relationships are useful tools in evaluating alternative agricultrual policies that affect the egg and broiler industries. For example, a program to export 10 percent of the supply of eggs can be expected to increase the domestic egg price by approximately 20 percent. Should a short-

age of beef and buffalo meat develop on the order of one kilo per capita, it will take the poultry sector about six to seven years to fully compensate for the production shortfall. These same relationships can be used to assess the economic impacts of other factors such as increased wheat procurement prices, controls on maize production or prices, higher or lower inflation rates, or changes in growth rates of per capita incomes.

The poultry sector is an important residual demander of grains for feed purposes which includes broken rice, cracked and lower quality wheat and maize. As about 70 to 80 percent of its total production costs are associated with feed, the industry is financially pressed during deficit grain periods when human consumption takes precedence. Moreover, the variable and low quality of local feed ingredients is a major constraint to the sector's continued growth. Such quality problems can be resolved through the labeling and warranting of feeds and feed ingredients for nutritional content. A vast array of example regulations for accomplishing this task are available from a number of countries in various stages of development. The GOP should avail itself of this information to immediately design and implement a feed grain quality labeling and warranting program.

The feed mixing models now used by the industry are based on standard nutrient contents which are probably not applicable when using local, low quality feeds. Utilizing an optimization analysis that was specifically "customized" for local conditions, full fat soya was found to be a competitive ingredient in least-cost rations. When fish meal, meat meal, till cake, and corn gluten meal are in short supply, which will be the likely case as the poultry industry develops, soybean meal would become the lowest cost protein feed alternative. When maize, broken rice, and polished rice are in short supply, full fat soya becomes the lowest cost source of energy.

The use of soybean meal and full fat soya is currently limited because imports are restricted to feed manufacturers' "proven sales" and costs are further increased by the 10 percent sales tax fee. Moreover, individual feed manufacturers are not large enough to buy ship load quantities at lower freight rates. Nor can a single local feed manufacturer make volume sales to poultry producers not yet accustomed to using high quality feeds. Domestic feed manufacturers should be allowed, singly or in groups, to import soybeans, full fat soya and soybean meal without restricitions or taxes and an aggressive program should be carried out to demonstrate to farmers the responsiveness of poultry production to improved feeds.

Current processing and marketing practices will not sustain continued rapid growth of the poultry industry as the domestic market for its products becomes increasingly saturated. To

overcome this problem, the industry should invest in: egg gathering/holding stations with preparation, separation and sales of eggs by quality; plants for dressing, chilling and processing of carcasses into primal cuts for sale to different income groups; and information-based promotional activities and research to overcome consumer resistance to poultry consumption, as indicated by the preference for "desi" products versus the "machinie" products. This should be further encouraged by eliminating import duties for marketing machinery and synthetic materials used in packaging, as well as, an extension of the tax free status for poultry marketing activities.

The significant growth and investment in poultry production, as described above, was not accompanied by similar improvements in the supporting distribution and marketing system. As a result, domestic marketing margins for poultry products often move in the opposite direction expected for a free market, which negatively affects both the industry and consumers. When poultry product supplies increase in a competitive market and prices fall, marketing margins usually increase because distributors require the same or higher per unit returns to cover costs of distributing to a larger, more remote or less accessable group of consumers. When quantities placed on the market are low and prices are high, marketing margins decline as a percentage of total cost as the distributor's cost per unit remains constant or decreases as he uses less capacity for moving the product.

This anomaly is probably the result of substantial economies of scale encountered by middlement in marketing poultry products as the industry has developed. Other factors thought to interfer with normal movements in domestic marketing margins are the fluctuating seasonal demand for poultry products, the relocation of poultry operations from rural areas to urban markets, and a periodically overburdened transportation system. The negative impact of fluctuating seasonal demand can be substantially reduced through market development and consumer education. The last two factors will become increasingly unimportant as the poultry industry matures and the national transportation system is expanded and modernized. Middle men should consequently continue to be given a "free hand" in the poultry industry to perform their valuable services as competitive forces dictate.

In the past, substantial amounts of capital have been invested each year in poultry production without the appropriate management capabilities to survive and prosper in the poultry industry. To circumvent this situation, some of the funds not spent on poultry production research should either be augmented or set aside for research and extension in management and marketing. In the same vein, the industry could form management associations and the GOP could divert funding to management services provided by the Poultry Research Institutes.

The combined effects of inadequate management, low quality feeds, relatively high marketing costs, particularly for transportation and processing, and heavy, sustained subsidies by many of the major poultry exporting countries have rendered Pakistan uncompetitive in nearby Mid-eastern poultry import markets. Export subsidies could increase Pakistan's share of those markets, but the treasury costs would be so large as to make the earned foreign exchange far more costly than current exchange rates. In addition to the high treasury costs that would be required to finance poultry export subsidies, any subsidy that expands Pakistan's poultry exports would likely lead to some diversion of supplies that would otherwise be consumed domestically. Under current production conditions, increasing exports would sharply bid up the prices of already scarce feeds, which constitute more than one-half of typical production costs. The effect of increased production costs and reduced domestic supplies would be to cause higher retail poultry prices and reduced domestic consumption at a time when national percapita consumption is already remarkably low and retail poultry meat prices exceed retail beef prices.

As the poultry industry matures, it will be come increasingly necessary to accurately describe and analyze the sector, its activities, and the potential and/or realized impact of economic forces for the purpose of private sector investment and for GOP policy making. Currently, information is collected by several different organizations with little coordination among them. The result is conflicting data and the reporting of illogical marketing margins and seasonal price movements, as well as, incongruent inputs and their costs. This problem can be solved in several ways. For example, the Poultry Board could support a collaborative data collection effort, or MINFA's Livestock Division could take a stronger role by sampling and publishing represenataive data and information on the prices, marketing margins, production costs, and competitive structure of the industry.

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CHAPTER ONE

THE PAKISTAN POULTRY INDUSTRY: DEVELOPMENT AND CURRENT SITUATION

Prior to 1963 when commercially organized, large-scale poultry production began in Pakistan, poultry was raised in small, backyard flocks of four to ten birds -- later known as the desi (local) variety to distinguish it from the farm bird which was subsequently produced from imported strains. Desi poultry production customarily served three common agrarian objectives which, in decreasing order of importance, were: (a) to insure the availability of chicken meat to honor respected guests; (b) to supplement the diet of the senior male family members by replenishing energy lost in tilling and other heavy labor; and (c) to augment the income of the household through the sale of surplus eggs and chicken meat.

Income was thus not a prime motive to maintain the backyard flock. Desi poultry production requires little or no cash outlay; the chickens are scavengers and feed on crop residues and kitchen wastes. The availability of these residues and wastes regulates flock size. Production of desi eggs and desi chickens increased only modestly during the 1957-65 period, as indicated by the figures in Table I-1.

TABLE I-1. PRODUCTION OF DESI EGGS AND CHICKENS, 1957-1965

YEAR	EGGS (million)	CHICKEN (tons)
1957	359	7284
1958	359	n/a
1959	359	8270
1960	427	n/a
1961	427	n/a
1962	595	n/a
1963	484	n/a
1964	484	n/a
1965	470	10022
MEAN ANNUAL PERCENT INCREASE	3.42	4.07

Source: Economics of Poultry Production, West Pakistan Agricultural University, Lyallpur, 1969.

In 1963, a national campaign was launched by the President to produce more food. The objective of the campaign was twofold: (1) to encourage the consumption of a variety of foods, and (2) to relieve pressure on the demand for mutton, beef, and wheat products. The demand for these products was increasing with rising incomes and a growing population, while their availability was declining because of production constraints and costs. It was specifically recommended by the President that the production of chicken, eggs, and fish be supported and that equal production opportunities be provided to the industry.

Under the "Grow More Food" campaign, the government announced a tax exemption on income derived from poultry farming. Government officials, who were previously forbidden to undertake business activities, were permitted to enter poultry and agricultural production. Given the new policy, Lever Brothers Pakistan Ltd. began preparations to produce poultry feed in Pakistan, an enterprise in which they were engaged in other parts of the world. A small flock of genetically improved egg-layers was imported by them from England for experimentation that generated encouraging results.

Pakistan International Airlines collaborated with Shaver Poultry Breeding Farms of Canada and began a poultry breeding operation in Karachi. PIA-Shaver introduced a small flock of hybrid layer and broiler parent stock to supply day-old chicks. The PIA-Shaver chicks had considerably higher genetic performance potential than country-bred, desi chickens. The genetic potential of the laying strains, with a balanced nutrition, was to produce 240 eggs per housed bird. The genetic potential of the broiler strain was the capability to attain a weight gain of three pounds in eight weeks with a feed conversion ratio of 2.5. The desi chicken, by comparison, produced a maximum of 40-60 eggs per bird and gained no more than 0.5 pounds in an eight-week period.

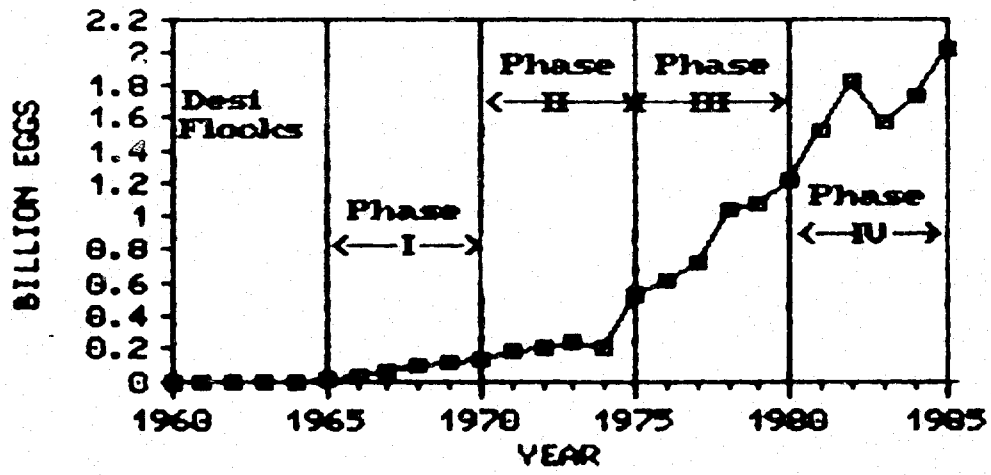
Together, Lever Brothers Pakistan Ltd. and PIA-Shaver Poultry Breeding Farms provided the two vital ingredients of modern commercial poultry production: (1) a genetically improved day-old chick capable of attaining higher production levels, and (2) a well-balanced poultry feed to support this production.

In 1964, two commercial broiler poultry farms opened in Karachi. Sunshine Poultry Farms and K & N's Poultry Farms each had a capacity to produce 1,200 broilers every four weeks. The equipment used for brooding, feeding, and watering was fabricated locally. Commercial poultry production on these farms proved to be a profitable venture.

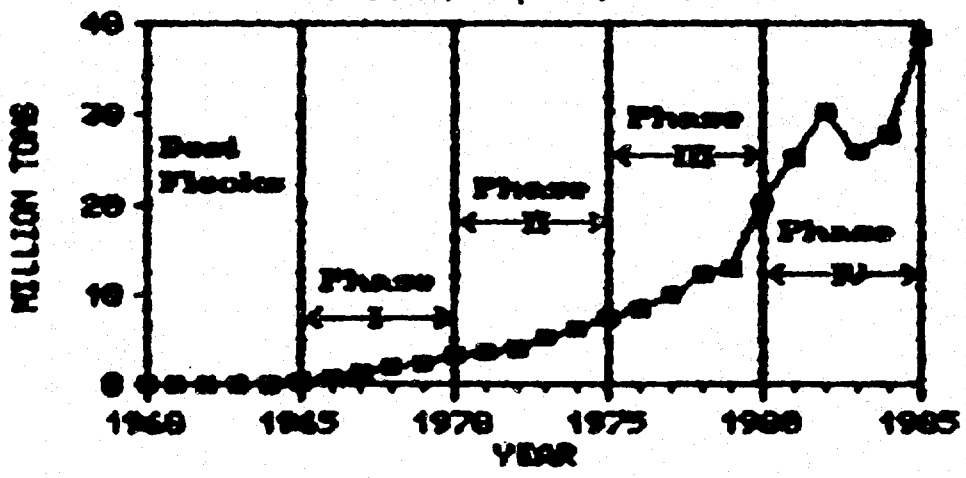
The subsequent development of Pakistan's poultry industry can be divided into four phases. During the introductory period, Phase I, genetically improved breeder flocks were imported and commercial production began in Pakistan. In Phase II institutions

to support commercial production were developed. The industry "comes of age" in Phase III when a poultry production boom occurs. In Phase IV the industry begins to mature and, from overinvestment and underutilized capacity, slides into a financial depression. These four phases, as they relate to changes in egg and meat production, are illustrated in Graphs I-1 and I-2.

GRAPH I-1. COMMERCIAL EGG PRODUCTION HISTORY, 1960-1985



GRAPH I-2. COMMERCIAL CHICKEN PRODUCTION HISTORY, 1960-1985



The following sections describe each of the four phases, which together span a period of twenty years.

I. Phase I: Introductory Phase, 1965-1970

The beginning of the introductory phase is marked by a series of major policy decisions taken by the Government of Pakistan. With these decisions,

- o the ban on import of parent stock and incubators was withdrawn, and imports were permitted under the Bonus Voucher System;
- o state-owned land could be leased for poultry farming at the rate of Rs 10 per year, on an annual renewal basis;
- o income derived from poultry farming was exempted from tax levy;
- o two meatless days were announced to encourage poultry and fish consumption and to reduce the demand for red meat. On these meatless days no red meat could be sold to butchers, and hotels and restaurants were not permitted to serve red meat dishes;
- o the serving of red meat was prohibited at parties numbering more than 150 guests; and
- o a Directorate of Poultry Production was established to provide extension services to the growing numbers of poultry farmers.

The effect of these incentives was a rapid expansion of poultry production, as indicated in Table I-2.

TABLE I-2. GROWTH OF COMMERCIAL PRODUCTION: INTRODUCTION PHASE I, 1965-70

	----FARM BIRD POPULATION----		--PRODUCTION OF EGGS AND MEAT--	
YEAR	No. of Layers (million birds)	No. of Broilers (million birds)	No. of Eggs (million)	Chicken Meat [1] (tons)
1965	0.05	0.20	9.00	222
1966	0.21	0.51	37.80	567
1967	0.38	1.01	68.40	1222
1968	0.61	1.70	109.80	1887
1969	0.69	2.10	124.20	2333
1970	0.78	2.79	140.40	3099
MEAN ANNUAL PERCENT INCREASE 1965-1970	73.2	69.4	73.2	69.4

[1] Includes broilers, cull birds, and cockerels.

Source: Pakistan Poultry Association.

The substantial increase in production, with expanded feed mill and hatchery capacity, was supported by the formation of an extension service, the development of specialized technologies for poultry production, and new government policies.

During the early years of Phase I the Directorate of Poultry Production was established at Karachi to deliver extension services and to promote disease control. The efforts of the Directorate played an important role in the expansion of the poultry business. Initially, no drugs or medicines were available on the open market to prevent poultry diseases. The Directorate encouraged Pfizer Laboratories Ltd. to produce poultry medicines for sale on the open market. Newcastle and Fowl Pox vaccines were produced at the Veterinary Research Institute in Lahore, and the Directorate supplied the vaccines to poultry farmers at no charge. The Directorate also established a small laboratory to diagnose poultry diseases.

In the mid-period of the introductory phase there were several developments: (a) two additional feed mills were established, M/s. Aftab Feeds, Karachi, and M/s. Wazir Ali Feeds, Hyderabad, bringing the total number of feed mills in Pakistan to three; (b) another hatchery, M/s Hybred (Pakistan) Ltd., was established with a Hyling franchise from the U.S.A.; and (c) the first integrated broiler unit, Pakistan Poultry Products, was developed with a capacity to process 200 broilers per hour. This unit had its own retail outlet for frozen broilers and operated a restaurant where only chicken dishes were served.

Toward the close of Phase I two trends were in evidence: (a) feed prices began to rise as the number of feed producers and their capacity to produce rose substantially with no corresponding increase in the supply of raw materials for feed production; and (b) the production capacity of feed mills thus remained seriously underutilized. In the face of stiff competition, M/s. Wazir Ali Feed Industries closed their business. In an attempt to check the rise in feed prices, the Directorate of Poultry Production managed the procurement of maize under the World Food Program. While maize was sold to feed mills at lower prices, feed prices were controlled -- a measure that provided temporary relief to poultry farmers.

This first phase was also characterized by marketing difficulties. Farm-produced chicken and eggs were not well received by wholesalers, retailers, or consumers, who found the farm products "artificial". The eggs were uniform in size, white in color, and resembled duck eggs. The broilers, too, were uniform in size, all had off-white plummage, and were docile, -- unlike the multi-colored, multi-sized, and more agile desi chickens. Both farm chickens and farm eggs were thought to have lower nutritional value, and consumers were willing to pay only one-half the price of desi products for farm products. In addition, the price of eggs varied remarkably between winter and summer months, and broiler prices were depressed during Ramazan, Moharram, and the mango season.

Because of rising feed prices, expanding poultry production levels, and declining product prices, poultry producers formed a lobby to promote new policies and to facilitate the continued growth of the industry. They formed the Karachi Poultry Producers Trade Group and affiliated with the Karachi Chamber of Commerce and Industry.

During Phase I policymakers gradually developed a perception that the Pakistani diet was deficient in protein and that poultry products could alleviate the deficiency. In 1968 the Planning Commission of Pakistan requested current data on protein needs in Pakistan from the National Science Council. "The Protein Committee" of the National Science Council recommended a minimum daily protein consumption of 68.5 grams per capita, with 27.4 grams deriving from animal products. The Committee estimated the available animal protein supply at only 12.2 grams per capita per day, yielding a deficit of 15.2 grams. With a rapidly expanding population and a diminishing supply of red meat, the Committee projected an increase in this animal protein deficit.

In the same year, the Agriculture University at Lyallpur prepared a study for the Planning Commission on meat production in Pakistan. The authors of the report observed that meat production was likely to stagnate or decrease over time. With increasing demand they projected a growing meat deficit, as illustrated in Table I-3.

TABLE I-3. PROJECTED DEMAND AND SUPPLY OF MEAT IN PAKISTAN, 1970-1985

	DEMAND			TOTAL SUPPLY	DEFICIT
	Urban	Rural		Total	
YEAR		(1000	tons)		
1970	180	220	400	370	30
1975	280	270	550	272	278
1980	400	330	730	276	454
1985	570	380	950	279	671

Source: Economics of Poultry Production, West Pakistan Agricultural University, Lyallpur, 1969.

In response to the findings of the Protein Committee, the National Science Council recommended to the Planning Commission that poultry production could help to reduce Pakistan's protein ^[deficiency. This recommendation, combined with the activities of the Karachi Poultry Producers' Trade Group, resulted in the Governor's Conference of 1969. The Conference approved further incentives to the poultry industry, including:

- o permission to import parent stock and incubators on Cash License under Free-List, free of all import duties;

- o establishment of the Poultry Research Institute and strengthening of disease diagnostic facilities; and

- o supply of electricity to poultry producers at agricultural or concessional rates.

In summary, a number of catalytic forces shaped the early development of the poultry industry. These forces included potential profits in the industry, availability of technologies, and supportive government policies resulting from the perception of a protein deficiency in the Pakistani diet. The early development of the industry was also characterized by emerging problems, including rising feed costs, disease outbreaks, and consumer preferences for desi products.

II. Phase II: Institutional Development, 1971-1975

As poultry production became a significant enterprise in the agricultural economy of Pakistan, the Government strengthened institutions servicing the new industry. The Federal Poultry Board was established as a national coordinating body, and a number of regional research institutes and committees were created with various support functions. In Phase II producers also struggled with the adverse effects of government programs, e.g., the ban on export of poultry products, and the consequences of some major planning flaws, such as the establishment of poultry estates without adequate sanitation and health controls.

The Federal Poultry Board, chaired by the Economic Advisor to the Prime Minister, was constituted with representation of all Federal Ministries and Provincial Departments of Agriculture and Livestock. The chairman and committee members of the Karachi Poultry Producers' Trade Group and Punjab Poultry Farmers' Association were ex-officio members. The Federal Poultry Board was vested with the highest authority to recommend on poultry production matters; it is now the central board for initating policy and changing industry regulations.

A committee modelled after the Federal Poultry Board was constituted in the Province of Sind to deal with the problems of poultry farming. It was chaired by the Secretary, Food and Agriculture, Government of Sind.

Gradually, both Government and producers perceived the need for research, especially in the areas of poultry disease and nutrition. The Poultry Research Institute was established by the Government of Sind with the assistance of UNDP/FAO funds. The scope of its activities included extension services, disease diagnosis, research on poultry nutrition, environment and housing, genetics, and marketing. The Directorate of Poultry Development was established in the Punjab with objectives consistent

with those of the Directorate of Poultry Production in Karachi.

Production incentives initiated during Phase I were enhanced during Phase II. Included among these incentives were:

- o exemption of income derived from poultry feed sales from the levy of income tax;
- o exemption of sales of poultry feed from the levy of sales tax; and
- o greater emphasis on poultry production placed by the Fourth FiveYear Plan.

As an enterprise, the poultry business continued to attract investors. Refugees from East Pakistan found it relatively easy to establish poultry farms without obtaining the sanctions and licenses usually required to begin an enterprise. After the nationalization of cotton ginning factories in the early 1970s, cotton handlooms in rural Punjab were abandoned and the area developed for this purpose was converted to poultry farms.

The data in Table I-4 illustrate the marked expansion in the poultry business in the early 1970s. In 1970 the number of layers was 780,000; by 1975 farm layers numbered 2,400,000. Broiler production increased from 2.79 million to 6.60 million over the same period.

TABLE I-4. GROWTH OF FARM-BIRD POPULATION IN PAKISTAN, 1970-75

YEAR	No. of Layers (million birds)	Production of Broilers (million birds)
1970	0.78	2.79
1971	0.87	3.21
1972	0.95	3.34
1973	1.12	2.45
1974	1.00	3.12
1975	2.40	6.60
MEAN ANNUAL PERCENT INCREASE 1970-1975	25.2	18.8

Source: Pakistan Poultry Association.

Associated increases in egg and chicken production followed the rise in inventory numbers. Production figures for the same period are shown in Table I-5.

TABLE I-5. PRODUCTION OF EGGS AND CHICKEN MEAT, 1970-75

YEAR	No. of Eggs (million)	Chicken Meat [1] (tons)
1970	140.40	3099
1971	191.40	3523
1972	209.00	4025
1973	246.40	5250
1974	220.00	6205
1975	528.00	7350
MEAN ANNUAL PERCENT INCREASE 1970-1975	30.3	18.9

[1] Includes broilers, cull birds, and cockerels.

Source: Pakistan Poultry Association.

When the number of commerical poultry farms expanded, the number of hatcheries and feed mills supplying production inputs also grew. During Phase II the number of hatcheries increased from three to twelve. Table I-6 presents the name, location, and year of establishment of hatcheries and breeding farms.

TABLE I-6. YEAR OF ESTABLISHMENT AND LOCATION OF HATCHERIES AND BREEDING FARMS, 1970-1975

NAME	LOCATION	YEAR ESTABLISHED
Arbor Acres Pakistan Ltd.	Lahore	1970
Quadria Poultry Breeders	Lahore	1971
Euribrid Murgha Valley Poultry Breeding House	Rawalpindi	1971
Karachi Farmers	Karachi	1972
Marakash Poultry Breeders	Karachi	1973
Al-Madina Breeders	Karachi	1974
Siegoz Poultry Farms	Karachi	1974
Best Birds	Lyallpur	1974
K&N Poultry Breeding Farms	Karachi	1975
Golden Breeders	Karachi	1975
M. A. Farms	Karachi	1975
Star Argo	Karachi	1975

Source: Directorate of Poultry Production and Research, Government of Pakistan.

The rapid growth in the poultry industry was not attained without resistance and difficulties. Pakistan had entered the international market, and exports of poultry products grew. In 1972, with growing poultry exports and their upward effect on the domestic prices of poultry products, the government banned all exports. The resulting increase in the domestic supply of poultry products was not met by increases in domestic demand. In effect, the export ban blocked a residual market that absorbed excess production and relieved downward pressure on poultry prices. Losses to the industry followed the imposition of the export ban, and egg production declined.

In the domestic market, poultry producers faced consumer resistance. Apparently, the resistance was based on certain popular beliefs. For example, popular beliefs held that if an expectant mother consumed eggs she was likely to miscarry; eggs were considered to generate heat in the body and were not consumed during summer months; chicken was to be served only to honored guests; eggs were to be consumed only by senior male family members; women were not to consume eggs because they are a sex-stimulant; and girls were denied eggs to delay puberty.

Responding to a situation of new entrants and considerable consumer resistance, the Karachi Poultry Producers' Trade Group launchhed a Sales Promotion Campaign to highlight the advantages of poultry products and attempt to dispel superstitions. At the General Body Meeting held for this purpose, the Group passed a resolution asking hatcheries to contribute three paisa per chick sold and collect the same amount per chick from their customers. Feed mills were asked to contribute ten paisa for each bag of feed sold. Only three hatcheries and three feed mills agreed to participate in the plan. Funds were collected and a campaign was launched. Market prices improved, but funds were exhausted sooner than expected. As the number of hatcheries and feed mills increased, the cooperation of members faded. New entrants did not agree to participate in the scheme, and the campaign was abandoned.

The combined effect of the ban on poultry exports and consumer resistance to poultry products contributed to heavy farmer losses in 1972. In the following year farmers took prevailing 1972 prices as a signal to curb production. Those who suffered losses closed their businesses or reduced their production levels. Later, in 1974, as production levels decreased, egg prices increased. The government interpreted this price trend as indicative of a supply shortage and a need to stimulate production.

The Government of Sind decided to lease land to poultry farmers and designed several poultry estates, of approximately 500 acres each, to stimulate production. The estates were leased to some 100 poultry farmers at approximately four acres per farmer, with a distance of no more than fifty feet between farms. According to the Pakistan Poultry Association, the Department of Animal Husbandry opposed the establishment of these estates, but the local administration continued to develop them.

Phase II is characterized by both the greatest success of the poultry industry and its greatest failure. A dramatic increase in poultry production resulted from the nationalization of industries in other sectors, the easing of entry requirements into poultry farming, and associated investments. At the same time, the clustering of production units led to large disease outbreaks, and the lack of marketing facilities limited industry growth.

III. Phase III: The Production Boom, 1976-1980

From 1974 to 1977 the Government of Sind followed an aggressive policy to attract investment in poultry farming by offering estate land under ten-year leases. The lengthened lease period attracted an additional 400 farms to the district of Karachi alone.

Concurrently, the nationalization of other industries, ensuing labor unrest, and a relatively poor financial climate contributed to the entry of capital into the poultry industry, particularly in the Punjab. Poultry production levels boomed. Commercial egg production increased from 624 million eggs in 1976 to 1,223 million eggs in 1980. Broiler production increased from 7.2 million birds to 17.4 million birds during the same period. The increase in production and the associated numbers of broilers and layers are shown in Tables I-7 and I-8.

TABLE I-7. GROWTH OF FARM-BIRD POPULATION IN PAKISTAN, 1975-80

YEAR	No. of Layers (million birds)	Production of Broilers (million birds)
1975	2.400	6.600
1976	2.840	7.200
1977	3.321	8.010
1978	4.722	9.750
1979	4.905	8.847
1980	5.600	17.420
MEAN ANNUAL PERCENT INCREASE 1975-1980	18.5	21.4

Source: Pakistan Poultry Association.

TABLE I-8. PRODUCTION OF EGGS AND CHICKEN MEAT, 1975-80

YEAR	No. of Eggs (million)	Chicken Meat [1] (tons)
1975	528.000	7350.000
1976	624.000	8422.395
1977	730.620	9844.896
1978	1038.840	12352.152
1979	1079.100	12838.689
1980	1223.200	20215.812
MEAN ANNUAL PERCENT INCREASE 1975-1980	18.3	22.4

[1] Includes broilers, cull birds, and cockerels.

Source: Pakistan Poultry Association.

Despite large production increases, the marketing structure of the industry remained as it was prior to the introduction of intensive poultry farming. The number of marketing outlets remained constant; the number of middlemen increased only slightly; packing and distribution methods remained unchanged; and the transportation of live broilers over long distances was not practical or economic. The increased volume of production was forced through limited marketing channels.

Marketing problems are evidenced in the year-to-year changes in product prices relative to feed prices. At the beginning of Phase III poultry feed prices began to exhibit an upward trend. By the middle of Phase III the ratio of egg prices to mash prices had dropped to 3.8, compared to the five and six ratio levels that had prevailed in the earlier phase. The declining ratio indicates that, under increasing production efficiencies, egg producers incurred substantial losses, with a gradual decline of the price ratio of broilers to finisher mash. Poultry product prices and feed prices are shown in Table I-9.

In summary it can be said that serious financial setbacks to poultry farming in Pakistan culminated from sudden increases in poultry production; continued consumer resistance; discontinuation of poultry exports; disease problems; high relative prices of poultry feed; deteriorating feed quality; and a limited supply of feed ingredients. Farmers faced with financial problems felt the need for a united voice to publicize the problems of the poultry industry and to lobby for remedial measures. On the advice of the Federal Poultry Board, they formed the Pakistan Poultry Association which was incorporated and licensed in 1979. Its membership is open to all Pakistan poultry producers.

TABLE I-9. POULTRY PRODUCT/FEED PRICE RATIOS, 1970-1985

YEAR	----PRODUCT PRICES---- Eggs (Rs/doz)	Chicken Meat (Rs/kg)	----FEED PRICES----- Layer Mash (Rs/50 kg bag)	Broiler Finisher	---PRICE RATIOS--- Egg/Mash (Ratio of	Meat/ Finisher Rs/kg)
1970	2.69	4.18	30.00	34.00	6.79	6.15
1971	2.59	4.13	33.10	35.10	5.93	5.88
1972	2.50	4.62	34.10	36.10	5.55	6.40
1973	3.34	6.03	49.50	53.85	5.11	5.60
1974	4.23	7.93	55.90	60.00	5.73	6.61
1975	4.33	9.24	72.90	80.15	4.50	5.76
1976	4.69	9.80	82.80	89.05	4.29	5.50
1977	4.91	11.46	96.95	103.30	3.84	5.55
1978	5.09	13.10	94.00	98.50	4.10	6.68
1979	4.95	13.54	97.20	106.75	3.86	6.34
1980	6.56	14.40	105.35	118.20	4.72	6.09
1981	6.55	14.54	120.27	136.97	4.13	5.31
1982	6.25	15.37	130.63	147.38	3.62	5.21
1983	8.50	17.79	134.83	151.50	4.78	5.87
1984	7.94	18.13	153.66	169.50	3.91	5.35
1985	6.89	17.98	146.67	167.50	3.56	5.37
MEAN ANNUAL PERCENT CHANGE						
1970-1975	10.0	17.2	19.4	18.7	-7.9	-1.3
1975-1980	8.7	9.3	7.6	8.1	0.9	1.1
1980-1985	1.0	4.5	6.8	7.2	-5.5	-2.5

Source: Directorate of Poultry Production and Research, Government of Pakistan.

The events in the 1976-1980 period are of particular interest in that most of the growth in poultry production was stimulated by events that occurred outside the industry, including the nationalization of other industries. By contrast, the problems of the poultry industry originated within the industry. Disease outbreaks, for example, were partially caused by farmers' decisions to locate farms at close proximity. Problems of higher production cost were associated with the deteriorating quality of feed and feed ingredients.

IV. Phase IV: Depression and Adjustment, 1981-1985

Problems faced by the poultry business intensified in Phase IV. Disease problems posed a serious threat to the sound development and consolidation of the industry. The large Karachi poultry estates began to close in 1974, and a number of poultry farms closed in other areas of Sind. Inventory decreases resulted

in decreasing production levels. A review of the production and inventory figures in Tables I-10 and I-11 reveals a drop in national commercial production during Phase IV. Production decreased particularly in Sind, and any increase in production during the period was reflective of increases in the Punjab, Baluchistan, and NWFP.

TABLE I-10. GROWTH OF FARM-BIRD POPULATION IN PAKISTAN, 1980-85

YEAR	No. of Layers (million birds)	Production of Broilers (million birds)
1980	5.600	17.420
1981	6.910	21.770
1982	8.290	20.000
1983	7.200	21.420
1984	7.900	23.831
1985	9.176	34.534
MEAN ANNUAL PERCENT INCREASE 1980-1985	10.4	14.7

Source: Pakistan Poultry Association.

TABLE I-11. PRODUCTION OF EGGS AND CHICKEN MEAT, 1980-85

YEAR	No. of Eggs (million)	Chicken Meat [1] (tons)
1980	1223.200	20215.812
1981	1520.000	25119.615
1982	1823.800	30202.249
1983	1584.000	25887.826
1984	1738.000	27828.620
1985	2018.720	38481.271
MEAN ANNUAL PERCENT INCREASE 1980-1985	10.5	13.7

[1] Includes broilers, cull birds, and cockerels.

Source: Pakistan Poultry Association.

In Phase IV, farmers as a group generated negative returns. Aside from disease problems, high feed ingredient prices and low feed quality contributed to rising production costs. The development of a larger market to service poultry producers was constrained by (a) a lack of improved marketing channels and organized marketing institutions, and (b) the absence of promotional activities. Local taxes imposed by the Union and District Councils and a multiplicity of other local taxes added to the rise in production cost.

Faced with disease problems, lower productivity, and numerous environmental and climatic difficulties, some of the more successful farmers decided to produce under more modernized conditions and to establish their poultry farms in the cooler, less polluted areas of the country. Breeding farms in Karachi and the Punjab thus relocated to Abbottabad, to the base of the Murree Hills, and to the Valley of Quetta. In Phase IV, farmers built houses with controlled environments for broilers, breeders, and commercial layers.

During the most recent phase, the poultry industry has become large enough to be recognized as a contributor to the national economy, in terms of capital investment, employment, and the use of modern technology. The following sections summarize briefly some of the contributions of the industry and some structural aspects of the business.

A. Investment in Poultry Production

Table I-12 shows a total investment in poultry farms, hatcheries, and feed mills of Rs 4326.533 million at 1985 current costs. The increase in investment over 1976 is 273 percent. Exemption from income tax has contributed to generating new capital formation, and various other incentives have helped to maintain a constant flow of capital into the poultry industry. Investment in the marketing of poultry products and other supporting industries is not included in total investment figures. The data below indicate that poultry production in Pakistan is relatively more capital intensive than other businesses of similar size.

B. Employment Provided by the Poultry Industry

In 1976, the number of persons employed in poultry farming, hatcheries, and feed production totaled 5,061. In 1985 that number increased to 19,054. These figures include technical manpower, e.g., veterinarians, and semi-skilled workers, e.g., assistant managers, supervisors, and poultry and hatchery attendants. Within the poultry industry the highest proportion of employees is engaged in semi-skilled jobs. The figures presented in Table I-13 exclude job opportunities offered by the government and related institutions, the marketing system, and by supporting industries.

TABLE I-12. INVESTMENT IN PAKISTAN'S POULTRY FARMING SECTOR, 1976, 1981, 1985

SUBSECTOR	INVESTMENT		
	1976	1981	1985
	(million Rupees)		
Layer farms	346	707	1264
Broiler farms	152	665	797
Hatcheries	270	689	1072
Breeding farms	97	257	377
Feed mills	295	490	816
TOTAL	1160	2808	4326

Source: Pakistan Poultry Association.

TABLE I-13. EMPLOYMENT PROVIDED BY THE POULTRY SECTOR, 1976, 1980, 1985

CLASSIFICATION	EMPLOYMENT		
	1976	1980	1985
	(no. of persons)		
Skilled workers	304	636	1124
Semi-skilled workers	3058	6413	13789
Unskilled workers	1699	3758	4141
TOTAL	5061	10807	19054

Source: Pakistan Poultry Association.

C. Industry Competition

No single hatchery producing broiler chicks holds more than a 15 percent share of total market sales. About eight hatcheries supply 50 percent of total sales; the remaining 50 percent of broiler chick sales are provided by some 60 hatcheries. In the layer chick market, two hatcheries provide 50 percent of total sales while nine hatcheries provide the remaining 50 percent. The largest market share of any one feed company in the Punjab or Sind is under 10 percent.

D. Operating Efficiency

Current levels of efficiency are achieved with 46 percent utilization of installed hatchery capacity, 35 percent feed mill capacity utilization, and approximately 50 percent

capacity utilization in layer parent stock production. On an average, egg-laying birds produce 220 eggs, as against an industry performance goal of 240 eggs. Broilers tend to attain a body weight of 1,500 grams in 49 days at a feed conversion ratio of 2.5. The industry's standard for broiler production is a body weight of 2,000 grams at a feed conversion ratio of 1.96. Broiler breeding stock produce, on an average, 80 chicks per mother, as compared to the industry standard of 139 chicks per mother.

V. Summary

The commercial poultry industry in Pakistan emerged through the combined efforts and foresight of the Government and of industry developers. In slightly over 20 years, the industry has developed from a concept to a reality, producing nearly 10 percent of the meat supply of Pakistan. The concept began in 1963 with the "Grow More Food" campaign. Government officials then perceived that the production of beef, buffalo, goat, and mutton could not keep pace with rising meat needs resulting from a growing population and improved income levels. Two eminent companies, PIA-Shaver and Lever Brothers Pakistan Ltd., introduced commercial day-old chicks and prepared feeds. Other industry pioneers followed: Sunshine Poultry Farms and K & N Poultry Farms in broiler production, and Pfizer Laboratories Ltd. in poultry medicines.

The early poultry ventures, involving risks, were supported by government policies that exempted poultry production from national tax levies and permitted producers to import breeder stock and equipment. The Government of Pakistan also established the Directorate of Poultry Production which provided extension services to the growing numbers of poultry farmers. As the industry matured in the early 1970s, a Federal Poultry Board was formed to coordinate government and industry activities in the layer and broiler business. Research services were offered through the Poultry Research Institute with the assistance of UNDP/FAO funds.

During the early 1970s, serious flaws in the development process began to emerge. Poultry farms were clustered together, promoting the spread of disease in the poultry population. The ban on poultry exports eliminated the residual market that cushions producers from seasonally low prices and periods of heavy domestic market supply. Marketing facilities remained limited, and product promotion, necessary to expand demand, was not developed.

In the late 1970s, the poultry production boom hit a market system that was ill prepared for the large volume of supply. The climb in poultry prices slowed while production costs rose. This trend, apparent in the late 1970s, became acute during the 1980s and has resulted in the current financial depression. Table I-14 illustrates the diminished growth rates resulting from the combination of problems besetting the industry.

TABLE I-14. SUMMARY OF GROWTH RATES OVER EACH PHASE OF POULTRY DEVELOPMENT, 1965 TO 1985

YEARS	------FARM-BIRD POPULATION------ (mean annual % increase)		PRODUCTION OF EGGS AND MEAT (mean annual % increase)	
	No. of Layers	No. of Broilers	No. of Eggs	Chicken Meat
1965-1970	73.2	69.4	73.2	69.4
1970-1975	25.2	18.8	30.3	23.4
1975-1980	18.5	21.4	18.3	22.4
1980-1985	10.4	14.7	10.5	13.7

Industry adjustments will be required to permit future growth in poultry production. These adjustments will be painful, as farmers restrain production, adjust to the capacity of the market, and seek management expertise and technology to improve production efficiency and to develop new and broader markets.

CHAPTER TWO

A PRICE, DEMAND, AND SUPPLY ANALYSIS OF THE PAKISTAN POULTRY INDUSTRY

The terms of reference for this study request the development of an econometric model for poultry products that can be used by policy analysts to estimate the effect on the poultry market of changes in the supply and demand parameters. This econometric model can be further used to estimate the present and future supply-demand balances of eggs and poultry meat, and the derived demand for day-old chicks, hatching eggs, and poultry feeds. In commenting on the terms of reference, the Finance Division of the Government of Pakistan advised the team to also assess the export potential for poultry products.

In view of these requirements, Chapter Two is divided into five major sections Section one provides an overview of the poultry industry in Pakistan. Sections two and three describe the structure of the poultry industry and the poultry market system. In section four, econometric models of the egg and poultry markets are presented, and product availability and prices are projected under various scenarios. The potential for export of poultry products is discussed in section five.

I. Overview of the Pakistan Poultry Industry

In 1969, the West Pakistan Agricultural University published one of the pioneering studies of the modern poultry industry, Economics of Modern Poultry Production in West Pakistan. The authors of the study noted that poultry production had long remained a "neglected and unimportant sideline" of Pakistan's agricultural industry. With increasing demand for eggs and poultry meat, modern poultry farming was emerging as a commercial enterprise. The increase in demand resulted from industrialization, urbanization, and a rise in per capita income. The authors predicted that the commercial poultry industry would grow to fill the gap between the demand for meat and the available supply of beef, mutton, and desi birds. They envisioned the future development of the commercial poultry industry around the higher income, urbanized areas of Karachi, Lahore, Rawalpindi/ Islamabad, Lyallpur, Gujranwala, Sahiwal, Hyderabad, and Multan.

Until the late 1960s, poultry meat was valued as a special dish in the higher income households of Pakistan. At this time, poultry was produced mainly in small backyard flocks, with little cash outlay. In the late 1960s, population growth and rising farm and urban incomes began to outpace growth in desi poultry production and created a widening gap between the demand for and

the supply of poultry meat. The consequent rise in poultry meat prices relative to mutton and beef prices encouraged the production of commercial chicken. The initial breakthrough in commercial production may be attributed primarily to the leadership of the PIA-Shaver partnership and the vigorous extension activity of the Livestock Department.

In commercial poultry production, the adoption lag typical of technology transfer in agriculture was shortened by a supply of coarse grains provided under the PL 480 program. This program not only had a stabilizing impact on the price of domestic feed grains but also created a residual supply of grains for chicken feed. In the initial phase expected profitability, combined with the relative ease of divisiblity of the business, encouraged the entry of a large number of small investors.

During the 1970s, policy measures designed to meet self-sufficiency in food resulted in structural changes in Pakistan's agricultural resource base. The expansion of irrigated acreage accelerated the production of irrigated wheat, rice, sugar cane and other crops at the expense of dryland production of coarse grains. The net effect of these policy measures was to increase both the supply of grains for human consumption and the residual supply of grains available for production of poultry feed.

From 1981 to 1985 increases in grain yield and total production slowed. In two of these years, major decreases in yield and production were reported. This decrease in total grain production can be largely attributed to declining profitability in production of food and fiber cash crops under irrigated conditions, and to stagnating or decreasing yields in conventional coarse grain varieties. A small but significant technical breakthrough in maize production has been accomplished through the introduction of hybrid and synthetic varieties. Larger-scale adoption of these varieties is limited by management requirements and the costly, energy-intensive input mix necessary to produce them under optimal conditions.

Commercial poultry production is unique among the various types of meat production because it relies heavily on the conversion of grain. Goats, beef, sheep, and desi birds (the other major contributors to Pakistan's meat supply) scavenge or consume roughages such as grass, berseem, alfalfa, and fodder from maize, wheat, sorghum, or rice crops.

The dependence of commercial poultry production on residual availabilities of grain jeopardizes the industry during periods of grain crop shortage. Human consumption of grain is a first priority. Feed costs, composed primarily of the costs of grain and high protein feedstuffs, account for nearly two-thirds of the total cost of producing commercial eggs and poultry meat.

Poultry farmers are increasingly exposed to risk and uncertainty resulting from the underdeveloped and limited market environment. With rising prices of feed ingredients and other inputs, the

viability of the industry is largely dependent on an increasingly narrow return to management. The high rate of turnover in production units is symptomatic of an elimination process. Survival in the poultry industry is associated with larger-scale units, integrated production and marketing, and scientific management.

Recently, fiscal incentives, liberalization of import regulations for breeder stock and equipment, and the support of credit programs extended by the Agricultural Development Bank of Pakistan have fueled the growth of the hatchery industry. Pakistan is believed to enjoy a locational advantage because of its proximity to the Gulf States and Iran. A pattern of loose expansion in the hatchery industry has emerged and is responsible, to some extent, for lowering the health and genetic standards of chicks. As a supporting industry to poultry production, hatchery production is also experiencing an adjustment in size of operation.

The current situation in the poultry industry is characterized by the following features:

- the incidence of high turnover among farm production units attributable to the flow of remittance money into smaller scale units without a matching flow of suitable management expertise;

- preferential establishment of poultry estates on state land contracted under long-term leases to influential individuals, some of whom sub-lease their grants to others;

- a trend toward integrated, large-scale chicken production, necessary to the survival of hatcheries, feed mills, and commercial layer and broiler units because of rising input prices relative to product prices;

- the attraction of large business interests to the commercial poultry industry as a result of reduced taxation and other fiscal incentives; and

- the exposure of the poultry industry to high risks and uncertainty, despite the accelerated growth rate achieved over the last decade, due to the absence of investments in marketing and storage facilities, limited support of public research, and and inadequate development infrastructure.

The commercial poultry industry now produces a significant proportion of Pakistan's meat supply. The industry is unique in that it has "modernized" without proceeding through the usual long, evolutionary phase. A large part of the industry has modern production facilities with controlled environments, caging, and automated feed, and automated manure removal. This technology was acquired directly from the world commercial poultry industry.

The overall development of the commercial poultry industry has been a success for the economy of Pakistan and for the government

and business interests that nurtured it. After such rapid development, the industry now faces a series of problems symptomatic of any new industry. These problems include a painful investment adjustment that will eliminate inefficient producers and necessitate new investment in marketing and management. Industry size will also require that the government or the industry regulate the quality of chicks, feed, feed ingredients, and disease control practices.

II. The Structure and Functioning of the Poultry Industry

A. Components of the System

The commercial poultry industry produces two major products -- meat and eggs. Marketable broilers are produced within eight weeks of their placement. Egg production takes more time following, more or less, an annual cycle. Layers are kept for approximately 18 weeks in a grower house before they are brought to production. After 18 weeks they are placed in a laying cage where they produce eggs for a 40 to 60-week period.

Broiler and egg production require several supporting activities. The hatchery industry provides day-old broiler and layer chicks. Hatcheries purchase their hatching eggs from breeder farms, and breeder farms depend on producers of breeding stock. Substantial quantities of feed are purchased from feed mills that premix the required ingredients. The flow of products through the poultry industry is depicted in Illustration II-1.

Feed millers in Pakistan are dependent to a great extent on the poultry industry which constitutes the principal component of demand for their product. Manufactured feeds are used extensively only in commercial poultry and dairy production. The demand for manufactured feed is roughly equal in both broiler and layer production. The layer industry houses about eight million birds per year, while the broiler industry produce 7 to 8 million birds in two month cycles, or 43 to 48 million birds per year.

Some broiler and layer producers mix their own feed with purchased ingredients. In personal interviews, a number of poultry producers stated that home mixing of feed is a growing trend. However, the aggregate estimates shown in Table II-1 do not support this view. The figures indicate a higher proportional increase in commercial feed purchases in relation to broiler and layer production. Feedmill production grew by 24 percent per year from 1980 to 1984, while production of broilers and layers grew by only 20 percent and eight percent, respectively.

ILLUSTRATION II-1. THE PAKISTAN COMMERCIAL POULTRY INDUSTRY

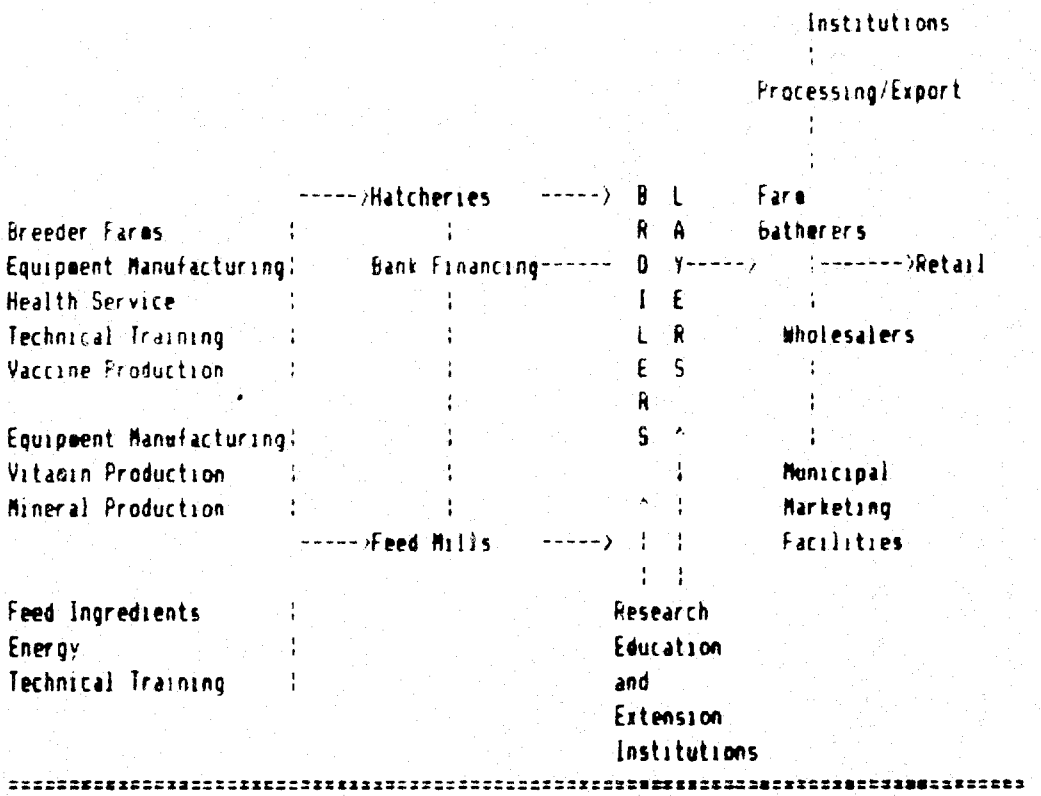


TABLE II-1. COMMERCIAL POULTRY SYSTEM

	INPUTS						POULTRY FARMS					
	Feed Mills		Breeder Farms		Hatcheries		Layer			Broiler		TOTAL FARM INVESTMENT
YEAR	No.	Production (000 tons)	No.	Stock (000 birds)	No.	Chick Production (mil birds)	No.	Eggs (mil)	Culls (mil tons)	No.	Production (mil tons)	(mil Rs)
1977	17	124	30	170	23	19.9	1450	730	2660	725	7610	915
1980	27	207	55	220	41	28.5	2030	1142	4450	1120	16550	1459
1984	51	619	201	780	100	63.4	3684	1920	6025	3482	40945	3600
MEAN ANNUAL PERCENT CHANGE												
1977-80	12	14	16	7	16	9	9	12	14	11	21	12
1980-84	14	24	30	29	20	17	13	11	6	25	20	20

Source: Poultry Research Institute, Rawalpindi.

Feed accounts for 50 to 80 percent of the total cost of producing broilers and eggs and is one of the major factors in determining production efficiency. Temporary scarcities of energy feeds

(maize, wheat, and sorghums) and protein feeds (fish meals, cottonseed, meal and soyabean meal) have tended to limit production throughout the development phase of the commercial poultry industry. Despite these limitations, new investors continue to build feed mills, anticipating continued growth in the demand for poultry feeds.

Since a large proportion of capital is borrowed, and since interest rates are high, day-old chicks are the second largest cost item in producing broilers and eggs. Despite the 20 percent growth in hatchery numbers over the last five years, the price of day-old chicks has remained relatively high. Apparently, investments have been made anticipating growth in the poultry industry and potential appreciation in land values near the population centers of Karachi, Lahore, Faisalabad, and Islamabad. The growth of hatchery capacity has been considerable relative to growth in other sectors of the poultry industry. A "shakeout" will undoubtedly occur as adjustments are made to compensate for the actual size of the day-old chick market.

Once produced, broilers and eggs are sold to middlemen who collect egg and broiler supplies from farms and sell them to wholesalers or directly to retailers in nearby cities. Most broilers are sold live to the retailer or the consumer. This method maintains a fresh product when cooling and freezing may cost more than the customer is willing or able to pay.

Despite growth in the volume of broiler and egg sales over the last ten years, there is no evidence that marketing facilities for poultry products, within the city, have expanded. Presently, municipal market facilities are not adequate to handle the physical volume of poultry products effectively and most products move through an alternative distribution network outside municipal channels. The scope of the alternative system is also restrictive in that a collector cannot transport more than 1,000 birds at one time. Any remaining birds are marketed later, at a sub-optimal point in time.

Only three processing facilities exist in Pakistan, and an insignificant number of birds are marketed through processing facilities that slaughter, chill, freeze, and package. The existing facilities sell mainly to institutions, i.e., hotels, restaurants, and the army.

Eggs are also sold directly from cases and other containers without cleaning, candling, grading, or special packaging. Collecting stations, which are usually early signs of market development, have not yet been built although the Pakistan Poultry Association and several companies have expressed interest in building stations for storage and grading.

According to the Pakistan Poultry Association and the Poultry Research Institute, there is little promotional activity relating to broiler meat and egg products in Pakistan. Consumers tend to prefer desi chicken meat and eggs to the commercial products,

which sell at a discount.

Chicken is a luxury meat in Pakistan and is affordable only at higher income levels. Higher priced than mutton or beef, broilers cost from Rs 15 to Rs 25 per kilogram. The wages of the average worker average Rs 25 to Rs 100 per day. The consumption of chicken is thus clearly restricted by household budgets. Where fish is not available to substitute for red meat on "meatless days," higher income households increasingly purchase chicken. The consumption of eggs is also somewhat limited by their relatively high price and also by the common belief that eggs are a "heating food", not suitable for consumption during the summer months.

B. Utilization of Production Capacity

From time to time, the production capacity of the poultry industry exceeds utilization. As shown in Table II-2, the industry is currently overbuilt.

TABLE II-2. COMMERCIAL POULTRY SYSTEM CAPACITY AND UTILIZATION

		YEAR			MEAN ANNUAL PERCENT CHANGE	
BUSINESS	UNIT	1977	1980	1984	1977-80	1980-84
FEED MILLS						
Capacity	(000) tons	319	510	850		
Production	(000) tons	173	271	297		
Utilization	Percent	54	53	35		
BREEDER FARMS						
Capacity	(000) birds	310	400	1000	7	20
Production	(000) birds	220	310	780	9	20
Utilization	Percent	71	78	78		
HATCHERIES						
Capacity	(000) chicks	38000	52840	132000	9	20
Production	(000) chicks	28050	30760	63440	2	16
Utilization	Percent	74	58	48		
LAYER FARMS						
Capacity	(000) birds	4250	7170	10000	14	7
Production	(000) birds	3320	5560	8000	14	8
Utilization	Percent	78	78	80		
BROILER FARMS						
Capacity	(000) birds	11500	24660	60100	21	20
Production	(000) birds	8010	17420	43100	21	20
Utilization	Percent	70	71	72		

Source: Poultry Research Institute, Rawalpindi.

The feed milling business is operating at 35 percent of capacity, and the hatchery business is using 48 percent of its capacity. As noted above, the number of hatcheries has grown at a rate of 20 percent per year over the 1980-84 period. Hatching requires extensive technical management skills to operate without serious hatching and mortality losses and to maintain competitiveness. The present management capability is too limited and the production costs are too high to sustain these low rates of utilization. A number of hatcheries will probably close in the near future. With broiler prices levelling, the recent entry of new feed mills and broiler operations will undoubtedly result in industry adjustment.

III. Poultry Product Markets

A. Egg Prices and Production

1. Egg Prices

Movements in producer and retail egg prices over the last 15 years are shown in Graphs II-1 and II-2 and their corresponding tables. Egg prices have increased at an average rate of about 8 percent per year. The general upward trend in prices has been sustained by substantive increases in per capita income and a gradual acceptance of commercial eggs in place of the more favored desi eggs. During 1985 and the first half of 1986 egg prices fell below the 1984 level of Rs 8.50 per dozen. With declining prices, some layer houses have closed. In the Karachi area, about two-thirds of the layer houses have closed in two of the five poultry estates zoned for poultry production. Reportedly, major disease problems also contributed to the closure of the Karachi houses.

Egg prices are largely determined in a free market where poultry producers employ limited price discipline tactics. Producers occasionally organize to prevent a sharp or protracted decline in prices. A disciplined market tends to exhibit a decrease in relative price variation over time. The egg price movement shown in Graphs II-1 and II-2 reveals neither the presence nor absence of market discipline. Absolute monthly price variation, as measured by the standard deviation, increases over time. Relative price variation, as measured by the coefficient of variation, neither increases nor decreases sytematically.

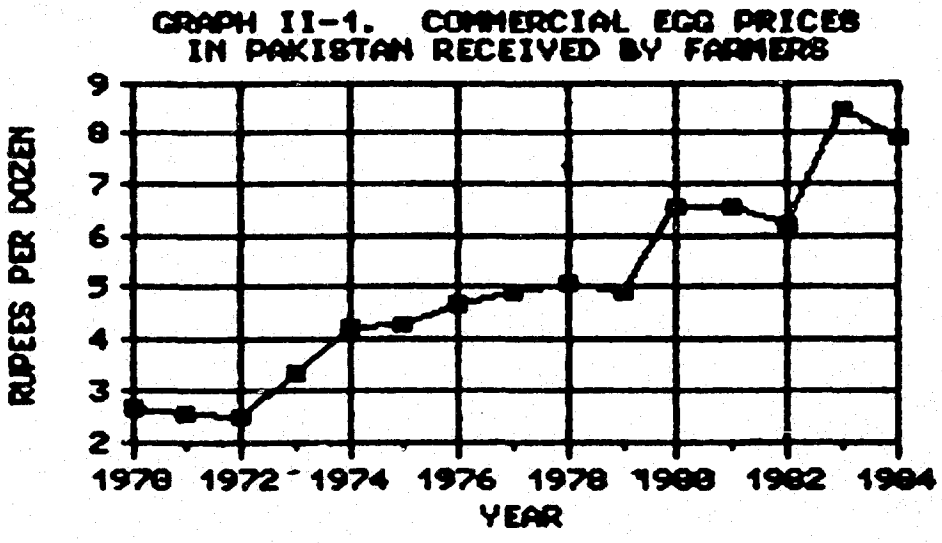


TABLE II-3. COMMERCIAL EGG PRICES IN PAKISTAN [1]

YEAR	CALENDAR YEAR PRICE	FISCAL YEAR PRICE	STANDARD DEVIATION [2]	COEFFICIENT OF VARIATION
	(Rupees per Dozen)			
1970	2.69	2.74	0.48	18.01
1971	2.59	2.49	0.39	14.92
1972	2.50	2.82	0.60	24.12
1973	3.34	3.81	0.62	18.59
1974	4.23	4.27	0.76	17.92
1975	4.33	4.49	0.69	15.83
1976	4.69	4.86	0.81	17.30
1977	4.91	5.21	0.84	17.01
1978	5.09	4.73	0.75	14.70
1979	4.95	5.70	0.89	17.93
1980	6.56	6.60	0.86	13.04
1981	6.55	6.60	0.78	11.92
1982	6.25	7.32	1.36	21.72
1983	8.50	7.93	0.95	11.18
1984	7.94	7.35	1.42	17.85

[1] Prices received by farm producers.
[2] Based on monthly egg price variation.

Source: Poultry Research Institute, Rawalpindi.

GRAPH II-2. COMMERCIAL EGG PRICES IN PAKISTAN PAID BY CONSUMERS

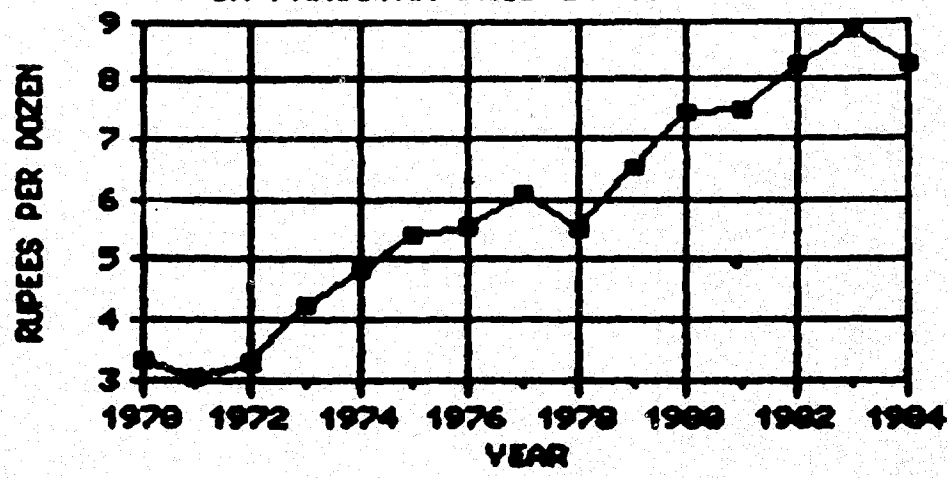


TABLE II-4. COMMERCIAL EGG PRICES IN PAKISTAN [1]

YEAR	CALENDAR YEAR PRICE	FISCAL YEAR PRICE	STANDARD DEVIATION [2]	COEFFICIENT OF VARIATION
	(Rupees per Dozen)			
1970	3.33	3.32	0.39	11.57
1971	3.18	3.05	0.32	10.13
1972	3.02	3.31	0.65	21.39
1973	3.75	4.27	0.62	16.62
1974	4.78	4.83	0.83	17.41
1975	5.08	5.40	0.88	17.36
1976	5.49	5.58	0.97	17.75
1977	5.87	6.12	0.92	16.26
1978	5.94	5.53	0.67	11.22
1979	5.77	6.54	0.75	13.01
1980	7.46	7.47	0.80	10.69
1981	7.37	7.49	0.79	10.66
1982	7.26	8.26	1.34	18.39
1983	9.38	8.84	0.99	10.56
1984	8.81	8.29	1.49	13.90

[1] Prices paid by consumers.
[2] Based on monthly egg price variation.

Source: Poultry Research Institute, Rawalpindi.

2. Egg Price Margins

Egg wholesalers state that they cannot influence retail prices, but they do attempt to "hold the line" on egg price margins. With some exceptions, price margins have remained almost constant at ten percent of the retail price since 1973.

Wholesalers, retailers, and egg producers appear to have agreed to this margin and imply that higher margins might invite the imposition of controls by the government.

The price discipline practiced by the wholesale business may create a barrier to further market development. Under competitive marketing conditions the margin responds positively to the volume of supply. As more egg supplies are placed on the market the capacity of the wholesale distribution system is strained, and a higher margin is required to pay the added costs of using the system. In other words, additional couriers must be paid a higher price to bid them away from other endeavors. When egg supplies decline, the slack in the distribution system results in competition among wholesalers to utilize their "excess capacity."

Egg price margins in Pakistan move upward with price at a constant rate, failing to adjust downward when supplies fall and adjusting upward by only this rate when supplies expand. Under these market conditions wholesalers have no incentive to expand distribution services when supplies expand or to compete over services when supplies contract.

Inverse movement is evident over the last three years: margins have fallen and egg supplies have grown. A growth in egg supplies usually signals a larger margin to pay for promotion, storage, and increased distribution, widening the market for additional volume. In this case margins actually declined, indicating a withdrawal of these services at a time when they were most needed. Graph II-3 and its corresponding table illustrate the movement of egg price margins over the last 15 years and the recent decline in margins that may be hindering market expansion.

Egg price margins are the incentive for the wholesaler and retailer to perform their services. Egg marketing in Pakistan is a "bare bones" operation; there is little promotion and limited effort to differentiate product quality. These activities are common to markets for other luxury products sold to higher income consumers. Under current conditions in the wholesale and retail markets, growth in the egg market evolves with increased income and by "word of mouth" promotion of egg consumption.

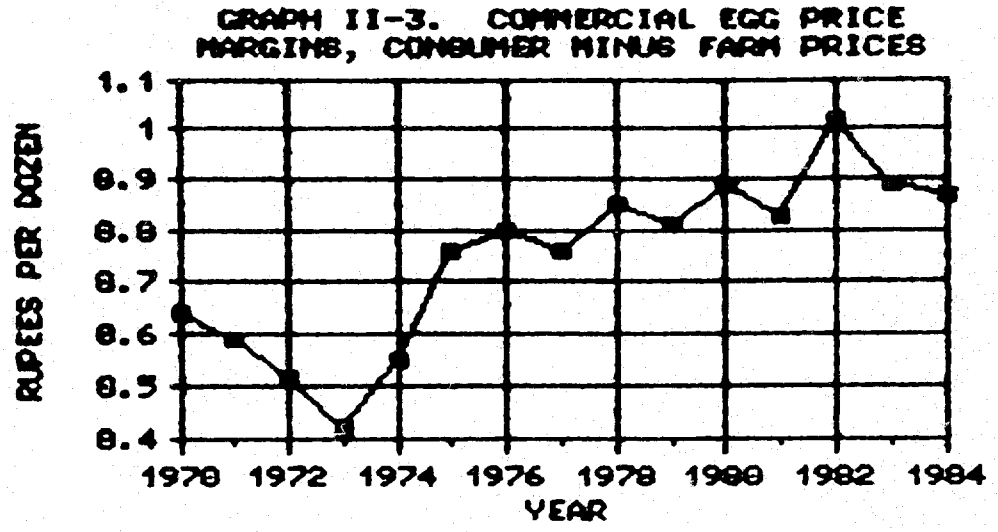


TABLE II-5. COMMERCIAL EGG PRICE MARGINS [1]

YEAR	CALENDAR YEAR MARGIN	FISCAL YEAR MARGIN	STANDARD DEVIATION [2]	COEFFICIENT OF VARIATION
	(Rupees per Dozen)			
1970	0.64	0.58	0.20	30.82
1971	0.59	0.56	0.25	41.84
1972	0.52	0.48	0.20	37.57
1973	0.42	0.47	0.09	22.70
1974	0.55	0.56	0.37	67.97
1975	0.76	0.91	0.28	37.52
1976	0.80	0.72	0.32	39.74
1977	0.76	0.91	0.23	30.85
1978	0.85	0.80	0.27	31.76
1979	0.81	0.84	0.24	29.05
1980	0.89	0.86	0.23	25.49
1981	0.83	0.89	0.12	14.13
1982	1.02	0.94	0.27	26.90
1983	0.89	0.92	0.16	17.92
1984	0.87	0.94	0.28	32.33

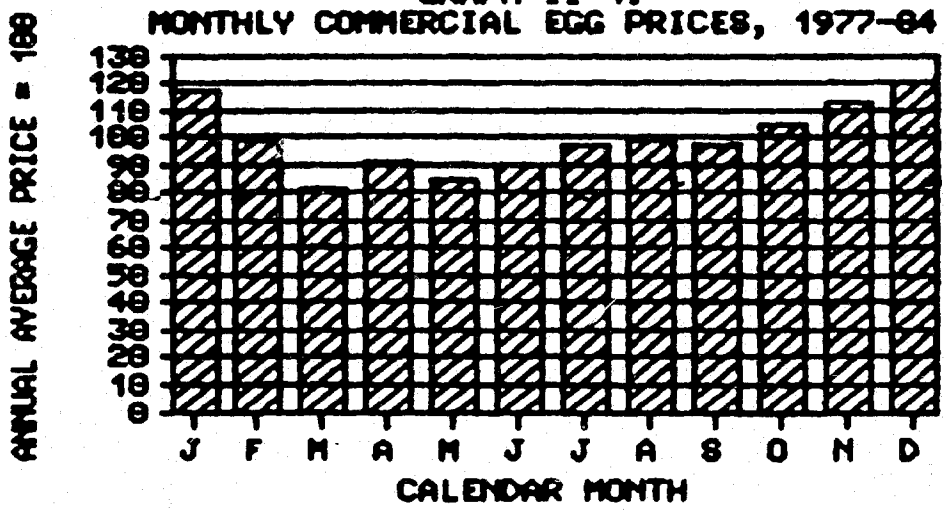
[1] Difference between consumer and farm prices.
[2] Based on monthly egg margin variation.

Source: Poultry Research Institute, Rawalpindi.

3. Seasonality of Egg Prices

A survey of egg prices reveals that in roughly seven out of 10 years, egg prices follow a distinct seasonal pattern. Prices fall rapidly from December through January to an annual low in March, April, and May. The decline is dramatic. Egg prices drop by as much as 40 percent below annual highs. Graph II-4 shows the seasonal index of producer prices, where the annual average equals 100.

GRAPH II-4.
MONTHLY COMMERCIAL EGG PRICES, 1977-84



Seasonal price fluctuation is related to the demand for eggs and the biological production process. The demand for eggs declines during the summer because eggs are considered a "heating" food and also because there is greater danger of spoilage. Layers also reach peak production in February due to their developmental stage and more comfortable laying temperatures. The accumulated forces of lower demand and heavier supply pressure egg prices downward during the summer months.

During winter months the two forces operate in the opposite direction. Consumers seek eggs at the same time that newly grown, less productive pullets enter the laying flocks. As demand increases, without an accompanying supply response, prices gradually climb.

Egg producers have become accustomed to the seasonal fluctuation in egg prices and produce accordingly. They cut layer production in the early summer months and sell the birds in the cull bird market. In turn, the heavy seasonal supply of cull birds adds to the supply of poultry meat and drives down prices for all birds of slaughter.

4. The Desi Egg Price Difference

Roughly 40 to 50 percent of all eggs produced in Pakistan are laid by desi birds that are raised as scavengers in the village or farmyard. Desi eggs are usually brownish in color and are considerably smaller than commercial eggs. The egg consumer generally prefers the desi to the commercial variety. The difference in price between desi and commercial eggs is substantial and has been increasing over time. Table II-6 shows the growth in the price differential.

TABLE II-6. DESI EGG PRICE DIFFERENCE EXAMPLE, KARACHI

YEAR	DESI PRICE	FARM PRICE (COMMERCIAL)	DIFFERENCE
	(Rupees per Dozen)		
1976	6.90	5.79	1.11
1977	7.49	5.99	1.50
1978	8.54	6.37	2.17
1979	9.01	5.78	3.23
1980	10.21	6.80	3.41
1981	10.67	6.79	3.88
1982	12.14	6.94	5.20
1983	13.88	8.88	5.00
1984	14.24	8.06	6.18
1985	14.58	7.20	7.38
MEAN ANNUAL PERCENT INCREASE 1976-85	7.75	2.20	20.82

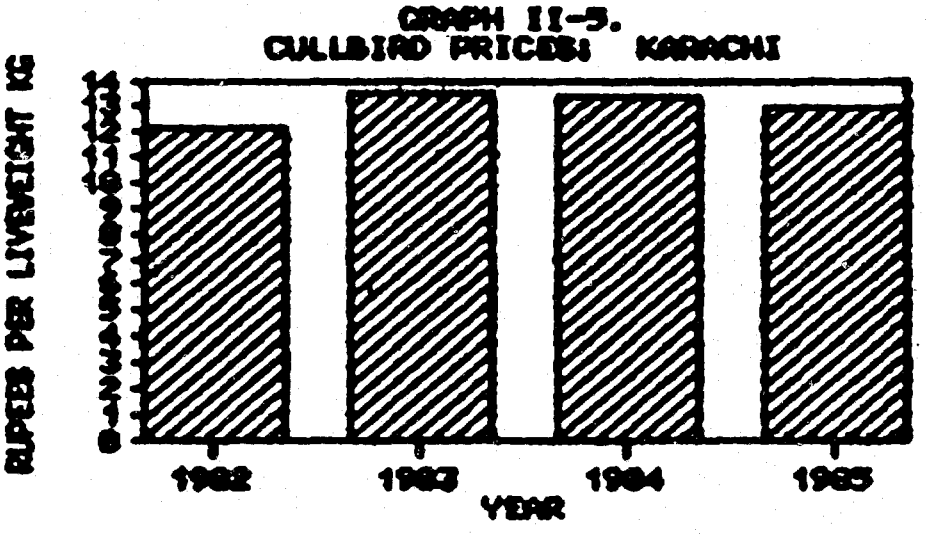
Source: Federal Bureau of Statistics, Monthly Statistical Bulletin, 1976-1985.

The price of the desi egg during 1985 was almost twice that of the commercial egg. Since 1976, the desi egg price has increased by an average of 7.75 percent per year. The commercial egg price has increased by an average of only 2.2 percent per year over the same period. The price differential has grown at about 21 percent per year since 1976. Based on these relative movements, the market appears to be warning producers that consumers clearly prefer desi eggs. Commercial birds are not producing eggs that suit the taste of Pakistani consumers. Although the preference for desi eggs may disappear with time, current egg production and marketing strategies are not well coordinated.

5. Cull Bird Prices

Usually, egg producers receive no net cash flow during the production cycle. The cash flow generated from egg sales is used to cover the cost of growing or feeding layers. The producer often pays for day-old chicks up to two or three months before they are received. When the producer uses a short-term loan, egg revenues are used to repay the loan. The net cash flow begins to accrue at the end of the production cycle when cull or spent birds are sold, the manure cleaned and sold, and empty feed bags gathered and returned for cash. The price of cull birds is important to the egg producer because cull birds provide eight to twelve percent of their total revenue.

The movement of cull bird prices follows broiler prices at six or seven rupees per kilogram below the going broiler price. Prices for cull birds have been collected only in recent years; their levels are shown in Graph II-5.



Cull or spent birds are sold as they stop laying, at an age of 50 to 70 weeks and at the end of a 30 to 50-week production cycle. Egg producers often time the production cycle to sell the spent flock before egg prices fall, which can temporarily exert downward pressure on chicken prices.

6. Egg Production

Egg production from fiscal year 1970 to fiscal year 1980 grew at an average annual rate of 15 percent. In the last several years the growth rate has slowed to an average of 10 percent per year. Per capita consumption has continued to grow and attained a level of 40 eggs in 1983. Egg consumption is probably distributed with disproportionately higher consumption levels among higher income groups, although this distribution may vary slightly with seasonal changes in egg prices. The growth in egg production and per capita consumption is shown in Graph II-6 and its related table.

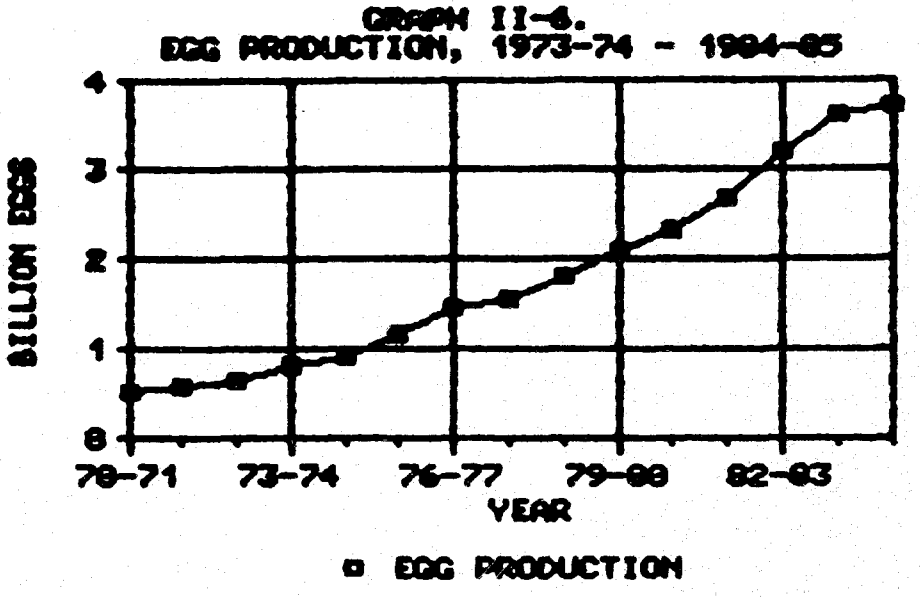


TABLE II-7. PAKISTAN EGG PRODUCTION

YEAR	TOTAL (Million)	PER CAPITA (No.)
1970-71	520	8.5
1971-72	583	9.2
1972-73	647	9.9
1973-74	811	12.1
1974-75	907	13.2
1975-76	1159	16.3
1976-77	1443	19.7
1977-78	1557	20.6
1978-79	1805	23.2
1979-80	2094	26.1
1980-81	2319	28.1
1981-82	2664	31.6
1982-83	3200	36.5
1983-84	3619	40.0
1984-85	3700 (est.)	39.7
MEAN ANNUAL % INCREASE		
1970-71 - 1980-81	15	12
1980-81 - 1984-85	10	7

Source: Government of Pakistan, Ministry of Food, Agriculture and Cooperatives, Planning Unit, Agricultural Division

B. The Poultry Meat Market

Graphs II-7 and II-8 and their related tables show broiler price movement over the last 15 years. Broiler prices have increased at an average annual rate of 10 percent per year since 1970. The continuing increase in broiler prices has been associated with steady increases in household incomes and slower growth in other meat supplies.

GRAPH II-7. BROILER PRICES IN PAKISTAN RECEIVED BY FARMERS

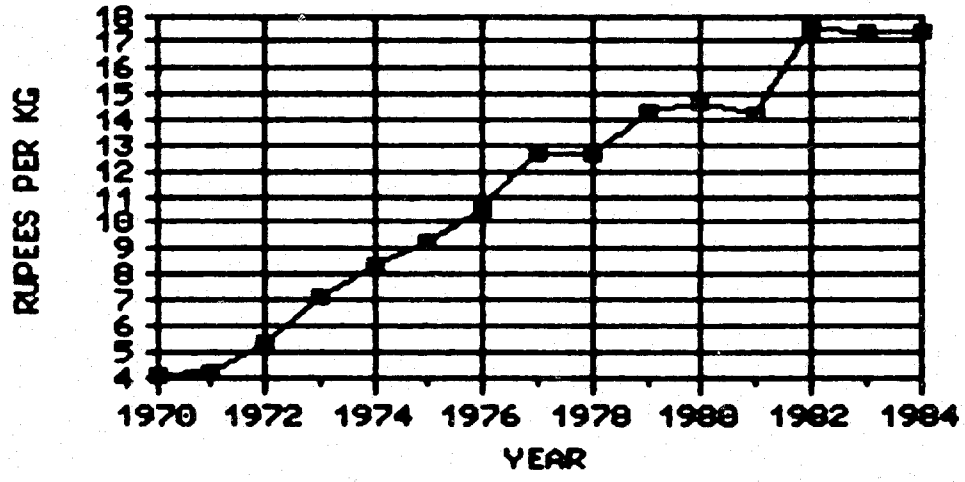


TABLE II-8. BROILER PRICES IN PAKISTAN [1]

YEAR	CALENDAR YEAR PRICE	FISCAL YEAR PRICE	STANDARD DEVIATION [2]	COEFFICIENT OF VARIATION
	(Rupees per Kg)			
1970	4.18	4.12	0.38	9.02
1971	4.13	4.21	0.54	13.21
1972	4.62	5.39	0.75	16.21
1973	6.03	7.16	1.17	19.38
1974	7.93	8.43	0.42	5.28
1975	9.24	9.29	0.56	6.09
1976	9.80	10.55	1.48	15.07
1977	11.46	12.66	1.29	11.22
1978	13.10	12.73	0.94	7.17
1979	13.54	14.37	1.74	12.84
1980	14.40	14.78	1.20	8.35
1981	14.54	14.23	0.69	4.71
1982	15.37	17.59	1.67	10.85
1983	17.79	17.41	1.15	6.39
1984	18.13	17.44	1.37	7.35

[1] Prices received by farm producers.
[2] Based on monthly broiler price variation.

Source: Poultry Research Institute, Rawalpindi.

GRAPH II-8. BROILER PRICES IN PAKISTAN PAID BY CONSUMERS

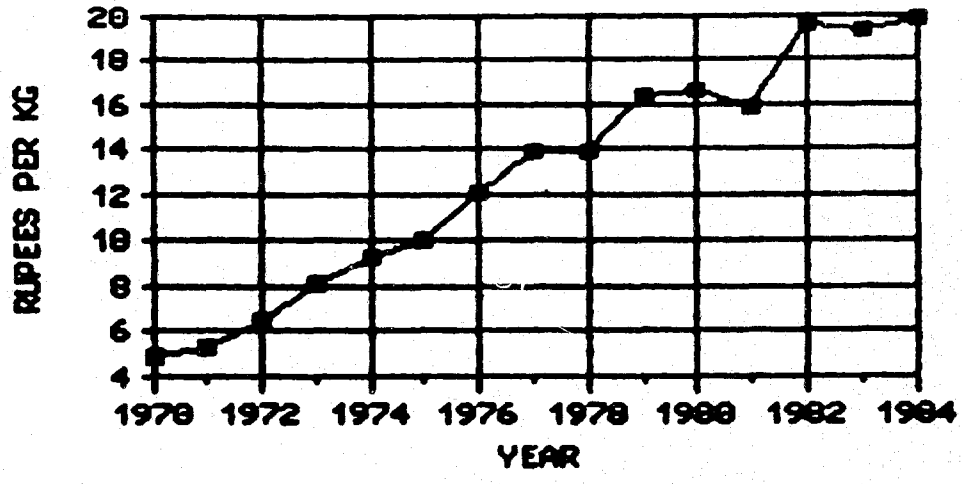


TABLE II-9. BROILER PRICES IN PAKISTAN [1]

YEAR	CALENDAR YEAR PRICE	FISCAL YEAR PRICE	STANDARD DEVIATION [2]	COEFFICIENT OF VARIATION
	(Rupees per Kg)			
1970	4.90	4.94	0.57	11.69
1971	5.65	5.34	0.73	13.91
1972	7.13	6.43	0.80	14.11
1973	8.98	8.18	0.80	11.20
1974	9.87	9.35	0.52	5.77
1975	10.86	10.11	0.42	4.29
1976	13.10	12.12	1.67	15.40
1977	14.29	13.91	0.91	6.94
1978	15.24	13.99	0.84	5.88
1979	16.42	16.41	2.24	14.70
1980	16.29	16.65	1.11	6.78
1981	17.25	15.85	0.67	4.14
1982	19.94	19.65	1.79	10.35
1983	20.18	19.30	1.16	5.82
1984	18.13	19.88	1.48	7.34

[1] Prices paid by consumers.
[2] Based on monthly broiler price variation.

Source: Poultry Research Institute, Rawalpindi.

As noted earlier, broiler meat is higher-priced than mutton, goat, buffalo, or beef; it is a luxury meat consumed by higher income, urban families. Although all meat prices except broiler prices are controlled, these price ceilings may have limited effectiveness since the few retailers interviewed stated that they add charges for the more desirable cuts.

Poultry meat is usually priced on a liveweight basis because most birds are purchased live and slaughtered at the time they are prepared for cooking. Broiler prices are determined in a relatively free market with occasional interference when producers organize to hold prices at a planned level. In most cases, producer action appears to have been unsuccessful. New producers continue to enter the industry and are willing to sell at any price.

The absolute monthly variation in broiler prices has increased over the last 15 years, although the relative variation appears to be declining. Over time, producers may have become more cautious in expanding production when prices rise or in reducing production when prices fall. With the decline in the expansion of layer flock numbers, growth in cull bird marketing has slowed and is now less erratic. Since cull birds and broilers compete as a source of chicken meat, changes in the cull bird market affect variability in broiler prices.

The levelling of broiler prices after 1982 and their recent decline are associated with increased production. Production of poultry meat has increased at an annual average rate of 13 percent since 1981-82. During the last half of 1985 and the first quarter of 1986, too, the growth rate appears to have risen although no substantial changes in income or in the production of competing meats have occurred to indicate a change in the demand for poultry meat.

1. Broiler Price Margins

Broiler price margins, defined as the difference between producer and retail prices, are shown in Graph II-9 and its related table. As compared to egg price margins, broiler price margins appear to have behaved in line with expectations. During the 1984-85 increase in broiler production, for example, broiler price margins rose from Rs 1.89 to Rs 2.44 per bird.

Price margins are the prices paid for wholesaling and retailing services. In broiler production, the direct costs of the wholesaler and retailer include transportation, local taxes, feed, weight loss and death loss, and, occasionally, the cost of slaughter. When the bird is slaughtered at the sales site, the wholesaler and retailer receive payment for slaughter and by-products. By-products include the head, legs, skin, egg follicles, and viscera. The slaughtering charge is currently Rs 1.00 per bird, and the charge for by-products is Rs 1.00 to Rs 1.50 per bird.

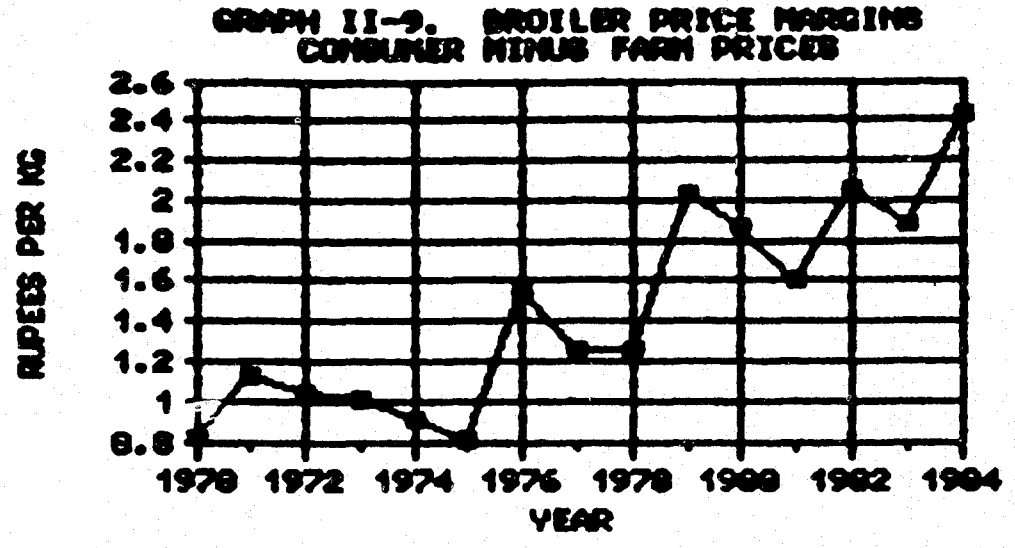


TABLE II-10. BROILER PRICE MARGINS IN PAKISTAN [1]

YEAR	CALENDAR YEAR MARGIN	FISCAL YEAR MARGIN	STANDARD DEVIATION [2]	COEFFICIENT OF VARIATION
	(Rupees per Kg)			
1970	0.73	0.83	0.37	51.03
1971	1.09	1.13	0.38	34.97
1972	1.03	1.05	0.42	41.12
1973	1.10	1.02	0.43	38.78
1974	1.06	0.92	0.41	39.15
1975	0.64	0.82	0.45	70.14
1976	1.06	1.57	0.46	43.83
1977	1.65	1.26	0.67	40.92
1978	1.19	1.26	0.38	32.21
1979	1.70	2.03	1.16	68.60
1980	2.02	1.87	0.32	15.66
1981	1.75	1.62	0.25	14.06
1982	1.88	2.06	0.43	22.79
1983	1.95	1.89	0.31	15.84
1984	2.05	2.44	0.38	18.58

[1] Difference between consumer and farm prices.
[2] Based on monthly broiler margin variation.

Source: Poultry Research Institute, Rawalpindi.

In a small component of the broiler market, chickens are slaughtered, dressed, frozen, and packaged for sale to the army, airlines, hotels, restaurants, and other institutions. The weight of the dressed bird is usually about 60 percent of the live bird, or 63 to 66 percent if the skin and neck are left on the carcass. Birds selling for Rs 18-Rs.20 per kilogram live-weight, sell for Rs 34-Rs.40 per kilogram dressed weight. The price differential covers the costs of slaughter, freezing, packaging, storage, and transportation. Marketing of frozen birds is relatively costly and has not yet been widely accepted by consumers.

2. The Desi Chicken Price Difference

The price differential between desi and commercial chickens has grown over the past years. The desi chicken price increased at about 7 percent per year from 1976 to 1985, while the price of commercial chicken rose at an average rate of only 4 percent per year. The price differential increased at an average rate of 17 percent over this period. In the first quarter of 1986 desi chickens sold for Rs 28 to Rs 32 per kilogram; commercial chickens sold for Rs 18 to Rs 20 per kilogram of live weight. The differential is shown in Table II-11.

TABLE II-11. DESI CHICKEN PRICE DIFFERENCE EXAMPLE, KARACHI

YEAR	DESI PRICE [1]	FARM PRICE (COMMERCIAL) [2]	DIFFERENCE
	(Rupees per Kg)		
1976	14.60	12.40	2.20
1977	15.36	13.95	1.41
1978	17.11	15.00	2.11
1979	18.29	14.70	3.59
1980	19.39	16.40	2.99
1981	22.38	17.75	4.63
1982	23.85	18.13	5.72
1983	27.35	19.99	7.36
1984	28.50	20.40	8.10
1985	29.30	19.05	10.25
MEAN ANNUAL PERCENT INCREASE 1976-85	7.21	4.39	16.64

[1] Federal Bureau of Statistics, Monthly Statistical Bulletin, 1976-1985.
[2] Pakistan Poultry Association.

As in the case of egg prices, chicken prices signal a strong preference for desi chickens. Desi chickens are a small, leggy, hardy breed. Legs, thighs, and wings are the preferred cuts. As commercial chickens become more common, tastes may change.

3. Poultry Meat Production

Greater numbers of large commercial producers have entered the industry since 1981-82, and poultry meat production has accelerated. The growth rate of desi birds and layers has decreased recently, leaving the largest percentage increase to commercial broiler production. Broilers now compose 40 percent of total chicken meat production. Desi birds provide 55 percent of the total, and cull or spent birds provide the remaining 5 percent. By contrast, in 1977-78 commercial broiler production represented only 15 percent of the total production of chicken meat.

In 1984-85, the annual per capita production of poultry meat reached one kilogram. The distribution of poultry meat consumption is largely skewed toward higher income groups, with beef and buffalo consumed by middle and lower income groups. Graph II-10 and its related table show the rise in per capita availability of poultry meat and the latter as a rising proportion of total meat production.

It has been noted earlier that commercial broiler production is restrained by the availability of grains that provide energy feed and meals that provide protein feed. Grain production has stagnated or decreased in the past several years. Available protein meals include fish, cottonseed, rapeseed, guar, blood, and meat.

GRAPH II-10.
POULTRY MEAT PRODUCTION

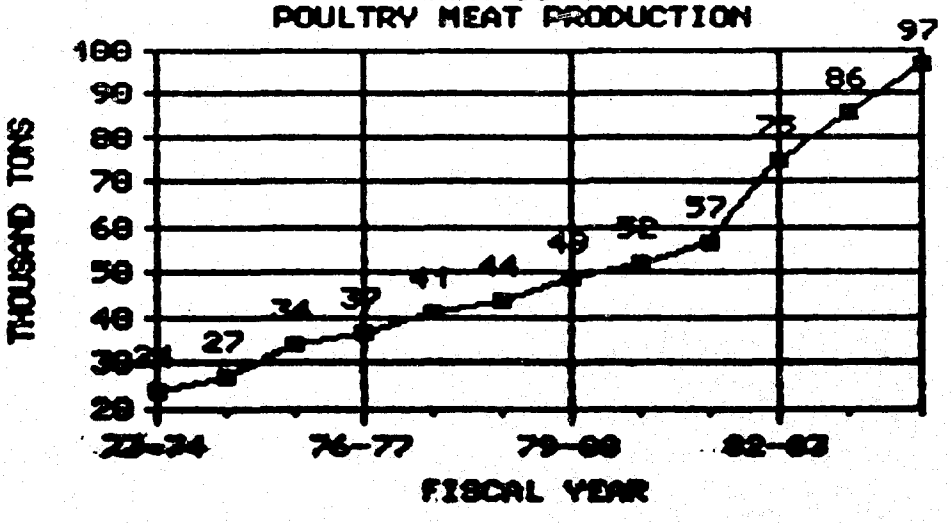


TABLE II-12. POULTRY MEAT PRODUCTION

FISCAL YEAR	POULTRY Total (000 tons)	POULTRY Per Capita (kg)	PERCENT OF TOTAL (%)	TOTAL MEAT PRODUCTION (000 tons)
1973-74	24	0.36	4.0	623
1974-75	27	0.39	4.0	249
1975-76	34	0.48	5.0	684
1976-77	37	0.51	5.0	715
1977-78	41	0.54	5.0	749
1978-79	44	0.57	6.0	783
1979-80	49	0.61	6.0	819
1980-81	52	0.63	6.0	858
1981-82	57	0.68	6.0	894
1982-83	75	0.85	8.0	947
1983-84	86	0.95	9.0	1010
1984-85	97	1.04	n/a	n/a
MEAN ANNUAL PERCENT INCREASE				
1973-74 - 1981-82	10.0	7.0		7.0
1981-82 - 1984-85	13.0	11.0		4.0

Source: MINFA, Agricultural Statistics of Pakistan 1984, Islamabad, November 1985, p. 206.

IV. Estimation of Demand and Supply of Poultry Products

A. Egg Demand and Supply

Per capita availability of eggs in Pakistan has been growing at an annual rate of 9 to 12 percent during the last decade. This growth has resulted from continued and uninhibited investment in the poultry industry. Recently, growth in production slowed slightly as egg prices leveled and declined.

Although the nominal decline in the price of eggs is alarming, real egg prices have declined since the early years of the commercial poultry industry. Real egg prices in this chapter are defined as the annual average producer price for eggs deflated to the extent of the general retail price index.

During fiscal year 1972 the real price of eggs was Rs 5.03 per dozen. By fiscal year 1983 the real price had decreased to Rs 4.43 per dozen. The gradual decline in real egg prices expresses the ability of industry management to improve production efficiency and produce effectively at lower real costs. Over time, the growing volume of eggs on the market also forced lower market prices and a wider distribution of the product among different income groups.

1. Major Factors Affecting The Demand and Supply of Eggs

Least squares estimation of the demand function for eggs reveals that the level of egg consumption is significantly associated with income, the price of beef, and the price of buffalo meat. Income, as measured by either per capita income or per capita net national product, has the largest single effect on the magnitude of consumption levels. The prices of beef and buffalo were excluded from the final regression equation because the substitution of beef and buffalo meat for eggs is not observable in the Pakistani diet.

Least squares estimation of the supply function for eggs indicates that the largest single factor affecting the supply of eggs is the direct link between between wheat prices and egg prices. This demonstrates the importance of feed costs in producing eggs since wheat is an important foodgrain fed to layers. and since the price movements in wheat are representative of price movements in other feed grains. The ratio of egg price to wheat price provides an aggregate measure of the efficiency of the industry. A high ratio indicates that producers earn positive net returns. As egg prices increase relative to wheat prices, the ratio increases and the producer generates a larger profit, other costs held constant. Higher profit levels encourage producers to build new production capacity and also invite the entry of new producers. As production capacity grows and new producers enter the industry, profit margins decrease and the ratio of egg price to wheat price falls.

Table II-13 shows the major factors affecting the demand and supply of eggs in Pakistan and the changes in their values over time. Growth in most of the major factors associated with the demand and supply of eggs has slowed in the past four years. This reduced growth rate may explain, to a large extent, the slower expansion in per capita availability of eggs and the recent decline in egg prices.

TABLE II-13. MAJOR FACTORS AFFECTING THE DEMAND AND SUPPLY OF EGGS

FISCAL YEAR	Eggs Available Per Capita Qed,Qes	Retail Price of Eggs Per	Price of Eggs at the Farm Pef	Retail Farm Price Margin MI	NNP Per Capita I	General Retail Price Index Pi	Price of Wheat Pw
	No.	Rs/Doz			Rs	75/76=100	
1972	9.9	3.31	2.82	0.49	930	56.10	27.65
1973	12.1	4.27	3.81	0.46	1194	74.48	33.70
1974	13.2	4.83	4.27	0.56	1420	92.10	51.22
1975	16.3	5.40	4.49	0.91	1621	100.00	49.41
1976	15.6	5.58	4.86	0.72	1813	110.77	52.43
1977	20.6	6.12	5.21	0.91	2139	120.48	59.43
1978	23.2	5.53	4.73	0.80	2324	128.47	61.40
1979	26.1	6.54	5.70	0.84	2683	142.23	64.94
1980	28.1	7.47	6.60	0.87	3075	159.81	68.23
1981	31.6	7.49	6.60	0.89	3459	175.79	77.75
1982	36.5	8.26	7.32	0.94	3898	183.67	76.35
1983	40.0	8.84	7.93	0.91	4269	199.03	83.90
MEAN ANNUAL PERCENT CHANGE							
1972-80	12.3	9.5	9.9		12.3	9.9	10.6
1980-83	9.2	4.3	4.7		5.6	4.7	5.3

The factors shown in Table II-13 are associated in the following specific form, with t-values indicated in parentheses:

DEMAND: $Qed = b11 + b12(Per/Pi) + b13(I*100/Pi)$, or

$$Qed = -24.9163 - \underset{(-2.64)}{.042488(Per/Pi)} + \underset{(8.77)}{0.0380(I*100/Pi)}$$

$R^2 = .97$

D-W = 1.05

SUPPLY: $Qes = b21 + b22(Pef*Pi/Pw)$, or

$$Qes = -4.5710 + 2.3256(Pef*Pi/Pw)$$
$$(12.504829)$$

$R^2 = .94$
D-W = 2.09

$Qed = Qes$

$Psr = Ml + Pef$

Where variables are defined as:

Qed = No. of eggs available for consumption, per capita
Qes = No. of eggs available from production, per capita
Per = Retail price of eggs, Rs per dozen
Pef = Producer price of eggs, Rs per dozen
Ml = Egg price margin, the difference between the retail price and the producer price, Rs per doz
I = Net national product per capita, a proxy for income per capita, Rs per person per annum
Pi = General retail price index, 1975/76 = 100
Pw = Price of wheat in Karachi, Rs per 40-kg bag,

and b's are parameters in the respective equations.

Expressed in terms of the independent variables, the equilibrium price and quantity are given by:

$$Pef = [(b21-b11) - b12(Ml/Pi) - b13(I*100/Pi)][(b12/Pi) - (Pw/b22Pi)]^{-1}$$

$$Qe = [(b11/b12)Pi + (b13/b12)(I*100) - (b21Pw/b22Pi) + Ml] * [(Pi/b12) - (Pw/b22Pi)]^{-1}$$

The equilibrium price and quantity relationships are used in the following section to depict three scenarios of egg prices, egg production, and egg consumption levels.

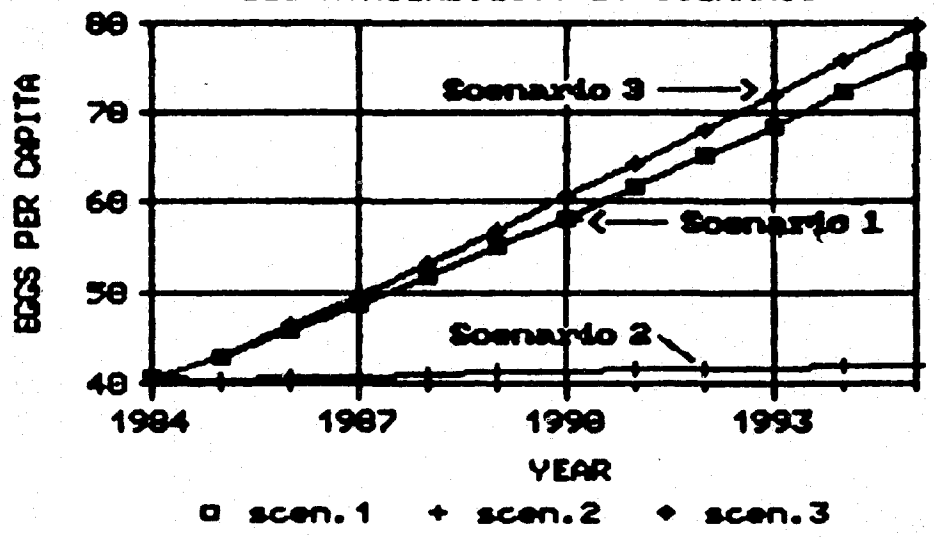
2. Egg Prices and Egg Availability Under Differing Scenarios

The availability of eggs changes substantially with changes in the "health" of the economy. The increases in consumption and prices that drive production are dependent on a growth in income that exceeds inflation, and prices that stimulate production. Egg availability continues to grow as the economy expands. If wheat prices increase at one 1 percent per year, and if wheat is available for feeding layers, egg availabi-

lity grows at a faster rate. A higher growth rate in egg availability then presses egg prices below those of the growing economy. Growth in egg availability ceases when the economy stagnates.

Graph II-11 shows per capita egg availability under three different scenarios. Under the first scenario per capita NNP increases at about 10 percent per year, consistent with the projections of the Sixth Five-Year plan. The inflation rate, or the general retail price index, increases at about 6.9 percent, corresponding to similar projections in the Sixth Five-Year Plan. Wheat prices increase at about 5 percent per year, consistent with past annual changes in the price of wheat. Under the first scenario, the egg supply and demand model predicts continued and substantial increases in per capita egg availabity over the next 10 years. Egg availability grows from approximately 40 eggs per capita in 1984 to 70 eggs per capita in 1993. When real income grows the market expands and egg prices rise, encouraging production.

GRAPH II-11.
EGG AVAILABILITY BY SCENARIO



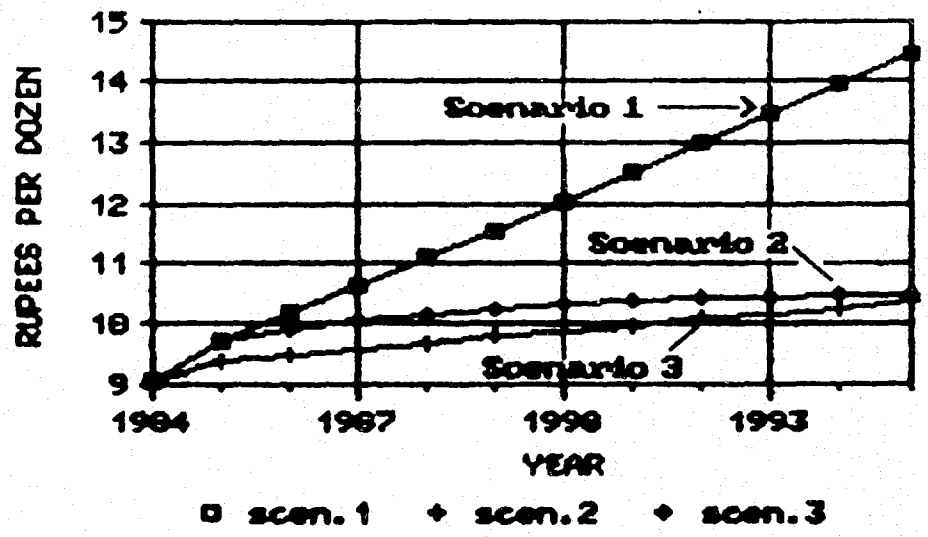
The second scenario depicts a stagnating economy, with an annual growth in income of 4 percent and an annual inflation rate of 5 percent. Under this scenario, the egg industry does not grow. Per capita egg availability changes from 40 in 1984 to only 42 in 1993. The egg supply and demand model indicates that the egg industry is very sensitive to changes in real income under the second scenario. When real income decreases the market contracts, discouraging egg production.

The third scenario depicts the economy as it is projected in the Sixth Five-Year plan, but wheat prices are held to a 1 percent annual increase. As a result, growth rates in egg availability exceed those of the first scenario. Lower feed costs relative to egg prices encourage additional production and release a larger

number of eggs per capita.

Egg prices for each scenario are shown in Graph II-12. In the first scenario, egg prices continue to increase as the economy expands. The increase in egg prices leads to higher producer profits and expansion in facilities. The model depicts a continuous upward shift in demand that permits higher equilibrium prices and larger equilibrium supply.

GRAPH II-12.
RETAIL EGG PRICE BY SCENARIO



In the second scenario, the economy stagnates and egg prices remain near current levels. Expansion in production and consumption ceases. The important implication of this result is that to earn profits and attract further investment, the egg industry depends on continued growth in per capita income.

The third scenario depicts egg prices when feed costs increase more slowly than inflation. Rising egg prices relative to wheat prices result in the expansion of the egg supply. An expanding egg supply forces egg prices down. Egg prices fall from the highest price of the first scenario to a level 20 percent lower.

In summary, the egg supply and demand model describes the heavy dependence of the egg industry on growth in the economy. Eggs remain a luxury item, and increasing egg consumption requires increasing income. The model also indicates that egg supplies are dependent on a continued supply of low cost grains for feed. Egg production has attracted a number of new investors over the last five years, with capacity expanding at about 7 percent per year. However, these results suggest that investment in the competitive egg industry is not for the faint-hearted.

B. Estimation of Demand and Supply of Chicken Meat

Per capita availability of chicken meat has been growing at a steady rate of 10.8 percent over the last ten years. This rate appears to result from continued investment, although the decline in chicken prices should discourage investment. Real chicken prices have declined from Rs 11.50 per kilogram in 1972 to Rs 8.50 per kilogram in the first quarter of 1986. Declining real price is associated with improvements in production efficiency. New producers have also created a competitive climate as they adopt new technolgies and find more conducive financial, locational, and climatic environments for raising commercial broilers.

Compared to production of other meats in Pakistan, the commercial production of chicken meat is directly dependent on the availability of grain and high protein feeds. Commercial broiler production provides about half the total supply of chicken meat. The other half is supplied by scavenging desi birds with no particular feed requirements. Beef, buffalo, mutton, and goats feed on roughages and fodders. Fish production currently supplies an insignificant portion of the total meat supply in Pakistan.

1. Major Factors Affecting the Demand and Supply of Chicken Meat

Least squares estimation of the demand for chicken meat reveals that consumption is significantly associated with income, and the supply of beef and buffalo meat. No statistically significant relationship between goat or mutton consumption and consumption of chicken meat is evident, suggesting that there is no tendency for consumers to substitute chicken for goat and mutton meat. No statistically significant relationship was found between rice or wheat consumption and the consumption of chicken meat. Retail price indexes for other consumer goods were also tested as proxies for substitute goods, revealing no significant association.

Least squares estimation of chicken meat supply shows that production of chicken meat is significantly affected by the price of chicken relative to the price of maize, and by the supply of cull or spent birds. As layer flocks grow, the supply of cull or spent birds also grows, increasing the total supply of chicken meat.

Demand elasticities are instructive as they show the percentage change in quantities consumed given a 1 percent change in factors affecting demand. The regression results indicate that a 1 percent increase in the retail price of chicken meat is associated with a nearly equivalent decrease in the quantity demanded. A 1 percent increase in per capita income is associated with a 2.2 percent increase in the consumption of chicken meat. The consumption of chicken meat decreases by 4.5 percent with a 1

percent increase in the supply of beef or buffalo. One percent of the per capita beef or buffalo supply is equivalent to 0.05 kilograms, and 4.5 percent of per capita chicken meat supply is equal to that approximate amount. This indicates a one-for-one substitution of beef or buffalo meat for chicken meat. The elasticity estimates generated by the model are similar to those found in other studies of meat demand in Pakistan, although other studies have not separately measured demand elasticities for chicken meat.

Table II-14 shows the major factors affecting the demand and supply of chicken meat in Pakistan and the change in their values over the last decade. The figures indicate that the availability of chicken meat has continued to grow at a stable rate of about 10.8 percent per year over the last decade. Despite saturation of the market and falling chicken prices during the last four years, the availability of chicken meat has increased. During these years supplies continued to flow into the market because of increases in production of desi birds, increased grain production, and expansion in layer flocks.

TABLE II-14. MAJOR FACTORS AFFECTING THE DEMAND AND SUPPLY OF CHICKEN MEAT

	Chicken Meat Available Per Capita	Retail Price of Chicken Meat	Farm Price of Chicken Meat	Retail Farm Price Margin	Beef & Buffalo Meat Available Per Capita	General Retail Price Index	NNP Per Capita	Year-Year Change in Number of Layers	Price of Maize
	Qcd,Qcs	Pcr	Pcf	M2	Qb	Pi	I	dL	Pm
FISCAL YEAR	Kg	Rs/Kg			Kg	75/76=100	Rs	(000)	Rs/40 Kg
1972	0.25	6.43	5.39	1.04	5.35	56.10	930	72	30.05
1973	0.36	8.18	7.16	1.02	5.29	74.48	1194	712	32.01
1974	0.39	9.35	8.43	0.92	5.18	92.10	1420	161	60.89
1975	0.48	10.11	9.29	0.82	5.10	100.00	1621	1163	55.84
1976	0.51	12.12	10.55	1.57	5.12	111.77	1813	610	53.18
1977	0.54	13.91	12.66	1.25	5.16	120.48	2139	707	56.45
1978	0.57	13.99	12.73	1.26	5.20	128.47	2324	820	67.73
1979	0.61	16.41	14.37	2.04	5.22	142.23	2683	951	66.25
1980	0.63	16.65	14.78	1.87	5.26	159.81	3075	40	65.88
1981	0.68	15.85	14.23	1.62	5.32	175.79	3459	803	87.50
1982	0.85	19.65	17.59	2.06	5.29	183.67	3898	995	88.50
1983	0.95	19.30	17.41	1.89	5.39	199.03	4269	1525	82.29
MEAN ANNUAL PERCENT CHANGE									
1972-80	10.8	11.2	11.9	6.7	-0.2	12.3	14.2	-6.3	9.1
1980-83	10.8	3.8	4.2	0.3	0.6	5.6	8.5	148.5	5.7

The above factors are associated in the following specific form, with t-values shown in parentheses:

DEMAND: Qcd = b31 + b32(Pcr/Pi) + b33(Qb) b34(I/Pi) + b35(D) , or

$$Qcd = \underset{}{-3.9393} \underset{(-3.08)}{- 8.8117(Pcr/Pi)} \underset{(-3.80)}{- 0.8013Qb} + \underset{(10.66)}{0.0986(I/Pi)} \underset{(-2.04)}{- 0.1117D}$$

$R^2 = .96$
D-W = 1.8

SUPPLY: Qcs = b41 + b42(Pcf*Pi/Pm) + b43(dL) , or

$$Qcs = 0.0824 \underset{(8.20)}{+ 0.0160(Pcf*Pi/Pm)} + \underset{(2.62)}{0.00011dL}$$

$R^2 = .93$
D-W = 2.1

Qcd = Qcs

Pcr = M2+Pcf

Where variables are defined as:

Qcd = Chicken available per capita for consumption, kgs
Qcs = Chicken available per capita from production, kgs
Pcr = Chicken meat retail price, Rs per kg
Pcf = Chicken meat producer price, Rs per kg
M2 = Chicken meat price margin, the difference between retail price and producer price, Rs per kg
I = Net national product per capita, a proxy for income per capita, in Rs per person per annum
Pi = General retail price index, 1975/76 = 100
Pm = Price of maize in Karachi, Rs per 40-kg bag
Qb = Beef and buffalo meat available per capita, kgs
dL = Annual change in the number of layers on farms, (000)
D = Zero-one variable for epidemics, 1 in 1982, 0 otherwise,

and b's are parameters in the respective equations.

In terms of the independent variables, the equilibrium price and quantity are given by:

$$Pcf = [(b43-b31+b35D) - b32(M2/Pi) - b33Qb - b34(I/Pi)+b43dL] * [(b32/Pi) - b42(Pi/Pm)]^{-1}$$

$$Qc = [(Pi\backslash b32)(b31+b35D+b33Qb) - (Pm\backslash b42Pi)(b41-b43dL) + (b34\backslash b32)I+M2]*[(Pi\backslash b32)-(Pm\backslash b42Pi)]^{-1}$$

The model for chicken meat supply and demand is used in the following sections to simulate different scenarios.

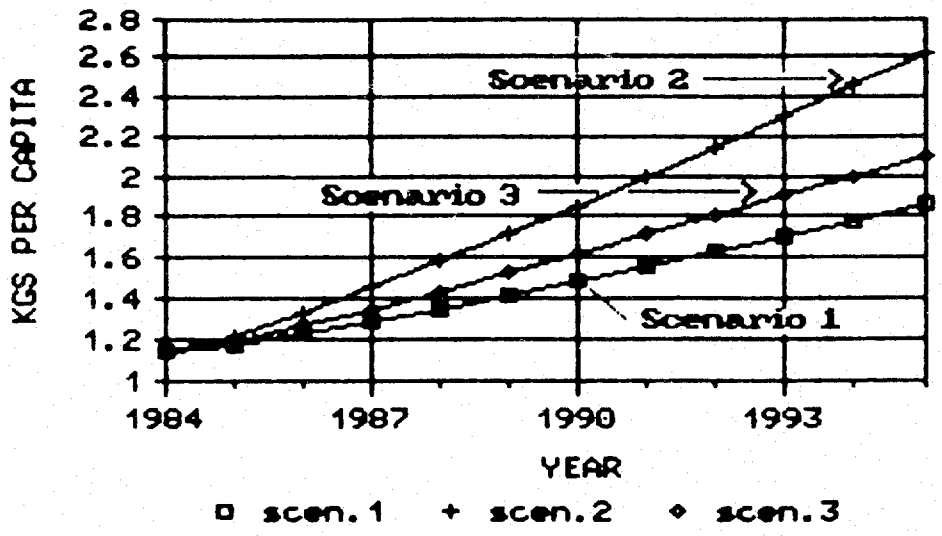
2. Chicken Meat Prices and Availability Under Differing Scenarios

The availability of chicken meat, like the availability of eggs, is sensitive to growth in income. However, the demand for chicken meat is also affected by the demand for beef and buffalo because these meats are close substitutes. The supply of chicken meat is also conditioned by the supply of cull and spent birds.

Graph II-13 shows the amount of chicken meat available under three different scenarios. Under the first scenario the basis used for comparison is the economy as it is depicted in the Sixth Five-Year Plan. Per capita NNP is used as the proxy for per capita income, increasing annually at 10 percent. The retail price index, used as the inflation rate, increases at 6.9 percent per year. Maize prices increase at the rate of 5.7 percent per year, as they have increased historically. Beef and buffalo supply is held at 5 kilograms per capita, equal to the level of the past five years. Layer flocks expand by one million birds each year, consistent with the expansion of the last five years. Under the assumptions of the first scenario, the chicken meat model predicts continued increase in both chicken prices and demand, with a rate of growth half that of the past ten years.

In the second scenario the assumptions of the first scenario are used for all parameters except beef and buffalo supply. In this scenario, a shortage of beef and buffalo is depicted, with per capita supplies falling from five to four kilograms. A substantial growth in chicken supply results. The rate of growth in per capita availability of chicken meat rises 50 percent above the rate attained under the first scenario. The second scenario suggests that a shortage of beef and buffalo meat would be more than compensated by an increase in production of chicken meat.

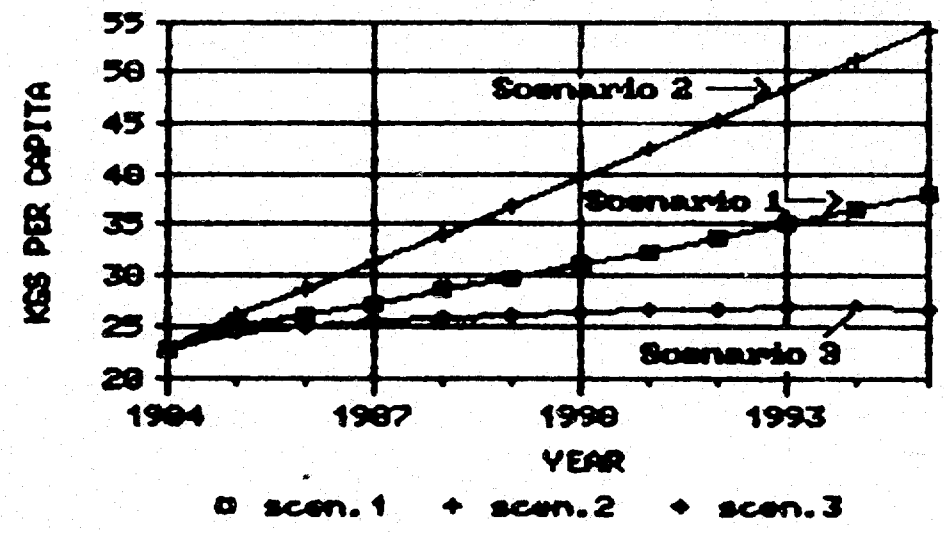
GRAPH II-13.
CHICKEN MEAT AVAILABLE BY SCENARIO



In the third scenario maize price increases are restrained to 1 percent per year, with other assumptions of the first scenario held constant. With stable maize prices, chicken meat production expands at a rate 25 percent faster than the rate attained in the first scenario. This result depicts the possible outcome in chicken meat production if the world surplus of grain continues and maize prices are depressed by market conditions. If a world deficit develops and maize prices rise, chicken meat production would fall as producer profits turn to losses.

Graph II-14 illustrates the path of chicken meat prices under the three scenarios. In the first scenario prices climb more slowly than in the past because more meat is produced and inflation rates are relatively low.

GRAPH II-14.
CHICKEN MEAT RETAIL PRICE BY SCENARIO



Chicken meat prices rise much more rapidly in the second scenario because the shortage of beef and buffalo meat results in a substantial drop in total meat supplies. Higher income consumers bid up the price of chicken meat. Production of chicken meat eventually compensates for the beef and buffalo deficit. Gains in production of chicken meat are relatively rapid since the broiler production cycle lasts a maximum of two months. This scenario would seriously drain the supply of grains unless additional supplies were available.

The third scenario is particularly interesting because it demonstrates the stimulating effect on chicken meat production of reducing or stabilizing feed costs. With lower production costs in a competitive industry, the price of chicken meat falls to a level below that of the first scenario. Under this scenario the price of chicken meat increases from Rs 25.00 per kilogram in 1986 to only Rs 27.00 per kilogram in 1993, a dramatic comparison to price increases in the other two scenarios.

In summary, the chicken meat industry is capable of compensating for shortages in the supply of beef and buffalo meat, but an increase in production will require higher prices to pay for new investment. If, on the other hand, low grain prices persist, the availability of chicken meat will expand and prices will increase at a substantially lower rate. Finally, as in the case of the egg industry, the chicken meat industry is sensitive to the growth in income that supports increases in demand. The industry has made few efforts to expand demand through promotion.

V. Potential for Export of Chicken Meat, Eggs and Day-Old Chicks

A. World Trade Patterns

The world market for chicken meat and eggs has expanded at a relatively slow rate during the last five years. Higher transport costs and fluctuating exchange rates have adversely affected the volume of international trade. As the value of the dollar, and energy and tranport costs decline, world trade in poultry products is likely to increase more rapidly than in the past years. In the Mideast market, which represents an exception, imports continue to diminish with declining oil revenues. Activity in the Mideast market is of particular concern to the producers of Pakistan.

Growing world production of eggs and chicken meat should fuel expansion in the poultry product trade. Large world supplies of grain and low grain prices are likely to provide relatively low-cost feeds to encourage production of poultry. As domestic markets become saturated with low-priced poultry inputs, more poultry products will be channeled into the international market. In some countries, governments will provide export subsidies to clear the domestic market and earn foreign exchange. The trend in world production and export of chicken and eggs is shown in Table II-15.

TABLE II.15. WORLD PRODUCTION AND EXPORTS OF CHICKEN AND EGGS, 1974-1984

YEAR	PRODUCTION (MT)		IMPORTS (MT)		IMPORTS AS PERCENT OF PRODUCTION (%)	
	Chickens	Eggs	Chickens	Eggs	Chickens	Eggs
1974	5937707	23065955	659584	578546	11	2.5
1975	6021624	23508982	666391	637606	11	2.7
1976	6012849	23875695	774478	606963	13	2.5
1977	6173603	24796589	941803	670494	15	2.7
1978	6467758	25665557	988896	709222	15	2.8
1979	6105827	27404285	1181142	760747	19	2.8
1980	6282201	28333968	1404614	833190	22	2.9
1981	6482241	29209636	1761104	901096	27	3.1
1982	6913000	28293044	1747816	927197	25	3.3
1983	7085000	28822296	1607172	904893	23	3.1
1984	7305000	29436190	1501510	927477	21	3.2
MEAN ANNUAL PERCENT CHANGE						
1974-1979	0.6	3.5	12.7	5.6		
1979-1984	3.7	1.4	4.9	4.0		

Source: FAO Trade Yearbooks, 1976-1984, Vols. 30, 32, 34, 36, 38.

Table II-15 shows that a growing proportion of world production has entered the international market over the past decade. In 1974 only 11 percent of the chicken meat and 2.5 percent of all eggs produced were imported on the world market. A decade later, in 1984, the import share of total chicken meat production was 21 percent. Of all eggs produced in 1984, 3.2 percent were imported. The major exporters of chicken meat are the United States, Brazil, France, and the Netherlands. Major importing nations are Egypt, Japan, Saudi Arabia, the Federal Republic of Germany, and the U.S.S.R. Currently, the People's Republic of China, Turkey, France, Belgium, and the Netherlands are the largest exporters of poultry products. The largest importers are Algeria, Hong Kong, Iran, and Iraq.

As shown in Table II-16, exports of eggs to Asia and the Mideast continued to grow through 1984. However, the volume of exports to these regions is expected to decline in the near future. Furthermore, the regions' 1984 imports of approximately one-quarter million tons raises doubts about Pakistan's export capacity. Assuming Pakistan produced 3.7 billion eggs in 1984 (Table II-7) and each dozen weighs approximately one-half kilogram, total production was 150 thousand tons, or 100 thousand tons less than the total Asian-Mideast import demand.

TABLE II.16. IMPORTS OF EGGS BY ASIAN AND MIDEAST NATIONS, 1974-1984

YEAR	Bahrain	Brunei	Hong Kong	Iran	Iraq	Kuwait	Saudi Arabia	UAE	Yemen, AR	Yemen, Dem	Others	ALL ASIA/ MIDEAST
						MT						
1974	3220	729	46971	14058	9556	7904	5679		132	151	42397	130797
1975	1790	780	53047	10079	33957	9409	5945		85	58	43399	158549
1976	1967	956	51251	17048	13154	11161	10630	9066		50	45139	160422
1977	1364	1387	57848	12130		11378	12303	20021	4629	350	53357	174767
1978	1266	875	61853	12000	10000	10700	16140	5000	7348	1000	41881	168071
1979	1073	705	68486	12000	10000	10998	14077	9000	4300	2500	42665	175804
1980	906	1209	68902	22340	18000	11829	17160	19040	5500	1227	42980	209093
1981	1588	1132	67709	40091	30000	11280	14240	8300	10951	1647	47962	234900
1982	1680	1270	69341	26446	37020	12926	12356	8000	7300	3131	45398	224868
1983	2205	836	68196	41126	33010	10000	5768	10500	9200	1843	42106	224792
1984	1700	718	75308	35630	55040	10000	3619	10000	8000	1800	44509	246324
MEAN ANNUAL PERCENT CHANGE												
1974-80	-19.05	8.80	6.59	6.03	13.50	6.95	20.24	20.38	110.84	41.79	0.23	8.13
1981-84	2.30	-14.80	3.61	-3.86	22.42	-3.94	-36.66	6.41	-9.94	3.01	-2.46	1.60

Source: FAO Trade Yearbooks, 1976-1984, Vols. 30, 32, 34, 36, 38.

B. Export of Poultry Products by Pakistan

Data provided by the Federal Bureau of Statistics indicate that Pakistan has exported a relatively small volume of poultry products over the past few years. (See Table II-17.) During 1984-85 Pakistan exported a total value of Rs 46,000 in eggs and Rs 24,000 in poultry offal. Poultry meat is not exported since export possibilities are curbed by limited facilities for freezing and cold storage and the extraordinarily high price of chicken meat.

The cost of exporting poultry meat from Pakistan is roughly twice the world import price. Domestic chicken meat prices in Karachi are Rs 18 per kilogram liveweight and Rs 30 per kilogram dressed weight. Adding another Rs 5 to cover export and transport expenses, the cost of exporting chicken meat from Karachi totals Rs 35 per kilogram dressed weight, compared to the world import price of Rs 16 per kilogram dressed weight.

TABLE II.17. PAKISTAN IMPORTS AND EXPORTS OF POULTRY, 1982/83-1984/85 (1)

FISCAL YEAR	--LIVE POULTRY--- Import Up to 185 g	Export	--LIVE POULTRY--- Import More than 185 g	Export	----OFFAL----- IMPORT	EXPORT	--EGGS IN SHELL-- IMPORT	EXPORT	EGGS NOT IN SHELL IMPORT	EXPORT
	(1000 Rs)									
1982/83	21073.00	34.00	2267.00	--	--	--	177.00	618.00	15.00	--
1983/84	25705.00	26.00	4496.00	--	--	--	24.00	--	51.00	--
1984/85	45319.00	--	2997.00	--	--	24.00	7439.00	36.00	220.00	10.00

(1) Imports are reported c.i.f. Exports are reported f.o.b.

Source: Foreign Trade, Volumes 11-12, Number 12, June 1984 and June 1985, Federal Bureau of Statistics, Statistics Division.

The higher price of chicken meat in Pakistan reflects both domestic costs of producing poultry and preferential conditions established by governments in other countries. Feed costs are relatively high in Pakistan, and a number of other governments subsidize poultry production for export.

The prices of eggs and day-old chicks in Pakistan compare more favorably with world market prices, and especially with prices in nearby Dubai. In 1985 the cost of exporting eggs from Karachi to Dubai would have totalled Rs 338 per case of 30 eggs, while the Dubai price averaged about Rs 296 per case. This Rs 42 differential represents 14 percent of the Dubai price.

A larger price differential exists for the higher quality eggs shipped by air. In 1985 the total cost of shipping eggs by air from Karachi to Dubai would have totalled Rs 410 per case of 30 dozen, as compared to the Dubai price of Rs 352. Details of the cost of exporting eggs from Karachi to Dubai are shown in Table II-18.

With substantial overcapacity in the hatching industry, the export of day-old chicks from Pakistan may be feasible. Both the production and the export of day-old chicks is a highly technical and management-intensive business. Chicks must be transported quickly because they have high feed and water requirements. In Pakistan, day-old chicks are usually transported between the Karachi, Lahore, or Islamabad markets. The Karachi price for the

TABLE II-18. COST OF EXPORTING EGGS FROM PAKISTAN [1]

MAJOR COST AND RETURN ITEMS	COST OF EGGS/CASE [2] Sea (Rs/30 doz)	Air (Rs/30 doz)
COSTS OF EXPORT:		
Average cost, 30 doz eggs, Karachi, 1985	186.00	186.00
14 paper pulp egg flats @ Rs 1 each	14.00	14.00
1 corrugated paper carts @ Rs 18	18.00	18.00
Pigmentation feed additive (for yolk color standards)	12.00	12.00
1.5% gradeouts sold @ Rs 1.85/doz	2.78	2.78
Government Grading Certificate	2.00	2.00
Inland transportation	3.00	3.00
Forwarding	5.00	5.00
Cold storage rental	6.00	6.00
Equivalent tax drawback on imported production items	18.00	18.00
TOTAL FOB COST/CASE	266.78	266.78
Freight cost by refrigerated sea container @ $4000/900 cases or $4.44/case	71.00	
Freight cost by air @ Rs 6.50/kg and 22 kg/case		143.00
TOTAL CIF COST/CASE	337.78	409.78
RETURNS FROM SALES IN DUBAI:		
CIF egg price by sea @ $18.50/case	296.00	
CIF egg price by air @ $22/case		352.00
TOTAL LOSS PER CASE	41.78	57.78

[1] Example is based on exporting from Karachi to Dubai.
[2] Cost at 1985 prices.

cheaper broiler chicks is Rs 7.55 per chick, and for the more expensive layer chicks Rs 8.73. Aside from the cost of the domestically-produced chick, the largest component of the total export cost is transportation. Transport costs for chicks are currently about Rs 1.25 per chick. Packing costs and local taxes are next in order of magnitude.

TABLE II-19. COST OF EXPORTING DAY-OLD CHICKS [1]

	BROILER CHICKS	LAYER CHICKS
MAJOR COST ITEMS FOR 80 DAY-OLD CHICKS:		
Eighty broiler chicks @ Rs 5.5	440.00	
Eighty layer chicks @ Rs 6.5		520.00
Packing @ Rs 14/80 chicks	14.00	14.00
Health Certificate @ Rs .1/chick	8.00	8.00
Inland transportation	5.00	5.00
Local tax and octroi @ Rs .15/chick	12.00	12.00
Forwarding	5.00	5.00
Equivalent tax drawback, imported production items	20.00	34.00
TOTAL FOB COST	504.00	598.00
Freight @ Rs 20/kg for 5 kg in 100-250 kg lots	100.00	100.00
TOTAL CIF COSTS	604.00	698.00
PER CHICK COST	7.55	8.73
RETURNS ON CHICK SALES IN DUBAI:		
CIF Export Price		
@ $.32 per broiler chick	5.12	
@ $.45 per layer chick		7.20
TOTAL LOSS PER CHICK	2.43	1.53

[1] Example is based on exporting from Karachi to Dubai.

An issue of particular interest to Pakistan concerns the equivalent tax drawback (value of taxes or import duties) associated with the import of poultry products. Under current regulations these may be rebated to the export producer or applied against the costs of subsidizing exports. The computation of the amount represented by the import taxes is illustrated in Annex II.

Tables II-18 and II-19 show the 1985 difference between the c.i.f. export cost per unit and the gross returns per unit in Dubai for egg products and day-old chicks. This amount represents the subsidy required to promote exports, or to make Pakistan products competitive with Dubai products. To export eggs to the Dubai market this subsidy constitutes Rs 42 per case for eggs transported by sea and Rs 58 per case for eggs transported by air. The subsidy for day-old chicks represents Rs 2.43 per broiler chick and Rs 1.53 per layer chick.

C. Summary and Conclusions

Given the volatility of poultry markets, it is not suprising that some industry and government officials favor stronger export policies. When egg prices drop to their lowest levels with seasonal fluctuations, the Government of Pakistan may consider using rebates to encourage exports that will generate additional foreign exchange. When hatcheries are operating with excess capacity, the Government may wish to stimulate domestic employment by promoting exports. However, despite the allure of export rebates, an analysis of market data shows such a policy would be extremely costly to the government treasury and could potentially cause sharp consumer costs due to reduced domestic supplies and higher retail prices.

The treasury costs of egg and chick export subsidies to a Mideast market such as Dubai would be a significant portion of domestic production costs (at least Rs 42 per case of eggs and Rs 1.53 per day-old chick). Poultry meat export subsidies would be an even larger treasury burden, about 50 percent of domestic production costs. While these subsidies might capture increased shares of the Mideast import markets for Pakistan, the treasury costs of the subsidies would far outweigh the benefits of the foreign exchange earnings, with the result that foreign exchange would be acquired at a more unfavorable price when compared to the current exchange rate.

Pakistan's capacity to offer poultry export subsidies will be severely strained by other major poultry exporting countries' subsidies. For example, France offers one of the larger subsidies to poultry exporters. The Government of France pays restitutions equivalent to Rs 49 per case for eggs (FF 1.75/kg) and Rs 0.43 per chick (FF 0.195/chick). Other nations, such as the Netherlands, charge lower or adjusted freight rates for export of poultry products. The cost for a 40-square-foot refrigerated container to ship eggs from Amsterdam to Dubai is $4,000, or the same rate charged for the much shorter Karachi-Dubai distance. The air freight rate for day-old chicks is also relatively expensive from Karachi to Dubai in comparison with other international rates.

Under present production conditions, it is also doubtful that export subsidies could increase poultry exports without diverting some of the supplies that would otherwise be consumed domestically. Since Pakistan's percapita consumption is already quite low, any policy that makes exports relatively more attractive would threaten to reduce domestic supplies and increase retail prices. For example, the results of the poultry meat demand model indicate that a 1 percent decrease in poultry meat supply would, holding all other prices and income constant, lead to about a 1.1 percent increase in poultry meat prices. The effects of reduced egg supplies would have an even larger effect on prices -- a 1 percent decrease in egg supply would, holding all other prices and income constant, lead to about a 2 percent increase in egg prices.

CHAPTER THREE

POULTRY FEED EFFICIENCY AND BUDGETS FOR COMMERCIAL POULTRY FARMS IN PAKISTAN

I. Poultry Feed Efficiency

Because feed constitutes more than 50 percent of typical poultry production costs, feed efficiency is one of the most important determinants of profitability. This section analyzes three major aspects of poultry feed efficiency: estimated poultry feed-output relationships, least-cost rations, and selected experimental results of feed efficiency for alternative protein feed ingredients.

A. Estimated Poultry Production Functions

Illustrative analyses of feed-output relationships were estimated for two of Pakistan's major poultry products: broiler meat and table eggs. The analyses cannot be interpreted as representative of the industry because the limited scope of this study did not permit extensive farm surveys. However, the results are consistent with industry experts' perceptions of production relationships for the sizes of firms sampled.

1. Broilers

The broiler production process starts with day-old chicks and ends about seven weeks later with a 1.5 kilogram broiler bird. About 40 percent of total feed is consumed as a 23 percent protein starter ration during the first half of the production period. The finishing ration is normally about 21 percent protein.

Table III-1. summarizes broiler production data for five Karachi poultry farms. These data were not collected under random sampling procedures and therefore cannnot be accepted as representative of the industry. Nor are there any reliable estimates of farm-level production statistics, for the nation or for any single province, that can be used as benchmarks for comparison. However, the average production statistics for these farms are similar to the conditional estimates often cited by industry experts.

A generalized broiler production function was estimated by using feed-output data observed for the five farms. Since each production cycle began with day-old chicks, the function was specified with a zero intercept. Output was specified as a cubic function of feed, following the characteristic sigmoid growth curve that is typically associated with biological growth.

TABLE III-1. BROILER FEED EFFICIENCY ON FIVE POULTRY FARMS

	Farm No. 1	2	3	4	5	Average
Total Chicks Started	2,000	2,000	2,000	2,000	2,000	2,000
Mortality Rate (%)	2.38	4.7	5.8	7.35	8.6	5.77
Total Broilers Mktd.	1,952	1,906	1,884	1,853	1,828	1,885
Total Bird Weight (Kg)	3,339	2,935	2,939	2,817	2,431	2,892
Ave Wt/Bird (Kg)	1.71	1.54	1.56	1.52	1.33	1.53
Bags of feed	150	140	146	158	127	144
Total Feed (Kg)	7,500	7,000	7,300	7,900	6,350	7,210
Ave Feed/Bird (Kg)	3.81	3.61	3.79	4.16	3.43	3.83
Feed Conversion Ratio	2.25	2.38	2.48	2.80	2.61	2.49
Production Time (Weeks)	7	7	7	8	7	7.2
Total Feed Cost (Rs)	27,000	25,200	26,280	28,440	22,860	25,956
Feed Cost/Kg (Rs)	3.60	3.60	3.60	3.60	3.60	3.60

SOURCE: K&N Poultry Farms, Karachi

Results of the estimated regression model for the broiler production function are summarized in Table III-2. The signs of the regression coefficients are as expected for an input-output relationship that exhibits diminishing marginal returns. However, the estimated regression coefficient for the cubic term (cubed feed variable) is not significantly different from zero at the five percent level.

The low level of statistical significance for the cubic term of the equation should not be suprising since the model was estimated with only five observations. The simple model is also likely to suffer from failure to specify other factors that contribute to cross-section variability. By using end-of-cycle production data, the model also fails to incorporate the dynamic aspects of changes in metabolic efficiency as day-old chicks grow into 1.5 kilogram birds.

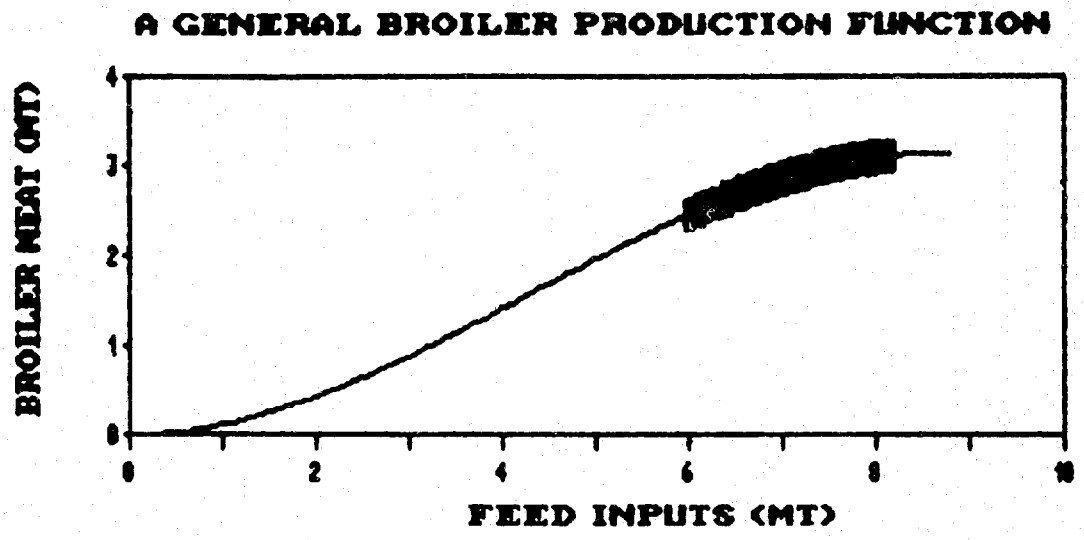
TABLE III-2. BROILER PRODUCTION REGRESSION MODEL

VARIABLE	COEFFICIENT	STANDARD ERROR	"T"	2-TAIL PROB.
Feed Squared	0.128297	0.035626	3.60	0.04
Feed Cubed	-0.010009	0.000000143	-2.07	0.13
Adjusted R-squared	0.30			
S.E. of Regression	0.2725			
F-statistic	2.67			

Dependent Variable: Broiler Production (Metric Tons)
Independent Variables: Metric Tons of Feed

The production function estimated in Table III-2 is more clearly depicted in Graph III-1. The thin curve is the function that represents the estimated production of broiler meat for a 2,000 bird flock. The thick segment of the curve over the range of 6-8 tons of feed inputs indicates the region of the graph where farm production was observed, and also marks the area where the "true" production may exist.

GRAPH III-1.



Assuming a broiler meat price of Rs 16.00 per kilogram and a feed price of Rs 3.60 per kilogram, the optimum broiler feed input level for a 2,000 bird flock is found in Graph III-2 to be at about 7.55 tons. Table III-3 shows the estimated incremental value and cost of feed over the range from 7 to 8 tons of feed inputs.

GRAPH III-2.

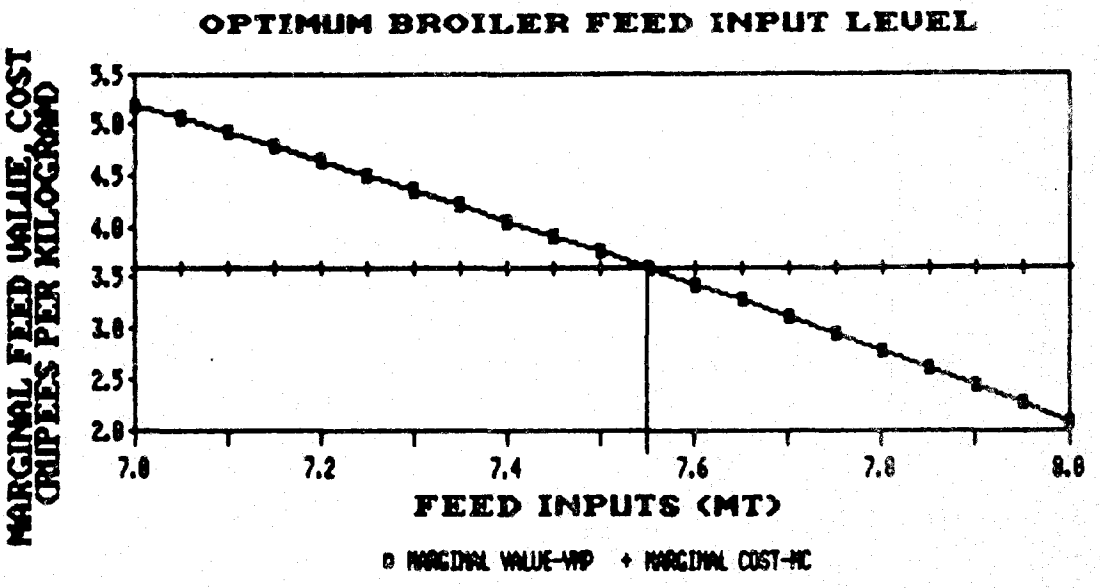


TABLE III-3. OPTIMUM LEVEL OF BROILER FEED USAGE

FEED INPUT	BROILER OUTPUT (MT)	MPP	VMP	MC	VMP-MC
				Rs/Kg	
	(a)	(b)	(c)	(d)	(e)
7.00	2.85	0.32	5.20	3.60	1.60
7.10	2.89	0.31	4.93	3.60	1.33
7.20	2.92	0.29	4.65	3.60	1.05
7.30	2.94	0.27	4.37	3.60	0.77
7.40	2.97	0.25	4.07	3.60	0.47
7.50	2.99	0.24	3.77	3.60	0.17
7.60	3.02	0.22	3.45	3.60	-0.15
7.70	3.04	0.20	3.13	3.60	-0.47
7.80	3.06	0.17	2.79	3.60	-0.81
7.90	3.07	0.15	2.45	3.60	-1.15
8.00	3.09	0.13	2.10	3.60	-1.50

NOTES:

(a) Broiler output estimated from Table III-2.

(b) The Marginal Physical Product of feed (MPP) is the estimated incremental change in broiler output per unit of incremental change in feed input.

(c) The Value of the Marginal Product of feed (VMP) is the product of the MPP and the broiler price (Rs 16/Kg).

(d) The Marginal Cost of feed (MC) estimated from Table II-D.1.

(e) With respect to feed, broiler profit is maximized and feed input is optimum when VMP-MC=0.

2. Layers for Table Eggs

The typical layer production cycle for table eggs begins with 16-week old pullets on grower finishing rations of 18 to 21 percent protein. Laying begins at about 21 weeks of age and continues for about 60 weeks on a 17-18 percent protein ration.

Table III-4 summarizes layer production data for nine Karachi layer farms during 1985. Because the farms were not randomly selected, the production statistics cannot be assumed to represent typical industry conditions. However, the average statistics for the farms are similar to typical performance estimates by industry experts.

Following the same procedure used for broilers, a layer production function was estimated with egg production specified as a cubic function of feed. Results of the regression analysis of the egg production model are summarized in Table III-5. Both estimated regression coefficients have the expected signs for a function exhibiting diminishing returns and are significantly different from zero at the one percent level. However, the high levels of statistical significance for the layer model cannot be regarded as more valid and representative than the broiler model because of a small sample size and the use of end-of-cycle production data.

TABLE III-4. FEED EFFICIENCY ON NINE LAYER FARMS (TABLE EGGS)

FARM #	NUMBER OF LAYERS START	NUMBER OF LAYERS FINISH	MORTALITY	PRODUCTION PERIOD	EGGS	FEED
	--- 1,000'S ---		(%)	(WEEKS) (a)	000 CASES (b)	MT (c)
1	5.00	4.28	14.44	62.00	4.05	210.99
2	4.32	3.74	13.44	62.00	3.49	175.65
3	5.93	5.43	8.37	51.00	4.23	209.45
4	1.92	1.37	28.64	51.00	1.34	86.99
5	2.69	2.39	11.16	55.00	1.80	97.88
6	2.36	2.08	11.92	50.00	1.80	77.86
7	5.00	4.38	12.32	59.00	3.77	204.20
8	4.42	3.94	10.88	55.00	3.13	154.28
9	5.40	4.20	22.30	62.00	3.83	208.56
MEAN	4.11	3.53	14.83	56.33	3.05	158.43
S.D	1.29	1.17	5.78	4.52	0.99	50.55

SOURCE: Kay's Feeds, Karachi

NOTES:

(a) Usual layer operation starts with 16-week old pullets. Laying begins about 5 weeks later and lasts for about 60 weeks.

(b) A case holds 30 dozen eggs.

(c) Feed inputs include both grower and layer feeds.

TABLE III-5. EGG PRODUCTION REGRESSION MODEL

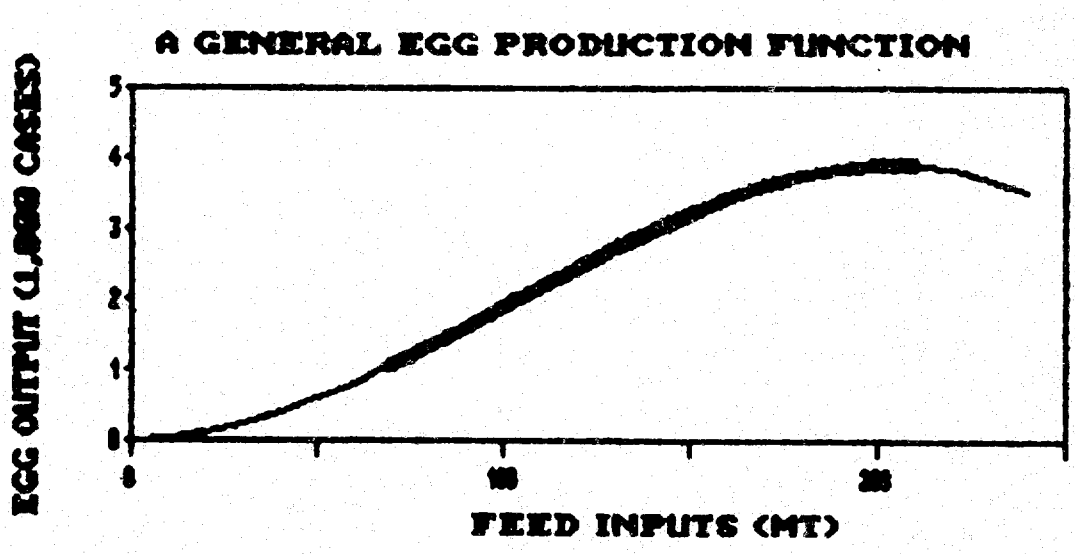
VARIABLE	COEFFICIENT	STANDARD ERROR	"T"	2-TAIL PROB.
Feed Squared	0.000283	0.00002889	9.79	0.00
Feed Cubed	-0.0000008239	0.000000143	-6.42	0.00
Adjusted R-squared	0.93			
S.E. of Regression	0.2955			
F-statistic	104.56			

Dependent Variable: Egg production (1,000 Cases)
Independent Variables: Metric tons of feed

The function estimated in Table III-5 is drawn in Graph III-3. The wider band of the curve over the feed input range of 80-210 tons depicts the range of observed egg production and the vicinity where the "true" production curve may lie.

In Graph III-4, the optimum level of layer feed input is estimated at about 173 tons, assuming an egg price of Rs 200 per case and a feed price of Rs 3.0 per kg. The incremental values and costs of layer feed inputs in this graph are summarized in Table III-6.

GRAPH III-3.



GRAPH III-4.

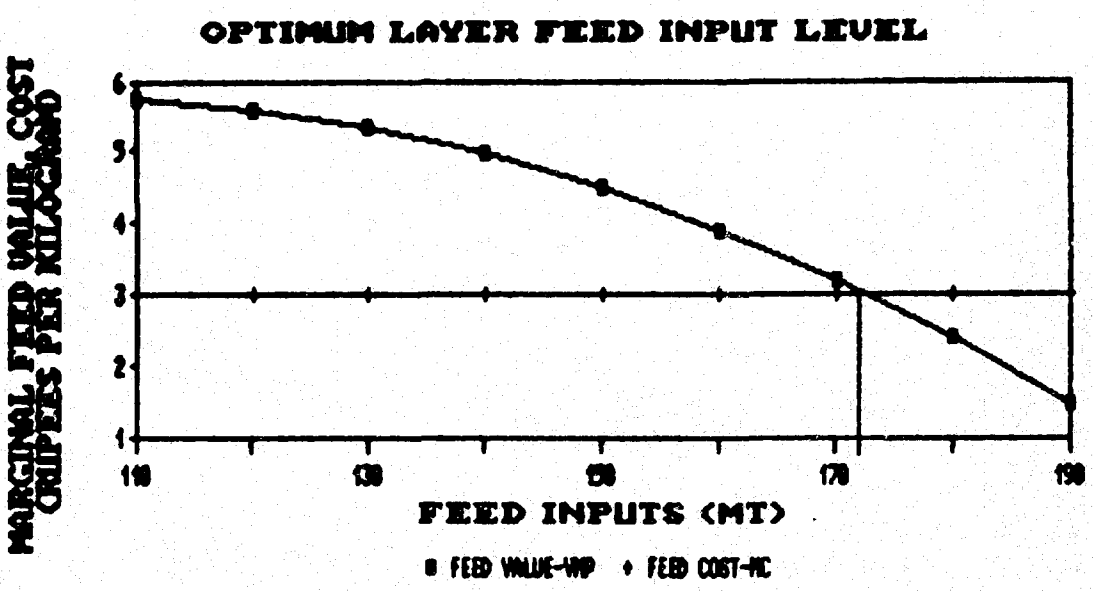


TABLE III-6. OPTIMUM LEVEL OF LAYER FEED USAGE (FOR TABLE EGGS)

FEED INPUT --(MT)--	EGG OUTPUT ---- 000 CASES (a)	MPP ---- (b)	VMP ----------Rs/Kg (c)	MC (d)	VMP-MC ---------- (e)
110	2.19	0.03	5.74	3.00	2.74
120	2.48	0.03	5.60	3.00	2.60
130	2.75	0.03	5.35	3.00	2.35
140	3.01	0.02	4.98	3.00	1.98
150	3.25	0.02	4.51	3.00	1.51
160	3.46	0.02	3.92	3.00	0.92
170	3.64	0.02	3.22	3.00	0.22
180	3.78	0.01	2.42	3.00	-0.58
190	3.88	0.01	1.50	3.00	-1.50

NOTES:

(a) Broiler output estimated from Table III-5.

(b) The Marginal Physical Product of feed (MPP) is the estimated incremental change in broiler output per unit of incremental change in feed input.

(c) The Value of the Marginal Product of feed (VMP) is the product of the MPP and the table egg price (Rs 200/case).

(d) The Marginal Cost of layer mash (MC) is assumed to be Rs 0.6/Kg less than broiler feed.

(e) With respect to feed, egg profit is maximized and feed input is optimum when VMP-MC=0.

B. Least Cost Feed Rations

The marginal productivity analysis of optimum feed input levels is useful for determining the neighborhood of inputs

that fall in Stage II of Production, near the point of maximum profit. However, if the general range of optimum feed input levels is determined through practical experience, it is often more useful to approach the profit maximization problem as a matter of minimizing the cost of the feed input required for a given level of output.

1. A Linear Programming Model of Least Cost Rations

Least cost rations can be conveniently formulated by solving a linear programming (LP) model for the combination of feed ingredients that satisfy a set of technical nutritional requirements at the least cost. One of the main advantages of LP in formulating least cost rations is the calculation of sensitivity of costs to changes in ingredient prices and nutrient requirements.

To develop a least cost ration with LP, four types of information are needed: (1) prices of available feed ingredients; (2) nutrient composition of each ingredient; (3) nutrient requirements for a performance standard; and (4) empirical evidence that the performance standard is economically feasible with the available feeds. Feed price data are readily available in Pakistan. The nutrient composition of local feed ingredients has not been adequately analyzed because of a relatively large supply of low quality feeds, insufficient feed testing equipment, and weak feed quality laws. Because of poor production management throughout the industry, even less is known about how given qualities of local feed ingredients affect poultry production performance.

Given these shortcomings of the LP approach, least cost poultry rations were formulated using estimated 1986 feed prices for Karachi (Table III-7). In lieu of time-series price data on some less popular ingredients, local industry price estimates were used for barley, tillcake, rice bran, di-calcium phosphate, soybean meal, linseed meal, and full fat soya. Models for starter broiler, finishing broiler, and layer rations were developed in accordance with feed nutrient composition and requirement standards commonly recognized by the Pakistan poultry industry (Table III-8). Upper limit restrictions (4-5 percent of total ration weight) were applied to 50 percent meat meal (MM50), cottonseed meal (CSM), rapeseed meal (RSM), guar meal (GUAR), 30 and 60 percent corn gluten meal (CG6030), and till cake (TILCAK) to limit inherent toxicity effects and to reflect limited annual availability of ingredients.

2. Least Cost Broiler Starter Ration

Results of the least cost broiler starter ration are summarized in Table III-9. The ingredients selected for the optimum ration are noted as "BASIS" in the STATUS column. The proportion of each basis ingredient per metric ton of ration is shown in the VALUE column.

Table III-7. Prices of Poultry Feed Ingredients, Delivered at Karachi (Rs/MT)

Ingredients	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986 (a)
Blood Meal	5602	5975	5976	6536	4689	4860	5314	6703	7368	7279	7265	7161
Bone Meal	859	1046	1270	na.	1565	1625	1710	1750	1900	2525	2525	2580
Broken Rice	1382	1233	1456	1195	1178	1460	1767	1750	1909	2317	2257	2270
Corn Gluten Meal, 30%	na.	na.	na.	na.	1634	1715	1900	1900	2340	2650	2400	2735
Corn Gluten Meal, 60%	3510	3511	3847	4482	3590	3800	4110	4110	4940	5500	5200	5298
Cottonseed Meal	1942	2502	2988	3548	2411	2465	3563	2787	4890	4227	3429	4232
Fish Meal	3137	4482	6200	6349	5154	5073	5743	5200	5315	6000	5950	6188
Guar Meal	1120	1307	2689	2316	2224	2525	3063	2500	2960	2895	1651	2897
Lime Stone	177	177	187	299	167	187	268	165	171	186	180	188
Maize	1718	1942	2129	2428	1741	1768	2140	2200	2029	2384	2380	2336
Meat Meal	2800	2241	3174	3362	3548	na.	3927	4857	4860	5014	4948	5524
Molasses	422	336	289	317	616	723	975	450	643	600	650	759
Rape Seed Meal	1419	1681	2166	1718	1661	1721	1637	1870	3302	2736	1616	2442
Rice Polishing	710	598	934	1046	1125	980	1376	1215	1325	1600	1157	1534
Sorghum	1680	1680	2129	1681	1875	na.	2050	2150	1985	2400	2108	2276
Wheat	1120	1307	1382	na.	1810	na.	1890	1950	2130	2200	2314	2456
Wheat Bran	1158	1008	1046	1345	1152	1285	1294	1294	1757	1295	1350	1505

SOURCE: Pakistan Poultry Association

(a) Prices for 1986 are estimated on the basis of 1975-1985 trends and current market conditions.

The cost (Rs 3,604 per MT) is similar to reported industry feed costs, but the sources of energy are quite different. The main source of energy in the LP ration is maize; however the industry typically uses relatively more broken rice than maize, mainly because rice is more readily available throughout the year. The high price sensititvity of maize in the ration bears out its precarious competitive position; assuming the prices of all other ingredients remained constant, the proportion of maize in the ration would decrease if its price increased by only Rs 3 per MT. The maize proportion would increase if its price decreased by at least Rs 267 per MT. Other energy ingredients would enter the ration according to the following respective price decreases per MT: broken rice (BRICE), Rs 127; rice polishing (RICPOL), Rs 290; barley (BARLY), Rs 569, sorghum (SORGH), Rs 577; and wheat, Rs 784.

The main contribution of protein to the least cost ration is rather evenly distributed among fish meal (FM50), meat meal (MM50), blood meal (BLOM), till cake (TILCAK), guar meal (GUARML), 60 percent corn gluten meal (CGF60), and full fat soya (FFSOY). Assuming all other ingredient prices remained constant, the proportion of fish meal in the ration would remain at five percent until its price exceeded Rs 8,009 per MT, compared to its current price of Rs 6,188. The proportions of till cake and 60 percent corn gluten meal would remain fixed until their unit prices approximately doubled. Conversely, the other protein ingredient proportions are highly sensitive to further price

TABLE III-8. INITIAL TABLEAU FOR LEAST-COST BROILER, LAYER RATIONS

	MAIZE	SORGH	BRICE	BARLY	FM50	MM50	BLOM	TILCAK	CSM	RSM	GUARML	C6F30	C6M60	WBRAN
COST (Rs/MT)	2336	2276	2270	2470	6188	5524	7161	3370	3280	2442	2897	2735	5298	1505
WEIGHT (MT)	1	1	1	1	1	1	1	1	1	1	1	1	1	1
PROTEIN (%)	8.5	11.5	7.5	12	50	50	75	40	40	36	40	25	55	14
M/E (Kcal/Kg	3366	3256	3450	2763	2537	2650	2650	2640	1914	1680	2204	1709	3476	1300
PHOS. (%)	0.3	0.3	0.12	0.36	2.5	2.5	0.22	1.5	1.2	1.2	0.6	0.66	0.4	1.2
CALC-LL (%)	0.02	0.04	0.04	0.07	6	6	0.28	2	0.3	0.8	0.4	0.16	2.68	0.14
CALC-UL (%)	0.02	0.04	0.04	0.07	6	6	0.28	2	0.3	0.8	0.4	0.16	2.68	0.14
LYSINE (%)	0.23	0.27	0.27	0.4	3.85	2.7	6.47	1.35	1.69	1.96	2.36	0.62	1.1	0.55
METH+CYS (%)	0.38	0.29	0.27	0.36	2.06	1.29	2.25	2.1	1.28	1.2	1.4	0.74	2.41	0.41
PREMIX (%)														
FM50 (%)					1									
CSM (%)									1					
RSM (%)										1				
GUAR (%)											1			
C66030 (%)												1	1	
TILCAK (%)								1						

-------TABLEAU CONTINUED----------

	RICPOL	RBRAN	DIPHOS	LIMSN	MOLAS	SBM	LSM	STBM	WHEAT	FFSOY	PREMIX	----RESTRICTIONS----- ----BROILERS-- LAYERS -START FINISH-		
COST (Rs/MT)	1534	1300	3500	188	759	4760	2420	2390	2456	5070	132000			
WEIGHT (MT)	1	1	1	1	1	1	1	1	1	1	1	=1	=1	=1
PROTEIN (%)	11.5	6.5			3.3	48	32	20	12.5	38		>=23	>=21	>=17.5
M/E (Kcal/Kg	2750	816			1960	2500	1657	750	3080	3300		>=3150	>=3190	>=2750
PHOS. (%)	1.4	1.34	17.5		0.08	0.67	0.67	10	0.46	0.59		>=.65	>=.65	>=.6
CALC-LL (%)	0.04	0.1	24	36	0.5	0.29	0.44	20	0.06	0.25		>=1	>=1	>=3.5
CALC-UL (%)	0.04	0.1	24	36	0.5	0.29	0.44	20	0.06	0.25		<=1.2	<=1.1	------
LYSINE (%)	0.5	0.17				2.84	1.25	0.9	0.41	2.4		>=1.2	>=1.1	>=.8
METH+CYS (%)	0.5	0.17				1.33	1.16		0.41	1.15		>=.9	>=.87	>=.66
PREMIX (%)												=.001	=.001	=.001
FM50 (%)												<=.05	<=.05	<=.05
CSM (%)												<=.05	<=.05	<=.05
RSM (%)												<=.04	<=.04	<=.04
GUAR (%)												<=.04	<=.04	<=.04
C66030 (%)												<=.04	<=.04	<=.04
TILCAK (%)												<=.04	<=.04	<=.04

INGREDIENT GLOSSARY:

BARLY	Barley	GUARML	Guar Meal	RSM	Rape Seed Meal
BLOM	Blood Meal	LIMSN	Limestone	SBM	Soyabean Meal
BRICE	Broken Rice	LSM	Linseed Meal	SORGH	Sorghum
C6F30	Corn Gluten Feed-30%	MAIZE	Maize	STBM	Steamed Bone Meal
C6M60	Corn Gluten Meal-60%	MM50	Meat Meal-50%	TILCAK	Till Cake
CSM	Cotton Seed Meal	MOLAS	Molasses	WBRAN	Wheat Bran
DIPHOS	Di-Calcium Phosphate	PREMIX	Vitamin/Mineral Premix	WHEAT	Wheat
FFSOY	Full Fat Soya	RBRAN	Rice Bran		
FM50	Fish Meal-50%	RICPOL	Rice Polishing		

NOTE: Premix prices per MT are: Broiler Starter, Rs 132,000; Broiler Finishing, Rs 88,250; Layer, Rs 59,870.

TABLE III-9. LEAST COST BROILER STARTER RATION ANALYSIS

RATION COST (Rs/MT): 3604

INGREDIENT	STATUS	VALUE (a)	UNIT COST	UNIT VALUE	NET COST	MINIMUM	MAXIMUM
MAIZE	BASIS	0.624	2336	2336	0	2169	2338
SORGH	NONBASIS		2276	1699	577	1699	NONE
BRICE	NONBASIS		2270	2143	127	2143	NONE
BARLY	NONBASIS		2470	569	1901	569	NONE
FM50	BASIS	0.050	6188	6188	0	NONE	8009
MM50	BASIS	0.075	5524	5524	0	4347	5532
BLDM	BASIS	0.072	7161	7161	0	6999	7164
TILCAK	BASIS	0.040	3370	3370	0	NONE	7265
CSM	NONBASIS		3280	1729	1551	1729	NONE
RSM	NONBASIS		2442	893	1549	893	NONE
GUARML	BASIS	0.032	2897	2897	0	2892	3083
CGF30	NONBASIS		2735	-6392	9127	-6392	NONE
CGM60	BASIS	0.04(	5298	5298	0	NONE	10724
WBRAN	NONBASIS		1505	-3232	4737	-3232	NONE
RICPOL	NONBASIS		1534	1244	290	1244	NONE
RBRAN	NONBASIS		1300	-5468	6768	-5468	NONE
DIPHOS	NONBASIS		3500	706	2794	706	NONE
LIMSN	NONBASIS		188	131	57	131	NONE
MOLAS	NONBASIS		759	-2983	3742	-2983	NONE
SBM	NONBASIS		4760	3472	1288	3472	NONE
LSM	NONBASIS		2420	487	1933	487	NONE
STBM	NONBASIS		2390	352	2038	352	NONE
WHEAT	NONBASIS		2456	1672	784	1672	NONE
FFSOY	BASIS	0.066	5070	5070	0	5069	5183
PREMIX	BASIS	0.001	132000	132000	0	NONE	NONE

NOTE:
(a) All values are listed as proportions of one ton.

RESTRICTION	DUAL	RHS VALUE	MINIMUM	MAXIMUM
WEIGHT (MT)	-8707	1.00	0.99	1.00
PROTEIN (%)	0	23.00	NONE	24.55
M/E (Kcal/Kg)	3	3150.00	3141.90	3180.82
PHOS. (%)	201	0.65	0.63	0.66
CALC-LL (%)	245	1.00	0.98	1.07
CALC-UL (%)	0	1.20	1.00	NONE
LYSINE (%)	0	1.20	NONE	1.34
METH+CYS (%)	3645	0.90	0.87	1.01
PREMIX (%)	140	1.00	0.00	10.55
FM50 (%)	-1821	0.05	0.00	0.10
CSM (%)	0	0.05	0.00	NONE
RSM (%)	0	0.04	0.00	NONE
GUAR (%)	0	0.04	0.03	NONE
C66030 (%)	-5425	0.04	0.02	0.05
TILCAK (%)	-3895	0.04	0.02	0.08

increases. The proportion of each ingredient in the ration would fall in response to the following respective price increases per metric ton: blood meal, Rs 3; meat meal, Rs 8; full fat soya, Rs 113; and guar meal, Rs 186. Other major protein sources are highly uncompetitive with the main protein ingredients in the least cost ration. Cottonseed meal (CSM), soybean meal (SBM), rapeseed meal (RSM), and linseed meal (LSM) prices would have to fall more than Rs 1,200 per metric ton to enter the ration.

3. The Least Cost Broiler Finishing Ration

The results of the least cost broiler finishing ration are summarized in Table III-10. The cost and mix of ingredients in the finishing ration are similar to the starter ration. The difference in technical requirements between the starter and finishing rations results in a decrease of only Rs 45 per MT in the cost of the finishing ration.

As in the case of the starter ration, maize is again the only energy ingredient in the finishing ration. However, the proportion of maize in the finishing ration would remain constant over a much wider maize price range (Rs 58 to Rs 2,338 per MT) than in the case of the starter ration. For other energy ingredients to enter the least cost ration, their respective prices would have to decrease by the following amounts per MT: broken rice, Rs 127; rice polishing, Rs 298; sorghum, Rs 577; wheat, Rs 786; and barley, Rs 1,874.

The finishing ration contains about the same proportions of protein ingredients as the starter ration, except for guar meal, which would not enter until its price fell by Rs 5 per MT. The blood meal proportion would decrease if its price increased by only Rs 3 per MT. The proportions of till cake and corn gluten meal would remain fixed, even if their respective prices approximately doubled. The proportion of meat meal would decline if its price increased by only Rs 8 per MT, but the full fat soya proportion would remain until its price increased by at least Rs 433 per MT.

After guar meal, the protein ingredient most likely to enter the ration would be soybean meal, but its price would have to fall by at least Rs 1,292 per MT. Prices of both cottonseed meal and rapeseed meal would have to fall by about Rs 1,560 per MT to enter the ration.

4. The Least Cost Layer Ration

Results of the least-cost layer ration analysis are summarized in Table III-11. The optimum cost of the layer ration is only Rs 2,411 per MT, compared to about Rs 3,600 per MT for the broiler rations, primarily because of lower energy and protein requirements for layers.

While maize constitutes approximately 60 percent of the broiler rations, the proportion of energy ingredients in the layer ration

TABLE III-10.LEAST COST BROILER FINISHING RATION ANALYSIS

RATION COST (Rs/MT): 3559

INGREDIENT	STATUS	VALUE (a)	UNIT COST	UNIT VALUE	NET COST	MINIMUM	MAXIMUM
MAIZE	BASIS	0.642	2336	2336	0	58	2338
SORGH	NONBASIS		2276	1699	577	1699	NONE
BRICE	NONBASIS		2270	2143	127	2144	NONE
BARLY	NONBASIS		2470	596	1874	566	NONE
FMSO	BASIS	0.050	6188	6188	0	NONE	8010
MMSO	BASIS	0.076	5524	5524	0	5127	5532
BLOM	BASIS	0.064	7161	7161	0	6070	7164
TILCAK	BASIS	0.040	3370	3370	0	NONE	7263
CSM	NONBASIS		3280	1720	1560	1720	NONE
RSM	NONBASIS		2442	883	1559	883	NONE
GUARML	NONBASIS		2897	2892	5	2892	NONE
CGF30	NONBASIS		2735	-6410	9145	-6410	NONE
CGM60	BASIS	0.740	5298	5298	0	NONE	10732
WBRAN	NONBASIS		1505	-3246	4751	-3246	NONE
RICPOL	NONBASIS		1534	1236	298	1236	NONE
RBRAN	NONBASIS		1300	-5486	6786	-5486	NONE
DIPHOS	NONBASIS		3500	660	2840	660	NONE
LIMSN	BASIS	0.00004	188	188	0	131	2675
MOLAS	NONBASIS		759	-2988	3747	-2988	NONE
SBM	NONBASIS		4760	3468	1292	3468	NONE
LSM	NONBASIS		2420	479	1942	478	NONE
STBM	NONBASIS		2390	335	2055	335	NONE
WHEAT	NONBASIS		2456	1670	786	1670	NONE
FFSOY	BASIS	0.087	5070	5070	0	5069	5503
PREMIX	BASIS	0.001	82500	82500	0	NONE	NONE

NOTE:
(a) All values are listed as proportions of one ton.

RESTRICTION	DUAL	RHS VALUE	MINIMUM	MAXIMUM
WEIGHT (MT)	-8724	1.00	0.99	1.00
PROTEIN (%)	0	21.00	NONE	23.69
M/E (Kcal/Kg)	3	3190.00	3189.57	3230.00
PHOS. (%)	196.6	0.65	0.50	0.65
CALC-LL (%)	248	1.00	1.00	1.10
CALC-UL (%)	0	1.10	1.00	NONE
LYSINE (%)	0	1.10	NONE	1.27
METH+CYS (%)	3647	0.87	0.87	1.21
PREMIX (%)	91	1.00	0.87	12.81
FMSO (%)	-1822	0.05	0.00	0.05
CSM (%)	0	0.05	0.00	NONE
RSM (%)	0	0.04	0.00	NONE
GUAR (%)	0	0.04	0.00	NONE
CG6030 (%)	-5434	0.04	0.00	0.04
TILCAK (%)	-3893	0.04	0.04	0.08

TABLE III-11. LEAST COST LAYER RATION ANALYSIS

RATION COST (Rs/MT): 2411

INGREDIENT	STATUS	VALUE (a)	UNIT COST	UNIT VALUE	NET COST	MINIMUM	MAXIMUM
MAIZE	NONBASIS		2336	2255	81	2255	NONE
SORGH	BASIS	0.086	2276	2276	0	2152	2322
BRICE	BASIS	0.301	2270	2270	0	2198	2333
BARLY	NONBASIS		2470	1539	931	1539	NONE
FM50	NONBASIS		6188	5601	587	5601	NONE
MM50	NONBASIS		5524	5460	64	5460	NONE
BLOM	BASIS	0.067	7161	7161	0	6162	7266
TILCAK	BASIS	0.040	3370	3370	0	NONE	4520
CSM	NONBASIS		3280	2776	504	2776	NONE
RSM	NONBASIS		2442	2101	341	2101	NONE
GUARML	BASIS	0.040	2897	2897	0	NONE	3315
CGF30	NONBASIS		2735	-986	3721	-986	NONE
CGM60	BASIS	0.040	5298	5298	0	NONE	7291
WBRAN	NONBASIS		1505	-677	2182	-677	NONE
RICPOL	BASIS	0.334	1534	1534	0	1447	1720
RBRAN	NONBASIS		1300	-2171	3471	-2171	NONE
DIPHOS	NONBASIS		3500	-1244	4744	-1244	NONE
LIMSN	BASIS	0.090	188	188	0	-4124	584
MOLAS	NONBASIS		759	-569	1328	-569	NONE
SBM	NONBASIS		4760	4391	369	4391	NONE
LSM	NONBASIS		2420	1687	733	1687	NONE
STBM	NONBASIS		2390	1091	1299	1091	NONE
WHEAT	NONBASIS		2456	2119	337	2119	NONE
FFSOY	NONBASIS		5070	4833	237	4833	NONE
PREMIX	BASIS	0.001	59870	59870	0	NONE	NONE

NOTE:
(a) All values are listed as proportions of one ton.

RESTRICTION	DUAL	RHS VALUE	MINIMUM	MAXIMUM
WEIGHT (MT)	-4109	1.00	0.99	1.03
PROTEIN (%)	79	17.50	17.11	18.46
M/E (Kcal/Kg)	1.64	2750.00	2627.41	2774.87
PHOS. (%)	0	0.60	NONE	0.64
CALC-LL (%)	248	3.50	2.34	3.75
LYSINE (%)	0	0.80	NONE	0.90
METH+CYS (%)	425	0.66	0.63	0.67
PREMIX (%)	64	1.00	0.00	7.96
FM50 (%)	0	0.05	0.00	NONE
CSM (%)	0	0.05	0.00	NONE
RSM (%)	0	0.04	0.00	NONE
GUAR (%)	-418	0.04	0.00	0.08
C66030 (%)	-1993	0.04	0.03	0.06
TILCAK (%)	-1150	0.04	0.03	0.06

ration consists of broken rice and rice polishing in almost equal proportions. About 9 percent of the ration is sorghum. Maize would enter the least-cost layer ration if its price declined by only Rs 81 per MT. Wheat and barley would enter the optimum ration formulation if their prices fell by Rs 337 and Rs 931 per MT, respectively.

Blood meal, till cake, guar meal, and corn gluten meal constitute approximately equal proportions of the main protein ingredients in the ration. Assuming all other ingredient prices remain constant, the proportions of each of these ingredients would remain fixed until their prices per MT increased by the following amounts respectively: blood meal, Rs 105; guar meal, Rs 419; till cake, Rs 1,151; and corn gluten meal, Rs 1,984.

The lower protein and energy requirements for the layer ration result in a narrower range of price decreases necessary for most excluded protein ingredients to enter the optimum formulation. For the six excluded ingredients requiring the smallest price decreases to enter the least-cost ration, the respective decreases per MT are: meat meal, Rs 64; full fat soya, Rs 237; rapeseed meal, Rs 341; soybean meal, Rs 369; cottonseed meal, Rs 504; and fish meal, Rs 587.

5. Potential for Reducing Least-Costs of Poultry Rations

Since feed is one of the major variable costs of poultry production, it is useful to analyze the potential for lowering feed ingredient prices. The threshold prices necessary for major feed ingredients to enter the three least-cost rations are summarized in Table III-12. Of the excluded energy ingredients, broken rice and rice polishing would enter the broiler rations if their respective prices fell as little as Rs 300 per MT. Maize would enter the layer ration if its price fell by at least Rs 81 per MT. All other excluded energy ingredients would not enter the optimum ration formulations until their prices dropped by more than Rs 500 per MT, except in the layer ration where wheat would enter if its price fell by at least Rs 337 per MT.

Among the energy ingredients, cottonseed meal, linseed meal, rapeseed meal, and soybean meal are very uncompetitive in broiler rations, since each ingredient price would have to fall more than Rs 1,200 per MT to enter the rations. For the layer ration, cottonseed meal, fish meal, and linseed meal are unlikely to be competitive because each ingredient price would have to fall more than Rs 500 per MT to enter the ration.

When compared with the ingredient prices in Table III-7, these results suggest the poultry industry can not expect to use barley, wheat, cottonseed meal, or linseed meal to lower ration costs. For broiler rations, rapeseed meal and soybean meal prices are also unlikely to fall enough for those ingredients to be serious competitors.

TABLE III-12. THRESHOLD PRICES FOR MAJOR FEED INGREDIENTS TO ENTER LEAST-COST RATIONS, Rs/MT

	TYPE OF RATION						
	BROILER						
	STARTER			FINISHING		LAYER	
INGREDIENT	CURRENT PRICE (1986) (a)	THRESHOLD ENTRY PRICE (b)	REQUIRED PRICE DECREASE (c)	THRESHOLD ENTRY PRICE (b)	REQUIRED PRICE DECREASE (c)	THRESHOLD ENTRY PRICE (b)	REQUIRED PRICE DECREASE (c)
ENERGY:							
BARLEY	2,470	1,901	596	566	1,874	1,539	931
BROKEN RICE	2,270	2,143	127	2,143	127	2,270	0
MAIZE	2,336	2,336	0	2,336	0	2,255	81
RICE POLISHING	1,534	1,244	290	1,236	298	1,534	0
SORGHUM	2,276	1,699	577	1,699	577	2,276	0
WHEAT	2,456	1,672	784	1,670	786	2,119	337
PROTEIN:							
BLOOD MEAL	7,161	7,161	0	7,161	0	7,161	0
CORN GLUTEN MEAL (60%)	5,298	5,298	0	5,298	0	5,298	0
COTTONSEED MEAL	3,280	1,729	1,551	1,720	1,560	2,776	504
FISH MEAL (50%)	6,188	6,188	0	6,188	0	5,601	587
FULL FAT SOYA	5,070	5,070	0	5,070	0	4,833	237
GUAR MEAL	2,897	2,897	0	2,892	5	2,897	0
LINSEED MEAL	2,420	487	1,933	478	1,942	1,687	733
MEAT MEAL (50%)	5,524	5,524	0	5,524	0	5,460	64
RAPESEED MEAL	2,442	893	1,549	883	1,559	2,101	341
SOYBEAN MEAL	4,760	3,472	1,288	3,468	1,292	4,391	369
TILL CAKE	3,370	3,370	0	3,370	0	3,370	0
LEAST-COST RATION PRICE		3,604 (d)		3,559 (e)		2,411 (f)	

NOTES:

(a) SOURCE: Table III-7.

(b) The threshold entry price is necessary for the ingredient to enter the least-cost ration formulation, assuming all other ingredient prices are held constant at 1986 levels.

(c) The difference between the 1986 price and the threshold entry price is the amount the respective ingredient price would have to fall to enter the least-cost ration formulation. A zero price difference implies that the ingredient is in the respective least cost ration.

(d) SOURCE: Table III-9.

(e) SOURCE: Table III-10.

(f) SOURCE: Table III-11.

Feed import policy could have a major effect on the competitive position of full fat soya. Assuming the current FFSOY price includes a 40 percent import duty, the least-cost rations would shift sharply to FFSOY if the import duty were removed. Under these conditions, the new FFSOY price of Rs 3,604 per MT would lead to: a 49 percent increase in the FFSOY share in the starter

ration and a 15 percent drop in the cost of the ration; a 48 percent increase in the FFSOY share in the broiler ration and a 14 percent drop in the cost of the ration; and a 20 percent FFSOY share in the layer ration, compared to none formerly, and a 9 percent drop in the cost of the ration.

C. The Effects of Alternative Protein Feeds on Efficiency

Although the poultry industry has grown rapidly, remarkably little research had been conducted on the effects of alternative feed ingredients on efficiency. The role of protein in broiler feed efficiency is a particularly important issue because it represents a major source of cost savings and increased broiler supply. Some of the most important questions about the potential for increased feed efficiency concern the relative merits of fish meal and soybean meal. Poultry producers have strong arguments for and against fish meal and soybean meal, but there is no credible, scientific evidence on the relative merits of both feeds. Fish meal is high in protein and is produced locally, but the supply is limited and quite erratic and quality is often reduced by heavy salt, bacterial, and aflatoxin contamination. Most soybean meal is imported and aflatoxin contamination is a serious problem, but it does not suffer from the salt and bacterial contamination problem of fish meal.

On-farm feed efficiency cannot approximate efficiency levels in the developed countries, even if high quality, balanced rations were fed, because of poor production management practices throughout the industry. The best means of evaluating fish meal and soybean meal would require carefully controlled feeding trial experiments where all rations are tested for nutrient analysis and toxic contamination. The trials should control for seasonal effects of weather and disease and each trial should have sufficient replications to serve as meaningful statistical tests of performance differences.

The Punjab Department of Livestock and Dairy Development has conducted several broiler feed trials at the Poultry Development Centre, Rawalpindi. The results of three protein feed experiments are summarized in Tables III, 13 through 15. In each experiment, no statistically significant differences were detected between feed conversion ratios of alternative protein feed formulations. The feed trials are focused on the performance of soybean meal and fish meal, but the experimental designs do not permit a conclusive test of the relative efficiencies of the two ingredients. The feed conversion ratios in most trials are not significantly lower than the popular industry estimate of 2.50.

The trials of soybean meal alone and with rapeseed meal and linseed meal (Table III-13) suggest that all flocks suffered some chronic disease that weakened the birds, rather than causing heavy mortality. The high feed conversion ratios (2.84 to 3.19) are not commercially profitable, as indicated by feed costs of more than Rs 9 per kilogram of live weight.

TABLE III-13. BROILER FEED EFFICIENCY USING SOYBEAN MEAL ALONE AND WITH RAPESEED AND LINSEED MEAL

	Trial A	Trial B	Trial C	Trial D
FEED INGREDIENTS	--- Percent of Ingredients per Trial Ration ---			
Maize	40.0	40.0	40.0	40.0
Broken Rice	15.0	15.0	15.0	15.0
Fish Meal	6.0	6.0	6.0	6.0
Meat Meal	2.0	6.0	6.0	6.0
Soybean Meal	26.0	13.0	13.0	13.0
Rapeseed Meal	--	13.0	--	6.5
Linseed Meal	--	--	13.0	6.5
Rice Polishing	7.5	3.5	3.5	3.5
Bone Meal	1.0	1.0	1.0	1.0
Limestone	1.0	1.0	1.0	1.0
Vitamin-Mineral Mix	1.5	1.5	1.5	1.5
Crude Protein	23.01	22.88	22.01	22.53
EXPERIMENTAL RESULTS				
Duration of Experiment (Days)	54	54	54	54
Number of Birds at Start of Experiment	84	84	84	84
Number of Birds Died During Experiment	4	2	0	2
Mortality Percentage	4.76	2.38	0.00	2.38
Total Initial Chick Weight (Kg)	3.58	3.73	3.63	3.85
Total Final Weight All Birds (Kg)	126.99	139.00	124.50	135.90
Average Final Live Bird Weight (Kg)	1.59	1.70	1.48	1.68
Total Feed Consumed (Kg)	391.94	395.29	397.44	396.23
Average Feed Consumed Per Bird (Kg)	4.90	4.82	4.73	4.83
Feed Conversion Ratio	3.09	2.84	3.19	2.92
Total Cost of Feed per Kg (Rs)	3.77	3.38	3.44	3.41
Total Feed Cost/Kg Live Weight (Rs)	11.64	9.61	10.98	9.94

NOTES:

a. Each trial includes two replications.

b. All trials were conducted during 2 November-26 December 1985, in Rawalpindi.

SOURCE: Unpublished Data Supplied by the Poultry Development Centre, Rawalpindi, Punjab Department of Livestock and Dairy Development.

The trials of soyabean meal alone and with decorticated cotton-seed meal (Table III-14) present another control problem since the first three trials have unusually high mortality rates.

The fish meal trials (Table III-15) faintly suggest that fish meal may decrease profitability, but feed quality is not established.

TABLE III-14. BROILER FEED EFFICIENCY USING SOYBEAN MEAL ALONE AND WITH DECORTICATED COTTONSEED MEAL

	Trial A	Trial B	Trial C	Trial D
FEED INGREDIENTS	--- Percent of Ingredients per Trial Ration ---			
Maize	35.0	35.0	35.0	35.0
Sorghum	18.0	18.0	18.0	18.0
Soybean Meal	20.0	15.0	10.0	--
Decorticated Cottonseed Meal	--	10.0	15.0	20.0
Corn Gluten Meal 60%	6.0	6.0	6.0	6.0
Rice Polishing	7.0	2.0	2.0	7.0
Fish Meal	5.0	5.0	5.0	5.0
Blood Meal	5.0	5.0	5.0	5.0
Molasses	2.0	2.0	2.0	2.0
Limestone	1.25	1.25	1.25	1.25
Salt	0.25	0.25	0.25	0.25
Vitamin-Mineral Mix	0.50	0.50	0.50	0.50
Crude Protein	24.59	25.25	24.66	22.21
EXPERIMENTAL RESULTS				
Duration of Experiment (Days)	56	56	56	56
Number of Birds at Start of Experiment	102	101	102	102
Number of Birds Died During Experiment	25	18	25	7
Mortality Percentage	24.51	17.82	24.51	6.86
Total Initial Chick Weight (kg)	3.84	3.84	3.83	3.85
Total Final Weight All Birds (Kg)	99.00	99.75	92.96	107.25
Average Final Live Bird Weight (Kg)	1.29	1.20	1.21	1.13
Total Feed Consumed (kg)	242.00	260.00	255.50	239.00
Average Feed Consumed Per Bird (Kg)	3.14	3.13	3.32	2.52
Feed Conversion Ratio	2.44	2.61	2.75	2.23
Total Cost of Feed per Kg (Rs)	3.6	3.52	3.37	3.00
Total Feed Cost/Kg Live Weight (Rs)	8.80	9.17	9.26	6.69

NOTES:

a. Each trial includes two replications.

b. All trials were conducted during 16 April-11 June 1984, in Rawalpindi.

SOURCE: Unpublished Data Supplied by the Poultry Development Centre, Rawalpindi, Punjab Department of Livestock and Dairy Development.

TABLE III-15. BROILER FEED EFFICIENCY WITH AND WITHOUT FISH MEAL

	Trial A	Trial B
	-Percent of Ingredients-	
FEED INGREDIENTS	--- Per Trial Ration ---	
Maize	35.00	35.00
Sorghum	16.00	16.00
Decorticated Cottonseed Meal	15.00	15.00
Corn Gluten Meal 60%	5.00	5.00
Rice Polishing	10.00	10.00
Wheat Bran	6.00	6.00
Meat Meal	2.00	4.00
Blood Meal	3.00	5.00
Fish Meal	4.00	--
Limestone	1.25	1.25
Molasses	2.00	2.00
Salt	0.25	0.25
Vitamin-Mineral Mix	0.50	0.50
Crude Protein	23.31	23.63
EXPERIMENTAL RESULTS		
Duration of Experiment (Days)	56	56
Number of Birds at Start of Experiment	204	203
Number of Birds Died During Experiment	12	17
Mortality Percentage	5.88	8.37
Total Initial Chick Weight (Kg)	7.20	7.35
Total Final Weight All Birds (Kg)	238.00	250.00
Average Final Live Bird Weight (Kg)	1.20	1.28
Total Feed Consumed (Kg)	598.50	596.25
Average Feed Consumed Per Bird (Kg)	3.12	3.21
Feed Conversion Ratio	2.51	2.39
Total Cost of Feed per Kg (Rs)	2.60	2.60
Total Feed Cost/Kg Live Weight (Rs)	6.54	6.20

NOTES:

a. Each trial includes two replications.
b. All trials were conducted during 21 January 1984-12 March 1985, in Rawalpindi.

SOURCE: Unpublished Data Supplied by the Poultry Development Centre, Rawalpindi, Punjab Department of Livestock and Dairy Development.

D. Conclusions and Recommendations

1. Conclusions

Although extensive survey data on farm-level broiler and table egg production are not available, the limited analysis in this study suggests that the poultry industry production functions exhibit diminishing returns and producers are generally operating at profitable levels of output. The production function and least-cost ration analyses demonstrate both the potential for major increases in supply through increased feed efficiency and the equally bleak prospects for reducing feed ration costs.

The production function analysis of broilers estimated a feed conversion ration of about 2.5, which is similar to the usual industry estimates and the budgets estimated in Tables III-23;24. Feed conversion ratios of 1.8 are frequently cited in production systems using superior management and inputs. However, for Pakistan, the broiler feed conversion ratio will not fall significantly below 2.5 until there are major improvements in husbandry practices, followed by improved feed quality. Under present conditions, the benefits from any improvement in feed quality would be largely counteracted by inadequate production management.

Still, a decrease in the industry broiler feed conversion ratio from 2.5 to 2.3 would, assuming constant product and input prices, lead to as much as nine percent more output. If the feed conversion ratio were reduced to 2.1 under constant prices, industry broiler supply could increase by up to 19 percent.

It would be useful to compare the linear programmed rations from this section with the budget results in the following section. Unfortunately, the feed cost data in the cost and return analyses were too highly aggregated to be compared with the LP models.

The nature of the markets for major feed ingredients strongly suggests that the poultry industry should not expect significant reductions in production costs through lower feed ingredient prices. The only exception to this view may be in the case of imported feeds that have a significant import duty, such as full fat soya. In least-cost broiler rations, FFSOY constitutes six to eight percent of the ration and would enter the layer ration if its price fell by only Rs 237 per MT. Elimination of the import duty on FFSOY would reduce the direct cost of poultry rations and, because it is less prone to many of the toxicity problems of local feeds, increase the potential for increased feed efficiency through improved feed quality.

2. Recommendations

If the poultry industry is to improve its marketing efficiency, it must have reliable estimates of the marginal productivity of feeds. The industry, in cooperation with appropriate government agencies, should establish a standardized data

base on feed productivity, covering all major production regions. The data should represent typical rations under all seasonal conditions. Finally, the data should include standardized measures of nutrient content and feed quality, relating particularly to salt, bacterial, and aflatoxin levels.

These data should be used to estimate more realistic poultry production functions and least-cost ration formulations. The combined use of production functions and least-cost rations will allow industry specialists to more accurately forecast feed demand and production response to changes in feed prices and feed availability. These analyses will also provide the industry with more reliable information on the financial feasibility of improving feed quality.

The industry should conduct further analyses on the tradeoffs between foreign exchange costs and import duties on feeds, versus the benefits of increased poultry production when import duties on feed are removed or reduced.

II. Budgets for Commercial Poultry Farms in Pakistan

Budget analysis is one of the more practical tools used by managers of agricultural production enterprises to optimize their resources. As a management tool budget analysis is designed to evaluate costs and profitability of farm resource use. Farm managers can apply budget analysis to identify actions that avert income losses and improve future income prospects.

Enterprise budgets for selected layer and broiler farms in Pakistan are presented and discussed below. These budgets attempt to approximate some objective realities of commercial poultry farming in 1985 and demonstrate the sensitivity of farm profitability to changes in major cost items.

A. Data Sources

A variety of data sources were investigated to develop representative poultry budgets. An early comparative study was conducted by the University of Agriculture at Faisalabad in 1968-69 The authors of the study classified production costs and returns by North, Central, and Southern zones that represented NWFP, Punjab, and Sind, respectively. Major changes have since occurred in the scale and organization of the poultry industry, and input mix prices have changed relative to product prices. Given these changes, the study team found it necessary to seek current information on the cost and return relationships faced by producers.

More recent information on costs and returns to poultry production was obtained from the Pakistan Poultry Association in Karachi, student researchers at the Faculty of Agricultural Economics, University of Agriculture, Faisalabad, and from a purposive field survey. The survey data were collected in personal interviews with farmers and from farm records. Cost and return data for the Karachi broiler example were provided by the Pakistan Poultry Association in the conventional accounting format. Data for the Faisalabad broiler example were collected by the team through several farm visits.

Other informal interviews with farmers, feed mill operators, hatchery owners, and industry experts enabled the study team to develop valuable insights into layer production. Available cost and return data were used to develop a standard format for disaggregating cost and return items. Based on this work, several of the budget case studies have been selected for presentation.

Average 1985 prices for Karachi and Faisalabad are used to calculate expenses; average 1985 prices for Karachi and Lahore are used to compute income. Interest costs on equity loans, local taxes, and marketing costs have been omitted in some examples to compare farm level costs and returns for different localities. In others, costs of medicines and vaccines have been varied to illustrate the impact of changes in these items on net returns.

B. Costs and Returns in Commercial Egg Production

1. Representative Layer Budgets

The percentage distribution of input costs shows the dominant influence of feed costs on the total production cost of table eggs. In all cases feed costs represent approximately 65-76 percent of total costs. Other major cost items are, in decreasing order of importance, pullets, labor, depreciation on buildings and equipment, and energy costs. If bank interest on working capital, local taxes, and marketing costs are included among the cost items, this cost category represents the third largest percentage share of total input costs.

Table III-16 shows conversion ratios, mortality rates, costs, and returns for five case farms. In the first case the cost of production per crate of eggs with a flock of 6,200 birds is approximately Rs 224. At this production cost and with 1985 Karachi wholesale egg prices (Rs 186.9), the farmer is generating a negative return of Rs 6 per crate. If the farmer were able to secure prices equivalent to Lahore wholesale prices (Rs 218), his return would become positive at Rs 25 per crate.

TABLE III-16. SUMMARY OF COST AND RETURN ANALYSES, TABLE EGGS

Case No./ Location	Flock Size	Mortality Rate	Laying Rate	Eggs/ Bird	Total Cost/ Crate (Rs)	Total Return/ Crate [1] (Rs)	Net Return/ Crate (Rs)	FCR	Feed Cost as % of Total Cost
1. Karachi	6200	8.35	66.48	242.00	223.96	248.99	25.03	1.73	72
2. Karachi [2]	20000	14.50	57.76	230.49	279.41	217.69	-61.72	2.06	65
3. Karachi	20000	8.00	62.15	248.00	237.48	248.59	11.11	1.92	71
4. Faisalabad	19000	10.00	74.00	260.00	239.82	245.53	5.71	1.68	65
5. Karachi	5000	3.48	71.80	286.50	224.08	246.07	21.09	1.89	76

[1] Returns for all farms except Case "2." are calculated with Lahore prices, Rs 218/crate.
[2] Production cost includes local taxes, bank interest, and marketing costs.
Returns are calculated using Karachi prices, Rs 186.9/crate.

In Case 2, the per unit cost of production is Rs 279 for a flock of 20,000 birds. In addition to the expenses paid by the farmer in Case 1, this farmer pays interest costs, marketing costs, and local taxes. The farm in the second case also has a relatively high mortality rate of 14.5 percent, with medicine and vaccine costs of Rs 2.25 per bird. At 1985 Karachi wholesale prices, the farm is generating relatively large negative returns.

By resorting to partial self-marketing with Lahore wholesale egg prices, exclusive of tax and interest charges, the same farmer

can reduce losses. In Case 3 the farmer reduces the mortality rate to eight percent and generates a positive net return of Rs 11.11.

The Faisalabad farm (Case 4) has a mortality rate of 10 percent with a flock of 19,000 birds; medication and vaccine costs are Rs 2.25. With Lahore wholesale egg prices and no marketing, tax, or interest charges, the farm earns a net return of Rs 6 per case of eggs.

Case 5 is a smaller farm with a low mortality rate of 3.48 percent, and no marketing, tax, or interest costs. With Lahore product prices the net return per unit of this farm is Rs 21.

As a locale for commercial egg production, Karachi appears to benefit from improved management and marketing but suffers from difficult environmental conditions. By eliminating local taxes, marketing, and bank interest charges, the 20,000-bird farm in Case 1 reduces losses considerably. If the farmer reduces the mortality rate to eight percent, the enterprise can generate a large and positive return (Case 3). The feed conversion rate improves in Case 3, but it is still high enough to indicate the adverse effect of environmental factors in Karachi.

In Cases 1 and 5 with smaller flocks and improved management, production costs and mortality rates are lower; net returns per unit are considerably higher. Both of these farms earn more than the larger Karachi or Faisalabad farms.

The Faisalabad farm, Case 5, has a relatively high laying rate, the lowest feed conversion ratio, and a 10 percent mortality rate. Production costs are high on this farm because of the management of input mix, labor, energy, and disease control. Changing management techniques could raise the farm's profitability to a level similar to that of Case 1 or Case 4. The detailed budgets for each of the cases are shown in Tables III-18 through III-22 at the end of this chapter.

2. Conclusions

With the exception of interest payments and marketing costs and, to a certain extent, local tax burden, a poultry farmer has limited control over input prices. These are determined by market forces that condition the supply and demand for inputs. The farmer can cut costs and improve returns by applying management measures designed to improve feeding practices and bird environment. Improving bird environment is an essential step to achieve higher productivity and to reduce losses by controlling mortality. Feeding practices and stress control affect returns by lowering the feed conversion ratio. Synchronizing labor use in routine activities and in disease control can decrease costs by reducing bird mortality and feed conversion rates, and can increase returns by improving egg quality.

Once the farmer has met the requisite management standards, returns to poultry production are largely influenced by forces in the product market. The product market now resembles a caricature of the "one-day textbook market." Market constraints appear in three dominant forms:

- o physical constraints caused by the narrowness of the market;
- o structural constraints caused by the absence of grading, storage, and processing facilities; and
- o economic constraints caused by a limited demand for poultry products.

Two long-run scenarios might be depicted for commercial egg production if stability in the prices of major feed ingredients is assumed. Under the first scenario the Karachi locale could improve its competitiveness through major adjustments in environmental control and feed quality. Adjustment costs could be justified through integrated, large-scale production.

Fiscal incentives are required to promote integration that will attract and channel private investment. Private investors are needed to develop market infrastructure, egg packing and grading stations, cold storage, and processing facilities. Additional incentives could promote the export of table eggs, day-old chicks, and parent stock. These incentives would include freight rebates and subsidies. Current fiscal incentives in the form of tax holidays and tariff-free imports of parent stock, feed, and poultry equipment may have facilitated the channeling of "black money" into the poultry and feed industry, rescuing it by accident rather than design.

In the second scenario poultry farmers could secure the efficiency gains associated with more conducive environments and a better feed base by shifting their production to a locale like Faisalabad or other points in the Punjab. Given the lower management capability of farmers in this region, the second scenario would be operational only with major adjustments in management expertise and marketing infrastructure.

The layer component of the poultry industry appears to be operating at a very low margin regardless of location. The reasons behind the current level of investment in commercial egg production, given these low returns, may be found in the production linkages inherent in Pakistan's poultry industry. For example, small "cottage" feed milling units are sustained by a loosely structured credit and marketing arrangement in which poultry farmers obtain their feed on credit from a feed miller and return payment in the form of poultry products. This arrangement precludes the need for marketing services by shifting marketing functions to the feed miller. Similar arrangements are prevalent with large feed mills and some feed mills in the Punjab. Credit and marketing complementarities between poultry producers and feed millers have had the effect of sustaining both businesses

through difficult financial periods associated with poultry production. The rising cost of feed, energy, labor, and credit has had the effect of hastening the exit of small producers from the poultry industry and strengthening the trend toward integrated, larger-scale production. Hatchery and feed mill expansion and their vertical integration with large poultry production units have been necessary to protect the heavy capital investment in these industries.

C. Costs and Returns in Broiler Production

1. Representative Broiler Budgets

Comparative budget analyses for the two selected broiler farms in Karachi and one in Faisalabad are presented in Tables III-23 and III-24 at the end of the chapter. As in the layer cases, feed represents the major cost item in all budgets and occupies 50 to 60 percent of the total cost of production.

Table III-17 summarizes costs and returns for the broiler cases. In the first case a Karachi farmer produces 3,000 broilers per week for a total crop of 24,000 broilers in two months. With a mortality rate of 10 percent and medicine and vaccine costs of Rs 2.0 per bird, the farmer has a total cost per bird of Rs 16.80, and earns a net return of Rs .83 per bird.

TABLE III-17. SUMMARY OF COST AND RETURN ANALYSES, BROILERS

Case No./ Location	Annual Placement Birds	Mortality Rate	FCR	Total Cost/Kg (Rs)	Total Return/Kg (Rs)	Net Return/Kg (Rs)	Feed Cost as % of Total Cost
1. Karachi	24000	10.00	2.61	16.80	17.60	0.83	53
2. Faisalabad	20000	9.40	2.47	14.93	16.63	1.70	60

In Case 2 a Faisalabad farmer has a total crop of 20,000 broilers with 2,500 produced per week. With very low medicine and vaccine costs of Rs .16, a lower mortality rate than the Karachi farmer, and a broiler price of Rs 16,5 per kilogram liveweight, this farmer earns Rs 1.7 per bird.

2. Conclusions

Disaggregation of total cost and the percentage distribution of cost categories can be indicative of comparative efficiencies attributable to location, size of the market,

quality of the input base, and management.

The Karachi broiler producer appears to be efficient both in terms of per unit feed costs and the proportion of total cost occupied by feed costs, despite a relatively poor feed resource base (Table III-8). This finding could be attributed to (a) the concentration of industrial-scale feed production in the Karachi area; (b) the capacity of these broiler producers to purchase energy ingredients such as maize, broken rice, and wheat in bulk at harvest prices from the rural areas of Sind and Punjab; or (c) their greater access to either home-produced or imported protein sources.

The major feed producers have integrated with hatchery and farm poultry production. Relative factor and production marketing efficiencies may also be reflected in the lower cost of feed and higher price of poultry for the Karachi broiler farms.

If management is a function of training and education and exposure to business methods, the Karachi farmers are expected to enjoy an advantage relative to the Punjab farmers. A significant proportion of the commercial producers in Karachi were experienced businessmen before they began poultry farming. Many held positions in the government and other insitutions; poultry farming represented, for these individuals, a secondary activity.

The current trend toward integrated poultry production in the Karachi area reflects both its history of quality management and its access to modern equipment and technologies. Fiscal incentives have attracted the investment of established business houses that provide the financial basis to accelerate technology transfer and mechanization in poultry farming. The Karachi-based poultry industry enjoys these advantages in achieving relative production efficiencies.

The Karachi broiler producers are at a disadvantage in terms of labor, energy, and maintenance costs. The high medication and vaccination costs on these farms relative to the Faisalabad farm are ambiguous and may be explained only by the environmental problems faced by the Karachi industry. A major proportion of poultry medicines and vaccines are imported by private firms housed in Karachi; both wholesale and retail prices for these inputs should thus be correspondingly lower. Closely located and overcrowded poultry estates in the outskirts of Karachi may perpetuate environmental hazards that limit efficient poultry production. High incidence of disease requires intensive application of prophylactic measures and vaccination.

Higher bird infection rates result in increased bird mortality and an increased feed conversion ratio. Nevertheless, gains in the feed and product markets appear to compensate for relative inefficiences in labor, energy, and miscellaneous costs on the Karachi broiler farms shown in these budgets.

The Karachi farm earns positive net returns despite high energy, labor, and disease management costs and bank interest, tax, and marketing expenses. The income position of the farm improves dramatically, however, if bank interest, tax, and marketing expenses are excluded. With a reduction in mortality and in medicine and vaccine costs per bird, broiler production in Karachi could continue to offer attractive returns.

The Faisalabad and Punjab farmers, on the other hand, enjoy the benefits of an environment conducive to poultry production. These benefits are reflected in the lower labor and energy costs of the Faisalabad farm and less intensive vaccination requirements. The Faisalabad farm shows a very low per-bird cost for medicines and vaccines relative to those incurred on the Karachi farms. Despite lower broiler prices in Faisalabad (Rs 16.5), the farmer earns a return of Rs 1.7 per bird, per production cycle. When medicine costs are raised to the Karachi figures of Rs 2.0 per bird, net returns remain positive, but they are lower than those of the Karachi farms.

D. Recommendations

Importance of Farm Records and Farm Budget Analysis

The farm resource and cost data needed to conduct budget analyses for this report were difficult to find. The lack of suitable data suggests that existing training and extension programs have not placed sufficient emphasis on farm management and record-keeping methods.

Farm records and budgets enable farm managers to monitor the performance of their enterprises and to guide the use of their resources more effectively. The adoption of a standardized format for reporting income and cost items also facilitates inter- and intraregional comparisons of poultry enterprises within Pakistan. For decisionmakers, these comparisons are necessary to formulate policy for the poultry industry.

When applied to more comprehensive and consistent data that is collected over time, budget analysis can assist the farm manager and policymaker to:

- assess the relevance of technologies by explaining the relationship of equipment and management factors to production efficiency;
- determine the combination of critical management factors that help to avert losses, depending on their timeliness within the production cycle;
- evaluate the production efficiency of lead inputs such as day-old chicks, feed ingredients, and vaccines and identify alternative uses of farm resources;

- identify and assess input costs which, although they may not be technically associated with generating output, play a significant role in safeguarding the viability of the poultry industry, e.g., the burden of excessive taxes or marketing cost;

- determine the scale, time span, and seasonality of production to align poultry production with seasonality of demand for poultry products; and

- determine the income potentially available from utilizing unused or idle capacity throughout the poultry industry.

Budgets generated for localities that represent diverse eco-resource bases can be of considerable use to identify specific locations for efficient poultry production and potential for vertical and horizontal integration of poultry production with supporting feed mill, hatchery, breeding farm, and equipment manufacturing activities. Budgets can also assist in planning poultry production to achieve competitive efficiency both within the firm and between firms as the scale of production increases.

In view of escalating input costs, the slow shift in the demand for poultry products, and seasonal variations in poultry prices, small and medium-sized poultry production units could be visualized as supplementary to other farm enterprises. Budget analysis can be employed to highlight the cost advantages and increment to farm income associated with mixed farming where poultry is either a major or supplementary enterprise.

TABLE III-18. COST AND RETURN ANALYSIS, TABLE EGGS, FLOCK OF 6200 BIRDS, KARACHI [1]

COST AND RETURN SUMMARY			
Total Cost	929095.00	Total Return	910781.87
Cost/Crate	222.29	Return/Crate	217.91
Feed Conv Ratio	1.73	Net Return/Crate	-4.38
Mortality Rate	8.35		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Pullets 16 weeks old	6200	birds	28.00	173600.00	18.68
Growers' ration	223	bags	145.00	32335.00	3.48
Layers' ration	4066	bags	155.00	630230.00	67.83
SUBTOTAL FEED COSTS				662565.00	
Labor for 18 months	6200	birds	6.56	40680.00	4.38
Energy	6200	birds	2.18	13500.00	1.45
Vaccination, medication	6200	birds	2.00	12400.00	1.33
Depreciation: Building, equipment	6200	birds	3.00	18600.00	2.00
Miscellaneous	6200	birds	1.25	7750.00	0.83
TOTAL COST				929095.00	
COST/CRATE				222.29	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Sale of eggs [2]	4179.6	crates	186.92	781250.83	85.78
Sale of culled birds	5682	birds	20.72	117731.04	12.93
Poultry manure	12	trucks	275.00	3300.00	0.36
Empty bags	4250	bags	2.00	8500.00	0.93
TOTAL INCOME				910781.87	
RETURN/CRATE				217.91	

[1] 1986 prices.

TABLE III-19. COST AND RETURN ANALYSIS, TABLE E666, FLOCK OF 20000 BIRDS, KARACHI [1]

COST AND RETURN SUMMARY			
Total Cost	3577857.96	Total Return	2787763.50
Cost/Case	279.41	Return/Case	217.71
Feed Conv Ratio	2.06	Net Return/Case	-61.70
Mortality Rate	14.50		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Pullets 16 weeks old	20000	birds	29.00	580000.00	16.21
Growers' ration	896	bags	138.09	123728.64	3.46
Layers ration	14941	bags	146.67	2191396.47	61.25
SUBTOTAL FEED COSTS				2315125.11	64.71
Labor for 15 months	20000	birds	7.52	150375.00	4.20
Energy	20000	birds	2.48	49500.00	1.38
Prep/Maint of sheds	20000	birds	0.85	17075.00	0.48
Vaccination, Medicine	20000	birds	2.25	45000.00	1.26
Depreciation	20000	birds	6.00	119982.85	3.35
Marketing, local taxes	20000	birds	7.52	150400.00	4.20
Bank interest	20000	birds	7.52	150400.00	4.20
TOTAL COST				3577857.96	
COST/CASE				279.41	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Sale of eggs	12805	cases	186.90	2393254.50	85.85
Culled birds	17100	birds	20.72	354312.00	12.71
Empty bags	14736	bags	2.00	29472.00	1.06
Poultry manure	20000	birds	0.54	10725.00	0.38
TOTAL INCOME				2787763.50	
RETURN/CASE				217.71	

[1] 1986 prices.

TABLE III-20. COST AND RETURN ANALYSIS, TABLE EGGS, FLOCK OF 20000 BIRDS, KARACHI [1]

COST AND RETURN SUMMARY

Total Cost	3272057.96	Total Return	3425153.64
Cost/Case	237.48	Return/Case	248.59
Feed Conv Ratio	1.92	Net Return/Case	11.10
Mortality Rate	8.00		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Pullets 16 weeks old	20000	birds	29.00	580000.00	17.73
Growers' ration	896	bags	138.09	123728.64	3.78
Layers' ration	14941	bags	146.67	2191396.47	66.97
SUBTOTAL FEED COSTS				2315125.11	70.75
Labor for 15 months	20000	birds	7.52	150375.00	4.60
Energy	20000	birds	2.48	49500.00	1.51
Prep/Maint of sheds	20000	birds	0.85	17075.00	0.52
Vaccination, Medicine	20000	birds	2.00	40000.00	1.22
Depreciation	20000	birds	6.00	119982.85	3.67
TOTAL COST				3272057.96	
COST/CASE				237.48	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Sale of eggs	13778	cases	218.00	3003708.64	87.70
Culled birds	18400	birds	20.72	381248.00	11.13
Empty bags	14736	bags	2.00	29472.00	0.86
Poultry manure	20000	birds	0.54	10725.00	0.31
TOTAL INCOME				3425153.64	
RETURN/CASE				248.59	

[1] 1986 prices.

TABLE III-21. COST AND RETURN ANALYSIS, TABLE EGGS, FLOCK OF 19000 BIRDS, FAISALABAD [1]

COST AND RETURN SUMMARY			
Total Cost	3122137.35	Total Return	3196490.06
Cost/Crate	239.82	Return/Crate	245.53
Feed Conv Ratio	1.69	Net Return/Crate	5.71
Mortality Rate	10.00		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Pullets 20 weeks old	18023.00	birds	37.20	670455.60	21.47
Layers' ration	13183.94	bags	155.00	2043510.00	65.45
SUBTOTAL FEED COSTS				2043510.00	65.45
Labor for 18 months	18023	birds	8.19	147600.00	4.73
Energy	18023	birds	3.80	68400.00	2.19
Vaccination, Medicine	18023	birds	2.25	40551.75	1.30
Rent of farm, sheds	18023	birds	4.99	90000.00	2.88
Depreciation: Equipment	18023	birds	2.09	37620.00	1.20
Rice husk	18023	birds	1.33	24000.00	0.77
TOTAL COST				3122137.35	
COST/CRATE				239.82	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Sale of eggs	13018.67	crates	218	2838070.06	88.79
Culled birds	16221.00	birds	20	324420.00	10.15
Poultry manure	40.00	trucks	200	8000.00	0.25
Empty bags	13000.00	bags	2	26000.00	0.81
TOTAL INCOME				3196490.06	
RETURN/CRATE				245.53	

[1] 1986 prices.

TABLE III-22. COST AND RETURN ANALYSIS, TABLE EGGS, FLOCK OF 5000 BIRDS, KARACHI [1]

COST AND RETURN SUMMARY			
Total Cost	892655.00	Total Return	979247.26
Cost/Crate	224.33	Return/Crate	246.09
Feed Conv Ratio	1.89	Net Return/Crate	21.76
Mortality Rate	3.48		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Pullets 16 weeks old	5000	birds	28.00	140000.00	15.68
Growers' ration	224	bags	145.00	32480.00	3.64
Layers' ration	4297.50	bags	150.00	644625.00	72.21
SUBTOTAL FEED COSTS				677105.00	75.85
Labor for 18 months	5000	birds	6.78	33900.00	3.80
Energy	5000	birds	2.25	11250.00	1.26
Vaccination, medication	5000	birds	2.00	10000.00	1.12
Depreciation: Building, equipment	5000	birds	1.28	6400.00	0.72
Maintenance, misc.	5000	birds	2.80	14000.00	1.57
TOTAL COST				892655.00	
COST/CRATE				224.33	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Sale of eggs	3979.17	crates	218.00	867459.06	88.58
Sale of culled birds	4826	birds	20.70	99898.20	10.20
Poultry manure	10	trucks	285.00	2850.00	0.29
Empty bags	4520	bags	2.00	9040.00	0.92
TOTAL INCOME				979247.26	
RETURN/CRATE				246.09	

[1] 1986 prices.

TABLE III-23. COST AND RETURN ANALYSIS, BROILER FARM, 24000 TOTAL BIRDS, 3000 BROILERS PRODUCED PER WEEK, KARACHI [1]

COST AND RETURN SUMMARY			
Total Cost	556551.74	Total Return	584110.00
Cost/kg Live Weight	16.80	Return/kg Live Weight	17.64
Feed Conv Ratio	2.61	Net Return/kg Live Weight	0.83
Mortality Rate	10.00		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Day old chicks	24000	birds	5.10	122400.00	21.99
Feed starter	691	bags	173.75	120061.25	21.57
Feed finisher	1037	bags	167.50	173697.50	31.21
SUBTOTAL FEED COSTS				293758.75	52.78
Labor	24000	birds	0.95	22700.00	4.08
Energy	24000	birds	0.76	18280.00	3.28
Vaccination, Medicine	24000	birds	2.00	48000.00	8.62
Depreciation: Building, Equipment	24000	birds	0.52	12523.00	2.25
Misc. (inc. maint., dis-inf., litter, 4 trucks)	24000	birds	0.39	9280.00	1.67
Bank interest	24000	birds	0.95	22699.99	4.08
Taxes (local and government)	24000	birds	0.29	6910.00	1.24
TOTAL COST				556551.74	
PRODUCTION COST/KG LIVE WEIGHT				16.80	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Birds marketed, live weight	33120	kg	17.50	579600.00	99.23
Litter	4	trucks	350.00	1400.00	0.24
Empty bags	1555	bags	2.00	3110.00	0.53
TOTAL INCOME				584110.00	
RETURN/KG LIVE WEIGHT				17.64	

Note: 1986 prices are given.

TABLE III-24. COST AND RETURN ANALYSIS FOR BROILER FARM, 20000 TOTAL BIRDS, 2500 BROILERS PRODUCED PER WEEK, FAISALABAD

COST AND RETURN SUMMARY			
Total Cost	420309.90	Total Return	468140.00
Cost/kg Live Weight	14.93	Return/kg Live Weight	16.63
Feed Conv Ratio	2.47	Net Return/kg Live Weight	1.70
Mortality Rate	9.38		

COST ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Day old chicks	20000	birds	5.90	118000.00	28.07
Feed No. IV	498.00	bags	182.00	90636.00	21.56
Feed No. V	896.42	bags	180.00	161355.60	38.39
Glucose/Maize	20000	birds	0.03	652.00	0.16
SUBTOTAL FEED COSTS				252643.60	60.11
Vaccination, Medicine	20000	birds	0.16	3200.00	0.76
Energy	20000	birds	0.28	5600.00	1.33
Labor	20000	birds	0.61	12200.00	2.90
Brooding	20000	birds	0.45	9000.00	2.14
Depreciation: Building, Equipment	20000	birds	0.95	18973.00	4.51
Misc. (inc. land rent, litter)	20000	birds	0.03	693.30	0.16
TOTAL COST				420309.90	
PRODUCTION COST/KG LIVE WEIGHT				14.93	

INCOME ITEMS

Particulars	Unit	Description	Rate	Amount	% of Total
Birds marketed, live weight	28152	kg	16.50	464508.00	99.22
Empty bags	1366	bags	2.00	2732.00	0.58
Litter	3	trucks	300.00	900.00	0.19
TOTAL INCOME				468140.00	
RETURN/KG LIVE WEIGHT				16.63	

[1] 1986 prices, assuming four crops per year.

CHAPTER FOUR

MAJOR CONSTRAINTS TO POULTRY PRODUCTION AND RECOMMENDATIONS FOR FURTHER INDUSTRY DEVELOPMENT

I. Egg and Broiler Marketing

Since 1964 the Government of Pakistan has provided a series of incentives to encourage the development of intensive poultry farming. The incentives extended by the government have been oriented primarily toward stimulating production and have resulted in a persistent inflow of capital investment.

Commercial production has expanded steadily over the past twenty years; the industry has experienced few years with negative growth rates. New poultry businesses have continued to enter the industry, and existing businesses are increasingly adopting capital-intensive technologies. A number of producers now house their birds in controlled environments with fully automated facilities.

By contrast, investment in marketing facilities necessary to distribute the growing volume of poultry products has been insignificant. Antiquated marketing methods and the limited breadth of marketing channels lower producer returns by increasing risk. The industry has also neglected to invest in promotional strategies necessary to encourage and distribute poultry consumption more widely among income groups. The following sections describe product and marketing characteristics of eggs and broilers in Pakistan, identify constraints of the system, and make recommendations to relieve the constraints.

A. Eggs and Broilers as Consumer Products

As a product eggs offer the consumer high quality nutrients, including protein, and a relatively complete balance of amino acids, vitamins, minerals, and energy sources. Eggs are highly digestible and are an important source of nutrition for children during late infancy and later growth, and patients convalescing from digestive ailments. Eggs are a versatile food suitable for any daily meal or snack; they are a relatively inexpensive source of nutrients, both in cost per kilogram and in the fuel required to prepare them.

On the other hand, eggs are fragile and easily broken in marketing. They are highly susceptible to high temperature and spoil quickly. Eggs produced commercially in Pakistan have pale yolks and tend to have a fishy odor. These negative features result from the quality of grains and meals fed to layers. Yolks are low in the xanthophylls that give them a yellow color.

Xanthophylls are provided by yellow maize or can be imported, but the costs of these sources are prohibitive. The high percentage of fish meal used in mixed poultry feeds also lends a fishy flavor to the product.

Among all livestock, excluding fish, poultry is the most efficient convertor of inedible protein into edible protein. Poultry are capable of converting 1.8 kilograms of feed into one kilogram of live weight and 2.44 kilograms of feed into one kilogram of eggs. By comparison, the feed conversion ratio for beef is seven to one, and mutton requires five kilograms of feed to produce one kilogram of live weight. However, cattle and sheep consume lower cost roughages and crop residues.

The level of technical knowledge in poultry production is well-developed internationally and in Pakistan. Rapid research and development in the poultry field by the U.S., France, the Netherlands, and Brazil has enabled these countries to produce poultry at lower cost than other livestock products, and has been associated with considerable growth in the production of poultry meat as a percentage of total meat production. In Pakistan, a large part of the research and institutional development necessary to support efficient poultry production can be adapted from other regions of the world.

Broilers also have a relatively brief production cycle. Returns to investment are more rapid in poultry production than in other livestock enterprises. In intensive poultry farming, broilers can be produced in comparatively small, compact enclosures for which a suitable environment can be created at comparatively low cost. Consequently, poultry production units can be established in various geographical and climatic zones.

The nutrient composition of chicken is second to fish, and it contains a relatively high quantity of protein compared to red meat. As compared to fish, chicken is also consistent with consumer tastes in Pakistan, although its consumption has been limited in the past by customary consumption patterns. Chicken is generally consumed on special occasions and by higher income groups.

As a result of production efficiencies, chicken prices are gradually falling within a range affordable by a greater proportion of consumers. Relative to other meats, chicken prices have risen at lower rates. The price of chicken meat, deflated by the general retail price index, has generally decreased over time.

A major weakness of broiler products in Pakistan is related to marketing difficulties. Over 90 percent of the birds are sold live to consumers because they cannot be stored. As a consequence, wholesalers and retailers purchase the broilers in small lots, as needed, from the farmer. Limited by the the small volume of these purchases on an as-need basis, farmers cannot sell large lots of birds and are forced to hold birds after they have attained optimal marketing weight. The transport of live

birds is expensive and impractical, with a high percentage of weight loss and death loss. Consumers eventually pay for these losses in the form of higher retail prices.

The following sections briefly describe the characteristics of egg and broiler marketing across area, time, product form, and income groups. Problems in these interrelated aspects of product marketing and distribution inhibit the expansion of the poultry industry in Pakistan.

B. Markets in Selected Areas: Transportation of Products

A consequence of high mortality rates among breeding stock, low fertility levels, and low hatching rates is the relocation of a number of Karachi- and Lahore-based breeding farms to cooler regions of the country, such as Abbottabad, Mansehra, the Murree foothills, and the Valley of Quetta. Other farmers, conscious of ideal breeding requirements, have installed equipment to control house environment and to improve the performance of breeding stock.

With the relocation of breeding farms, eggs are now transported from new production sites to hatchery sites in Karachi and Lahore. High embryonic mortality rates occur during transport. In May, June, and July of 1984 and 1985, for example, 360,000 hatching eggs were transported per week from Rawalpindi and Quetta to Karachi and Lahore. More than 50 percent of the embryos died en route from exposure to high temperatures in railway cars. High mortality resulted not only in losses to breeder farms but in losses to the hatching chick, broiler, and layer industries that depend on a supply of hatching eggs. Availability of air-conditioned railway freight cars would help to alleviate such losses.

Two other major causes of industry losses are delays in flight schedules and the lack of adequate space to hold day-old chicks at the airport terminal. Under ideal conditions a day-old chick must be held in a controlled temperature of 80 to 90 degrees Fahrenheit, with a relative humidity of 60 percent. Unless these conditions are maintained, the chicks will become dehydrated and lose body weight. Temperatures exceeding 100 degrees Fahrenheit can be fatal for chicks. In Pakistan temperatures are generally above 100 degrees from May to August at all major airports, when the danger of dehydration and mortality rises, and shippers often decide not to use the air cargo space. Consequently, chicks are not delivered on schedule to laying and broiler establishments. Standardized holding spaces at the airport could reduce industry losses resulting from dehydration, chick mortality, and scheduling problems.

Poor packing of eggs prevents long distance transport of the product and results in a breakage rate of more than five percent between the point of production and the consumer. Eggs move within a limited marketing radius unless price differentials are

large enough to cover the costs of increased breakage plus transport. For example, eggs appear to move from Karachi or Lahore to Quetta only if the Quetta price is Rs 60 or higher.

Long distance transport of birds is also inhibited by mortality problems en route. Consequently, eggs and broilers do not appear to move from areas of surplus production to areas of product scarcity.

The recent revolution in milk processing and packaging in Pakistan indicates that poultry products might be consumed in more remote areas if they can be suitably packaged and transported. Milk is now marketed in Gilgit, Chitral, Kaghan, Pasni, and Gowadar. Investment by the industry in uniform, improved packaging for eggs and frozen chicken meat would enable wider geographical distribution of poultry products.

C. Markets in Time: Storage

When improved packaging is developed for poultry products, storage can be used more effectively to equilibrate demand and supply over time and to relieve the seasonal fluctuations that characterize the product market in Pakistan. Storage enables the carryover of surplus supplies into periods of relative shortage, exerting a stabilizing effect on inter-period price fluctuations. Under more stable price conditions, producers can plan their production cycles more effectively and bear less of the production risk associated with price variation.

D. Markets in Product Form: Processing

The majority of broiler processing plants that have been established in the last two decades have closed under financial duress. The plants were unable to generate a sufficient volume of sales because processed chicken has been unacceptable to consumers. Consumers tend to believe that only diseased birds are processed or frozen. Other consumers are unwilling to pay a higher price to cover the costs of processing or freezing but do not realize that the cost per kilogram of a live bird includes viscera and the losses involved in dressing and preparation. Frozen birds were also sold with the skins attached, although in most Pakistani dishes consumers prefer chicken without the skin.

In 1982 the Government of Pakistan announced an exemption on profits derived from poultry processing. During the last three years, however, only three broiler processing and freezing units have been established. These firms, like their predecessors, face financial difficulties resulting from the limited market.

E. Markets by Income Group

Broilers are sold live and few, if any, are sold by cut so lower income groups can not purchase chicken in the form of lower-priced, less preferred cuts. Some price distinction of product exists between commercial broilers and spent or cull laying birds.

Most eggs are not graded, and the broken eggs are not recovered for a fluid market. Cheaper pullet eggs were not observed in the markets visited by the team. In the absence of grading, the high quality, yellow-yolked eggs of uniform size are not promoted at a price premium. Only desi eggs are sold at a premium price.

F. Market Research and Product Promotion

Despite producers' awareness that consumer resistance to their products may stem from popular misconceptions, the industry has neglected to launch promotional campaigns to condition these beliefs. The small production capacity of most individual businesses limits their own promotional expenditures. A joint effort by the industry is therefore required to finance and sustain promotional efforts.

Lack of market research and promotional activity is extremely costly to the industry. The demand for eggs, for example, probably drops dramatically in the summer months because of the popular view that eggs generate heat. Summer prices fall below the level necessary to cover per-unit production costs. To make a profit over the annual production cycle, a producer must recuperate the summer's losses with higher winter prices. Farmers also sell their laying flocks prematurely, driving up feed conversion rates. In turn, large seasonal sales of cull birds on the chicken market can have a secondary effect on broiler prices and returns to broiler farmers.

Seasonality in demand for poultry products creates a seasonality in the derived demand for layer chicks. Almost 80 percent of layer chicks are placed within the five-month period between January and May. A larger volume of parent stock is imported to meet the high seasonal demand for chicks than would be necessary if chicks were placed year around. Lower utilization of parent stock during the off-season raises production costs. Capacity utilization of hatcheries is also related to demand for chicks.

These increased costs are eventually carried to the consumer in the form of higher product prices. Promotional efforts can, over time, affect the popular beliefs that shape the demand for poultry products. By avoiding the costs associated with promotional efforts, the industry is obliged to pay even higher costs in lost earnings.

G. Summary and Recommendations

Inadequate transport and storage facilities and product packaging, as well as weak product image are constraining the growth of the poultry industry. The industry needs to focus on developing a uniquely Pakistani marketing system to distribute the volume of products it now generates and has the potential to generate in the future.

The Government of Pakistan may consider the following initiatives to motivate investment in the marketing system for poultry products:

- extend an income tax exemption to businesses engaged in egg washing, grading, candling, packing, storing, and distribution;

- reduce duties or import duty-free (a) machinery required to pack and store eggs, including egg coolers, prefabricated cold storage, grading, packing and labelling equipment; (b) machinery designed to produce egg packing materials from paper waste, risk husk or paper pulp; and (c) pigments and xanthophylls used in coloring egg yolks and chicken skin;

- provide tax incentives through a total or partial refund of (a) taxes levied at the source on raw materials required to produce egg packaging; and (b) sales tax or central excise duty levied on locally-produced egg cartons made of synthetic materials;

- authorize designated banks to release the refunds described above within 15 days of receipt of necessary documents and credit the drawer with interest earned during any period of delay in refund;

- upgrade hygienic and sanitary standards maintained by the Municipal Corporations and Committees at slaughter and egg sales units;

- provide (from Municipal Corporations and Committees) plots of land at specified prices to establish poultry and poultry product markets;

- equip trains with cold storage and air-conditioned cars or reefers; and

- rationalize railway freight charges to encourage north-south product movement.

II. Improved Poultry Management

The Poultry Development and Research Institutes (PDRI) in Karachi, Rawalpindi, and Peshawar collect poultry production

information, conduct research, and offer advisory and diagnostic services to poultry farmers. Through the implementation of the FAO-sponsored rural poultry development program, the advisory, diagnostic, and training activities of the PDRI are expanding. The PDRI in Rawalpindi offers short training courses in poultry production and management to operating and potential poultry entrepreneurs.

Training in the recording and organization of farm business data for use as a management tool is more difficult to acquire. The PDRIs appear to offer only limited guidance in farm record maintenance and enterprise budget analysis. The more academic research available at the university and institute level also tends to be deficient in the presentation of production analysis information. The level of disaggregation in this research is generally insufficient for a thorough budget analysis. One exception to this general condition was the data maintained by the Pakistan Poultry Association in Karachi and by a few progressive hatchery owners.

A cell of qualified and experienced farm management specialists, agricultural economists, and statisticians should be formed within the Institutes to strengthen their service capabilities. It would be necessary for the team to have access to microcomputer hardware and software. The farm management service activities of the PDRI could be placed within a staffed and equipped arm of the Institute, such as a Poultry Production and Management Services Wing (PPMS). The PPMS would undertake the following activities:

- o monitor and evaluate the Institute's ongoing poultry development programs;
- o collect and analyze information on input prices and product prices and production and consumption of poultry products;
- o develop and distribute a standardized farm record system that can be easily maintained by poultry farmers;
- o form a broad-based group of poultry farmers willing to maintain records under the guidance of the PPMS in return for advisory services based on the analysis of their records;
- o develop an annual poultry industry performance profile based on the analysis of records of member farmers, thus providing information of vital use to decisionmakers and policymakers of the Federal Poultry Development Board and;
- o develop a practical training program in poultry production and management for in-service extension staff and private commercial producers.

The high turnover rate in the poultry industry may be attributed, in part, to limited management skills in financial and economic

analysis of the farm business. Budget analysis based on appropriately maintained farm records can serve as an effective tool to optimize resource use. The development of a farm record-based budget analysis service at the PDRIs could provide vital knowledge to poultry producers at a critical point in the life cycles of their farms.

III. Supply and Quality of Poultry Feed Ingredients

A. Coarse Grains

Fifty percent of poultry feed is composed of coarse grains that release metabolizable energy. As poultry production increases, feed millers demand a greater volume of the broken rice, maize, and sorghums used in feed production. the total available supply of these grains over the past six years has increased only modestly, with a declining growth rate in the supply of sorghums.

As the proportion of the coarse grain supply required for human consumption increases, the residual proportion available for feed production decreases. Recently established industries that extract fructose from broken rice and process maize into oil, starch, and glucose compete with the poultry feed industry for the supply of coarse grains.

As noted in preceding chapters, the price of poultry feed has increased relative to the prices of poultry products. Because feed costs represent 60 to 77 percent of the total cost of producing eggs and broilers, industry profitability is intimately related to relative movements of feed and product prices. Declining availability of coarse grains for feed production, combined with increasing demand by feed producers, has contributed to rising feed costs.

Projected trends in coarse grain production are bleak for the industry. The Sixth Five-Year Plan projects a total supply of 2.05 million metric tons of broken rice, maize, and sorghum in 1987-88. The feed required to sustain the poultry industry is estimated at 1.48 million metric tons, of which .74 million metric tons, or 50 percent, would derive from coarse grains. This amount represents 31 percent of the total projected supply--an amount that, as it now appears, will not be available to sustain the poultry industry.

B. Animal and Vegetable Proteins

Animal and vegetable proteins constitute 25 to 30 percent of compounded poultry feed. Sources of these proteins include meals made from blood, meat, fish, cottonseed, rapeseed, guar, corn gluten, sunflower, and til cake. Feed millers or home-mixers generally select five to eight of these sources at a time for feed production, basing their selection on available supplies, relative costs, and how these ingredients relate to

poultry growth factors.

The quality of these feed ingredients does not appear to conform to the standards of nutrition and purity established by poultry nutritionists or those maintained by poultry producers in other countries. Feed ingredients are, for the most part, by-products prepared without consideration to the hygiene needs of the poultry industry. Vegetable proteins often contain aflatoxins, and the animal proteins are often contaminated with bacteria. To be suitable for poultry feed, the ingredients must be produced under controlled temperatures that maintain requirements for moisture, fiber, ash, salt, toxin, and bacterial content. To increase shelf-life without introducing harmful side-effects, the use of chemical additives in the production of the ingredients should be monitored.

C. Fish Meal

Among poultry feed ingredients, fish meal is an especially desirable source of protein because of its nutritive qualities. Production of fish meal over the past seven to eight years in Pakistan has stagnated between 27 and 30 thousand metric tons. Feed millers have used, on average, a 10 percent fish meal content. A maximum of 300,000 tons of poultry feed can be produced at this percentage content, assuming all of the available fish meal were used in feed production. However, 600,000 tons of feed have been produced with this percentage content. No fish meal has been imported. Consequently, there is validity in feed millers' claim that the fish meal they use is cut with horn, hoof and meat meal, and damaged vegetable protein.

Some fish species are more desirable as poultry feed because of their digestibility and protein content. The fish meal produced in Pakistan is composed of a mixture of various species, with no standard protein or amino acid content and unknown digestibility characteristics.

The production process for fish meal, like that of other feed ingredients, is quite primitive. The fish are sun-dried on hilltops, exposing them to scavenging animals that carry salmonella and other bacteria. During the slow drying process, the fish are exposed to rain and dew, causing them to decompose before they are processed, and thus lose a proportion of their nutrients.

D. Soyabean Meal

Although the import levy on soyabean meal was repealed in 1983, sales taxes, import surcharges, licencing fees, and other minor taxes are still imposed. The poultry industry is permitted to import soyabean meal only under industrial licence, and within a maximum of 30,000 tons per year. The cost of imported soyabean meal remains prohibitive because of current world market prices for volumes under the size of a ship load,

and sales taxes and import surcharges that are imposed.

The restrictions on imports to industrial consumers results in smaller import volumes with higher freight charges. As a consequence of these higher effective costs, no more than 8,000 tons of soyabean meal have been imported in any one year since 1983. In short, the impact intended by the withdrawal of the import levy has not been achieved.

E. Quality of Mixed Feed

The quality of poultry feed can be no better than the quality of its ingredients. Substandard performance rates for layers and broilers are indications of feed quality problems. Compound feeds carry no labels that identify their nutrient content or warranties on the content. If farmers cannot ascertain feed content they cannot plan a feed intake program that suits their production objectives.

F. Summary and Recommendations

The restricted supply of domestically-produced and imported feed ingredients increases the cost of milling feed. Because of the dominance of feed costs in the total cost of producing eggs and layers, the restricted supply can exert a large impact on the prices of poultry products. The substandard quality of many of the principal ingredients decreases the productivity of the industry by contributing to disease, mortality, and higher feed conversion ratios. As described earlier in this chapter, the inferior quality of feed also diminishes the attractiveness of eggs and broilers to the consumer.

A growing shortage in coarse grains suitable for feed production could be partially offset with increased domestic production of soybeans. Soybeans provide both metabolizable energy and protein, and domestic production could, over time, substitute for the costly imports of soybean meal.

Production of soybeans could be encouraged by establishing feed mill forward contracts to provide seed, extension services, and inputs to growers and to purchase the product at the contract price. Designated banks, such as the Agricultural Development Bank of Pakistan (ADBP), could provide short-term or investment loans necessary to finance production. If necessary, the ADBP or feed mills could arrange advisory services for soybean production and marketing.

The full-fat soya that could be developed is an ingredient with an extensive blend of metabolizable energy and high protein. Domestic production or increased imports of full-fat soya would contribute to maintaining the high energy, high protein diets that broilers require. To use full-fat soya in poultry feed the beans must be heated in an extrusion process. The machinery

required to initiate the process could be imported duty-free, with other fiscal incentives provided to bean processors.

Importing licences could be extended to commercial importers and industrial importers. The home-mixer and custom compounder now furnish a growing portion of the total feed produced. Expansion of licence eligibility would permit the import of larger volumes under cheaper bulk freight rates. A further reduction in import costs per unit would result from the withdrawal of the 10 percent sales tax now levied on imports of soybeans and soybean meal.

While contributing to the supply of feed energy and protein for the poultry industy, full-fat soya would also provide competition to the fish meal industry. Because of its monopolistic position among producers of feed ingredients, the fish meal industry can avoid the quality controls encouraged by a more competitive environment.

IV. Health Regulations and Husbandry Standards

A. Disease Control

Poultry farmers in Pakistan continue to encounter significant disease problems. A variety of factors contribute to these problems. No regulations have been established, for example, to control the quality of day-old chicks or to test the blood of parent stock for pullorum, gallinurum, or salmonella. Close clustering of farms and the grouping of multiple age groups and strains of birds with varying immunity have encouraged the spread of bird diseases. No regulations exist on proper disposal of dead birds. The design of effective immunization programs under these conditions is extremely difficult.

Despite the establishment of research programs in poultry disease, research results have not been extended to farmers in the form of diagnostic facilities and adequate training in disease prevention. These services have been undertaken, instead, by feed mills and hatcheries. The uniformity and consistency of the extension services provided by the feed mills and hatcheries is questionable.

Diagnostic facilities and services have not increased at the same rate as the demand for the services. The largest concentration of poultry farms in the Province of Sarhad is located at Abbottabad. These farms have no access to a laboratory for disease diagnosis. No laboratory for diagnosis exists near Hub where the largest concentration of poultry farms in Baluchistan is located. Laboratories with the required equipment and manpower in Punjab and Sind are not located where they are most needed. Some of these facilities suffer from shortage of funds and are not capable of furnishing detailed analyses.

B. Recommendations

The cost of disease to the individual farmer and to the industry can be prohibitive. No one farmer or group of farmers can bear the total cost of disease eradication because of the spread of disease beween farms and provinces. The cost of regulating health standards and providing diagnostic facilities must be borne, in large part, by the federal government. The persistence of poultry disease in Pakistan underscores the need to address disease control problems.

To address these problems the following recommendations are proposed:

- make obligatory blood tests of breeding flocks to identify salmonella, pullurum, and gallinurum;
- impose a minimum aerial radius of one-half mile or more between breeding farms;
- enact regulations to control bird disposal methods;
- make obligatory the disinfection of vehicles and personnel entering and leaving poultry farms;
- provide well-equipped facilities for of conducting detailed pathological tests in areas with a poultry population of greater than 250,000 birds per 25 square miles;
- provide mobile laboratories capable of conducting routine diagnoses in areas with poultry population under 250,000 birds per 25 square miles;
- coordinate and strengthen through the Animal Husbandry Department vaccination and extension services that are currently supplied by feed mills and hatcheries;
- provide extension services to control disease outbreaks among desi flocks;
- pool university and private sector funds to strengthen applied research programs in poultry disease; and
- develop detailed recommendations for establishing and monitoring disease regulations.

V. Tax Burden

A. District Tax

Poultry farms are generally established in rural and suburban localities and fall within the jurisdiction of the District or Union Councils. They market their products and purchase their inputs in areas located within the jurisdiction of

Municipal Corporations. Municipal Corporations, District, and Union Councils are authorized to levy import and export taxes on poultry farmers in their jurisdiction. Proceeds from these taxes are then used for area development.

Farmers pay import tax to the Union Councils when they bring feed, medicines and vaccines, diesel, bottled gas, packing, and construction materials to their farms. When they take their produce for sale, their equipment for repair, or their crates or gas cylinders for refill, they pay export tax to the District Councils and import tax to the Municipal Corporations. When goods move from the jurisdiction of a District Council to the jurisdiction of a Municipal Corporation, with a final destination within the jurisdiction of a Union Council, three sets of taxes must be paid.

Taxation rates are not determined according to the tax-paying capacity of producers. Over the last two years the increase in the tax burden has contributed to farm losses. High relative tax rates in rural areas discourage rural investment.

B. Discrepancies in Import Policy

Current policies permit feed millers to import some feed ingredients duty free. Other important feed ingredients, such as coccidiostats, amino acids, chorine choride, carophyll, and trace minerals, cannot be imported under the same classification and are subject to import duties of 40 to 70 percent when imported by feed millers. When imported by the pharmaceutical industry to prepare a feed premix, however, they enter duty-free.

C. Wealth Tax

Section 2(e) of the 1963 Wealth Tax Act in Pakistan defines an asset as,

> in the case of an individual and a Hindu undivided family, property of every description moveable or immoveable, except: (a) growing crops, grass or standing trees on agricultural land; (b) any building owned or occupied by the cultivator or receiver of rent or revenue out of agricultural lands; provided that the building is on or in the immediate vicinity of the land and is a building which the cultivator or the receiver of rent or revenue by reason of his connection with land requires as a dwelling house or a store house or an outhouse.

This definition lends special tax consideration to agricultural assets. No wealth tax is applied to standing crops or buildings used for agricultural purposes.

Poultry farming, although agricultural, does not receive the same exemption from wealth tax. A breeder farm with a capacity of 25,000 breeders and necessary hatching machinery would be valued at a current cost of Rs 1,688 100 and would pay a wealth tax of Rs 372,026, regardless of profit or loss. A layer farm with 25,000 birds would be valued at Rs 2,610,000 and would pay Rs 17,200 in wealth taxes.

D. Recommendations

Local taxes represent a sizeable proportion of production costs on layer and broiler farms. The imposition of the taxes at multiple checkpoints en route causes a hardship in unloading and loading and places stress on the birds. The structure of tax rates should be reevaluated with the intent to lower the tax burden on certain key inputs and to attract investment to rural and suburban areas. Taxes should be collected on a quarterly basis on farms rather than on roads.

The government's policy on import of feed ingredients should be reevaluated. The exemption of poultry farming, as an agricultural enterprise, from the wealth tax should also be considered.

VI. Poultry Manure as a Resource

One thousand chickens produce roughly 65 metric tons of manure per year. Poultry manure can be of value as a source of fuel, fertilizer, and animal feed. As a fuel source one metric ton of poultry manure can yield approximately 50 cubic meters of methane gas per digestion or fermentation cycle, depending on organic and carbon content. In intensive poultry farming areas, collection of poultry manure for production of methane gas would also aid in controlling the disposal of poultry waste. Poultry manure is used as a fertilizer. If biogas plants were installed the sledge from production could be dried and marketed as organic fertilizer for nurseries and house gardens. Research indicates that poultry manure and litter can be used as a protein supplement for cattle, sheep, and fish. Commercial poultry litter contains woodshavings, rice husk or sawdust, and feathers. The protein or protein equivalent of the litter often ranges from 15 to 30 percent.

Given the amount of manure produced by poultry and the need for alternative sources of energy, livestock protein, and fertilizer, the study team recommends that the Pakistan Poultry Association conduct a financial analysis to determine optimum use of poultry manure.

VII. Formalizing the Data System

The Pakistan Poultry Association, the Poultry Research Institutes, and the Livestock Division of the Ministry of Food,

Agriculture, and Cooperatives collect current data on poultry production, consumption and prices. The three sources do not coordinate their collection activities or the data presentation. Data are generally published separately and without adequate explanation of collection methods. Consequently, the data user is unable to aggregate series or adjust data for specific analytical purposes, and the value of the data for decisionmaking is diminished.

The substantial data collection effort undertaken by these institutions and the relatively large volume of data they generate justifies a more formal coordination of collection activities and joint publication of materials. The Poultry Board may be the appropriate institution to supervise a collaborative effort.

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