

A Case Study of the Poultry Industry in Sri Lanka

Prepared by

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Development Project**
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Author's Note

In order to protect the Confidentiality Agreement between the Agro - Enterprise Development (AgEnt) Project and its clientele, the names of AgEnt clients have been replaced by a system of numbers.

We appreciate your understanding, while reading this document, that clients actual names have been replaced by a number in order to not divulge sensitive client information such as sales, employment, investment and future business strategies.

The intent of the report is to document and measure AgEnt assistance to the poultry industry in Sri Lanka, and determine industry behavioural change as a result of the assistance provided.

EXECUTIVE SUMMARY

The Agro-Enterprises Project (AgEnt) is concerned primarily with providing strategic support for Sri Lanka's agribusiness sector with a view to diversifying and expanding its productive capacity. The project is supporting development of a wide range of agricultural products with emphasis on the production and marketing of value-added goods.

This report is concerned with assessing both the current status of the poultry industry and the impact of project assistance on poultry development. The poultry industry was identified for support due to its significant growth potential and its relatively large income and employment multiplier effects. Assistance to selected clients in the poultry industry commenced in 1993. Of the nine active AgEnt clients, the majority are breeders and processors. The project has attempted to transfer knowledge, information and technology to these clients through several mechanisms, including technical assistance, investment grants, international travel grants, seminars, workshops, research publications, and news bulletins. The bulk of the assistance provided to date has been in the form of investment and travel grants.

Current Status of the Poultry Industry

The poultry industry has undergone rapid expansion and commercialization during the past 10-12 years. Between 1983 and 1994, production of poultry meat increased from 2,740 m.t. to 35,470 m.t. while per capita availability increased from 0.2 kg per annum to 2.1 kg per annum. Imports, as a proportion of total availability, have been negligible. During the same period, production of eggs increased from 567 million to 863 million, while per capita availability increased from 37 per annum to 48 per annum. Unlike broilers, the layer business has expanded at a relatively slow rate and shown a tendency to stagnate in recent years.

The production structures for chicken and eggs differ significantly from one another. Broiler production is dominated by large farmers, whereas egg production is dominated by small farmers. Poultry farming, which was once an extensive backyard activity, is rapidly becoming an intensive commercial activity due to growing consumer demand, especially

for broiler chicken. Part-time farmers will therefore eventually give way to full-time farmers.

There are only 9 active commercial processors in the island, who collectively account for around 60 percent of the annual broiler meat output. Day old chicks are supplied by 47 breeder farms, of which 44 are privately owned. The broiler chick business is dominated by three large companies (1, 12, and 13) who control about 70 percent of the output. Almost all the breeder farms have replaced local strains with imported strains, such as Shaver and Arbor Acre. The leading breeders and processors are technically advanced and highly efficient.

The island is more or less self-sufficient in the production of poultry feed, but the market is dominated by two large companies (12 and 14) who control nearly 90 percent of the output. Of the leading poultry companies, two have moved towards vertical integration, namely (12) and (2).

The main driving force behind the poultry industry is the rapidly growing consumer demand for broiler chicken. The consumption of chicken has increased at the expense of beef and possibly fish, as well. The service sector (tourist hotels, restaurants, armed forces, etc.) is a large consumer of poultry meat, which needs to be taken into consideration when calculating future demand for this commodity. At present, service-sector demand is depressed due to the sharp drop in tourism and the unstable economic environment. For production to maintain its current momentum, the overall economic climate has to improve and the GDP growth rate has to accelerate.

Compared to the United States, Sri Lanka is a high-cost producer of chicken, mainly due to high feed prices. The reason why feed prices are high is that most of the raw materials are imported. Due to the scarcity of raw materials in the world market, the country urgently requires a full-blown import-substitution program for feed grains.

The Role of AgEnt in the Poultry Industry

The project has a total of 11 clients in the poultry industry, of which 9 are active. The latter group includes the enterprise identified as (1), which is one of the major producers of day old chicks and poultry meat. (The other two enterprises are 12 and 13.) Of the 9

active clients, 8 have received one or more travel grants and 6 have received one or more investment grants. The types of equipment purchased with investment grants include modern incubator systems and semi-automated processing plants. As a rule, AgEnt finances investment and international travel on a cost-sharing basis so as to encourage clients to make optimal use of scarce resources.

Examination of company sales, investment and employment data for the past two years indicates that the project has successfully promoted behavioral change among its clients, who collectively have generated the following: (a) \$ 32.7 million worth of sales; (b) \$ 10.1 million worth of investment; and (c) 962 factory and farm-level jobs. Since the project has played a key role in promoting information and technology transfer, it can take credit for a relatively large share of these outcomes (around 70 percent on the average).

The international travel grants have served as a vital source of information and knowledge, while the investment grants have served as a key instrument of technology transfer. Due to project influence, the smaller clients have rapidly modernized and realized economies of scale in production. What the project has eminently succeeded in doing is to impart a professional approach to business which many of its clients did not earlier possess. As a result, they have become highly motivated, competitive and quality conscious, and are determined to become successful entrepreneurs. It is likely that these progressive forces will have a powerful demonstration effect on the rest of the poultry industry in the future.

It should be noted that AgEnt's role has been largely a catalytic one, given that the poultry industry had begun to develop and expand well before the inception of the project. The project came in at the right time and chose the right kind of client to work with.

I. INTRODUCTION

This study is concerned with various aspects of poultry development in Sri Lanka. Its three main objectives are (a) to provide an economic assessment of the poultry industry in terms of market structure, demand, supply, prices, import policies, and future growth potential; (b) to describe the role of the Sri Lanka Agro-Enterprises Project (AgEnt) in the development of the poultry industry; and (c) to estimate the impact of project assistance on specific indicators of performance, such as sales, investment and employment.

The AgEnt Project (initiated in 1992) is providing various forms of assistance to the agribusiness sector, including technical assistance, training, investment grants, and international travel grants linked to specific business events, such as trade fairs. The purpose of this assistance is to stimulate the development and expansion of private agro-based industries, while its goal is to diversify and commercialize agricultural systems. The project is involved in a large number of agricultural subsectors and is actively seeking to promote behavioral change, which is the basic principle underlying its goal and purpose statements.

The agribusiness sector (food, beverages and tobacco) is one of the key industrial categories in Sri Lanka. It contributes more than any other category to total value added in industry and is one of the major sources of growth in the economy. Between 1990 and 1994 this sector grew by 19.3 percent per annum although its relative share in total valued added declined from 38.9 percent to 34.8 percent.

Over this same period, the second largest industrial category - textile, wearing apparel and leather products - grew by 32.3 percent per annum and increased its relative contribution from 23.1 percent to 29.5 percent. Hence the decrease in the relative share of agro-based industries in total value added was due not to poor performance but to the faster growth of the garments and leather products industries.

One of the most rapidly growing agro-industrial categories in Sri Lanka is the poultry sector. The production of poultry meat, for instance, more than doubled between 1990 and 1994. Nonetheless, the average per capita consumption of chicken in Sri Lanka is nowhere near that of the industrialized countries due to a relatively low level of capita income (US\$ 650). Since the gap between demand and supply has been narrowing

rapidly in recent years, per capita income growth will have to accelerate to sustain further expansion of the poultry industry.

Although AgEnt has been providing assistance to poultry breeders and processors for the past two and a half years, its impact on the poultry industry has hitherto not been adequately assessed. A major task of this report is therefore to determine, through the analysis of specific outputs, whether the contribution made by AgEnt to the development of the poultry industry has been significant. It needs to be mentioned at the onset that this is first and foremost a case study, but since it is also concerned with the broader picture, it has elements of a sector study as well.

II. THE POULTRY INDUSTRY

The poultry industry is one of the most important agro-industrial categories in Sri Lanka by virtue of its potential to contribute significantly to income and employment generation as well as to improved nutritional well-being. The two main consumer products supplied by this industry to the market are broiler chickens and eggs. The broiler market has been expanding steadily in recent years in contrast to the egg market, which has been decreasing in absolute as well as relative terms. Between 1990 and 1994, average per capita consumption of chicken increased by 150 percent while that of eggs decreased by 26 percent. These market trends suggest that the poultry sector will be driven largely by the broiler industry in the future.

Geographical Location

Poultry farming is an island-wide activity, but the majority of farms are physically concentrated in a triangle which coincides more or less with the coconut triangle. The three end-points of the triangle are roughly Chilaw (north), Kurunegala (northwest) and Beruwela (south). With the exception of Crystal Springs (Gampola), all the other leading broiler processors are located within this triangle. The so-called poultry belt comprises the coastal stretch between Kandana and Lunuwila where a significant number of AgEnt clients are located. (A map showing the geographical distribution of AgEnt clients is provided in Annex A).

Structure and Market Configuration

The poultry industry is composed of four basic entrepreneurial categories which are as follows: (i) suppliers of day old broiler and layer chicks (breeder hatcheries); (ii) suppliers of eggs (layer farms); (iii) suppliers of dressed broiler chicken (processors); and (iv) suppliers of poultry feed (feed mills). The industry is linked commercially to two types of outgrowers - one supplying broiler chickens to middlemen or to commercial processors, and the other supplying coarse grains (primarily maize) to processors of animal feed.¹ The basic structure of the poultry industry is illustrated in Annex B.

The distinction between wholesale and retail markets is somewhat blurred in the case of broilers as all the chicken produced in the island is sold through retail outlets. The price the retailer pays the middleman or the processor is known as the wholesale price. The difference between the wholesale price and retail price usually ranges from Rs 7 to Rs 10 per kg of dressed chicken. Enterprises identified as (1), (12) and (4) are the main suppliers to the retail outlets in Colombo. A glut of chicken usually depresses the wholesale price without significantly affecting the retail price. A shortage of chicken, on the other hand, raises both the wholesale price and the retail price. A sharp decline in the wholesale price tends to push large numbers of small outgrowers out of the industry whereas a sharp increase tends to have the opposite effect.

During the past 10-12 years, professional entrepreneurs have emerged in all four business categories and completely transformed the poultry industry. Consequently the poultry market has become segmented - that is to say, whereas earlier it was primitive and loosely organized and somewhat diffused, it has now become highly structured and specialized. At the same time, a certain degree of vertical integration has taken place along the lines of more developed countries.²

¹ According to Drew (1993), there are approximately 65,000 poultry farmers (producers of chicken and eggs) in the island. There are no firm estimates on the number of maize farmers, but it is likely to be in the region of 75,000.

² As a recent document (Henry and Rothwell, 1995) observes: "There are generally three main forces pushing vertical integration: (a) market ownership and margin control, (b) biosecurity and quality, and (c) economies of scale and optimization of capital resources."

The enterprise (2), for instance, is a producer of day old chicks, eggs, dressed chicken, and poultry feed. Hence it is an example of a fully vertically integrated firm.³ The enterprise (12), which is a major supplier of day old chicks and poultry feed, has recently established one of the largest broiler processing plants in the island. Hence it is also moving towards vertical integration. The major supplier has a developed capability to influence prices of day old chicks, broilers and poultry feed by manipulating the market supply.

Suppliers of Day Old Chicks

There are 47 franchised hatcheries (breeder farms) in the island, of which 44 are privately owned and 3 are owned by the National Livestock Development Board (NLDB). The latter are located in Marawila (North), Kosgama (Southwest), and Karandagolla (Northwest). Some of the breeder farms are engaged in both the broiler and layer chick business, while others are specialized in one or the other. Of the 44 private breeder farms, around 13 are suppliers of day old layer chicks.

Most of the breeder hatcheries obtain their parent birds and chicks from foreign sources (Netherlands, France, Germany, India, Canada, USA, etc.) and do not engage in any local procurement. The largest exporter of broiler parent birds, broiler parent chicks, and layer parent birds to Sri Lanka is the Netherlands (over one-third of the Sri Lankan market share in each case). The share of the U.S. in the first and second categories is less than 10 percent while in the third, it is nearly 30 percent. Canada's share is around 16 percent in the first two categories and less than 10 percent in the third.⁴

Several AgEnt clients, such as the farms (1), (5), (8) and (3), have installed modern incubator systems imported from the United States. According to the Department of Animal Production and Health (DAPH), 32.5 million broiler chicks were produced in 1994, with three companies - (1), (12) and (13) - accounting for approximately 70 percent of this output. The market share of NLDB was around 5 percent. These data indicate that

³ (2) produces its own layers and broilers on a large nucleus estate, and imports most of its feed ingredients, including maize. The farm is not into the commercial feed business, hence the mill is operated at a subsistence level.

⁴ These estimates are based on data supplied by the Department of Animal Production and Health.

economies of scale have been realized by the larger companies in the day old chick business.

Suppliers of Broiler Chicken

The nine active commercial processors (many of whom operate outgrower schemes) account for a relatively large share of the poultry meat produced in the island (around 60 percent).⁵ This could be called the intensive commercial sector, as opposed to the extensive backyard sector, which supplies the balance 40 percent. Most of the processors operate on the basis of a buy-back scheme which is as follows: (a) the processor supplies day old broiler chicks and processed feed to his outgrowers free-of-charge or at a nominal price; (b) the outgrowers raise the chickens in sheds constructed at their own cost; (c) the processor buys back the chickens after 45 days at a previously agreed-upon price (based on live-weight); (d) after about two weeks, the outgrowers receive a new batch of day old broiler chicks, and so on.⁶

Some processors have nucleus estates while others do not, but the trend is increasingly towards handing the business of raising broiler chickens over to contract growers. Hence the poultry industry could be viewed as an important source of income and employment generation in rural areas. It needs to be borne in mind, however, that chicken farming is being increasingly dominated by outgrowers who are able to realize economies of scale vis-à-vis their contractual links with commercial broiler processors.⁷

⁵ Of the AgEnt clients, the three largest processors are (1), (4) and (6).

⁶ On the average, an outgrower receives about six batches a year. The size ranges from 100 birds to over 1,000 birds per batch. In April-May 1996, micro-outgrowers interviewed in the Lunuwila area said they were earning around Rs 12,000 per batch based on (a) an average price of Rs 60 per Kg; (b) an average weight of 2 kilos per live bird; and (c) an average size of 100 birds per batch. The projected annual income for one year (assuming no change in the buy-back price) is hence Rs 72,000 per micro-outgrower. The cost of constructing a shed for 100 birds (as reported by these outgrowers) is around Rs 5,000 on the average.

⁷ The report by Drew (1993) states that 65 percent of broilers are supplied by large producers, with farms in excess of 1,000 birds. Given the manner in which the production structure is evolving, this ratio is likely to increase in the future.

Suppliers of Eggs

Evidence suggests that there are a large number of small farmers and relatively few large-scale operators in the layer business. Drew (1993) estimates that around 60 percent of the eggs are produced by small farmers with less than 1,000 layers. It would appear therefore that the production structure is reasonably broad-based and equitable.

As mentioned above, egg production has been declining in recent years. It is likely that rising costs of inputs (feed, day old chicks, labor, etc.) have greatly reduced the profit margin per unit of output and pushed marginal producers out of the industry. It is also possible that some of the larger producers have switched from layers to broilers as the latter business is far more profitable. The layer industry is becoming increasingly competitive, hence only producers with a high degree of economic efficiency and market discipline are likely to survive in this business in the long run.

Suppliers of Poultry Feed

The poultry feed industry is dominated by two enterprises-(12) and (14) - who account for approximately 63 percent and 22 percent of total production, respectively. Enterprises (15), (9), and about 15 other small feed mills supply the balance 15 percent. It is likely that the new enterprise (16), will break the stranglehold that the enterprise (12) and (14) has on the poultry industry once it commences production in early 1997. The enterprise (12), however, can produce feed at a lower cost than the other large feed millers as its silos (for storing imported raw materials) are located in the Colombo port itself; hence it has a competitive edge in the feed business due to lower transportation costs.

III. MARKET FOR BROILER CHICKEN

Production

Prior to the early 1980s, the poultry industry was relatively backward with a major share of the broiler chicken being supplied by the extensive backyard sector. Efficiency was low, quality was poor, and there was little or no market specialization. Furthermore, the per capita consumption of chicken (and other types of meat) was infinitesimally small. Sahn reported (based on the analysis of 1980/81 survey data) that annual, per capita consumption of all categories of meat (beef, chicken, pork, etc.) was 4.36 kg among urban

households and that this comprised only 0.9 percent of per capita protein intake. He also reported that only 37.9 percent of urban households, 14.5 percent of rural households, and 11.9 percent of estate households consumed meat of any kind.

After the economy was liberalized in the late 1970s, a rapid growth of real per capita income occurred. Consequently the demand for chicken (which is highly income elastic) increased sharply as more and more households began to consume broiler meat. This had a stimulating effect on the poultry industry and supply increased rapidly to meet increased demand. Medium and large-scale broiler processors began to emerge and attracted large numbers of outgrowers into the business, as a result of which the industry became increasingly commercialized.

Figure 1 shows that there has been a sustained increase in poultry meat production since 1983 with the curve rising steeply after 1991, indicating a fresh influx of outgrowers. Between 1983 and 1989, production multiplied by a factor of 5, while between 1990 and 1994, it multiplied by a factor of 2.5.⁸ It is interesting to note that in 1993, actual production equaled the predicted value, i.e., 25,000 metric tons. But in 1994 it climbed steeply above the trend line estimate. The trend line shows production climbing to 41,000 metric tons in the year 2,000, but this level may be reached much sooner, given the rate at which domestic supply is currently growing. What the graph seems to suggest is that major shifts in production and processing technology have occurred in the poultry industry which are not captured by the trend line due to their recent occurrence.⁹

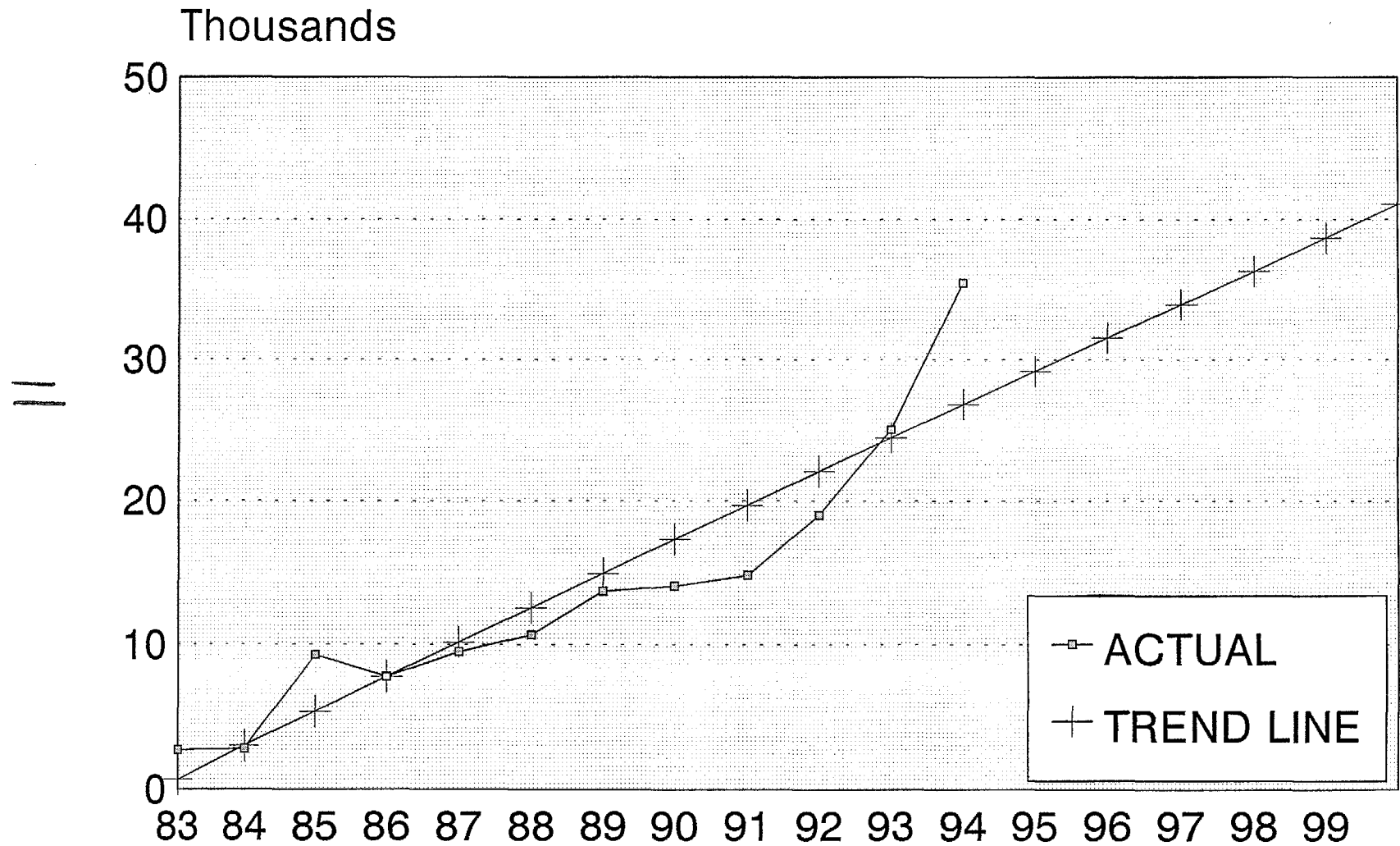
Between 1990 and 1994, production of poultry feed increased by a factor of 1.4 (Figure 2). The average production of feed, on the other hand, has shown a sharp decrease, which suggests that the efficiency of feed utilization has improved (Figure 3). We should note, however, that the efficiency gains are somewhat exaggerated as the graph pertains only to broilers and does not show what is happening in the layer industry.

⁸ Production data for 1995 were not available at the time of writing.

⁹ Independent estimates of chicken meat production are made by the Department of Animal Production and Health, which are slightly higher than those published by the Department of Census and Statistics. For example, the DAPH and DCS estimates for 1994 are 38,000 and 35,470 metric tons, respectively.

FIGURE 1: PRODUCTION OF POULTRY MEAT

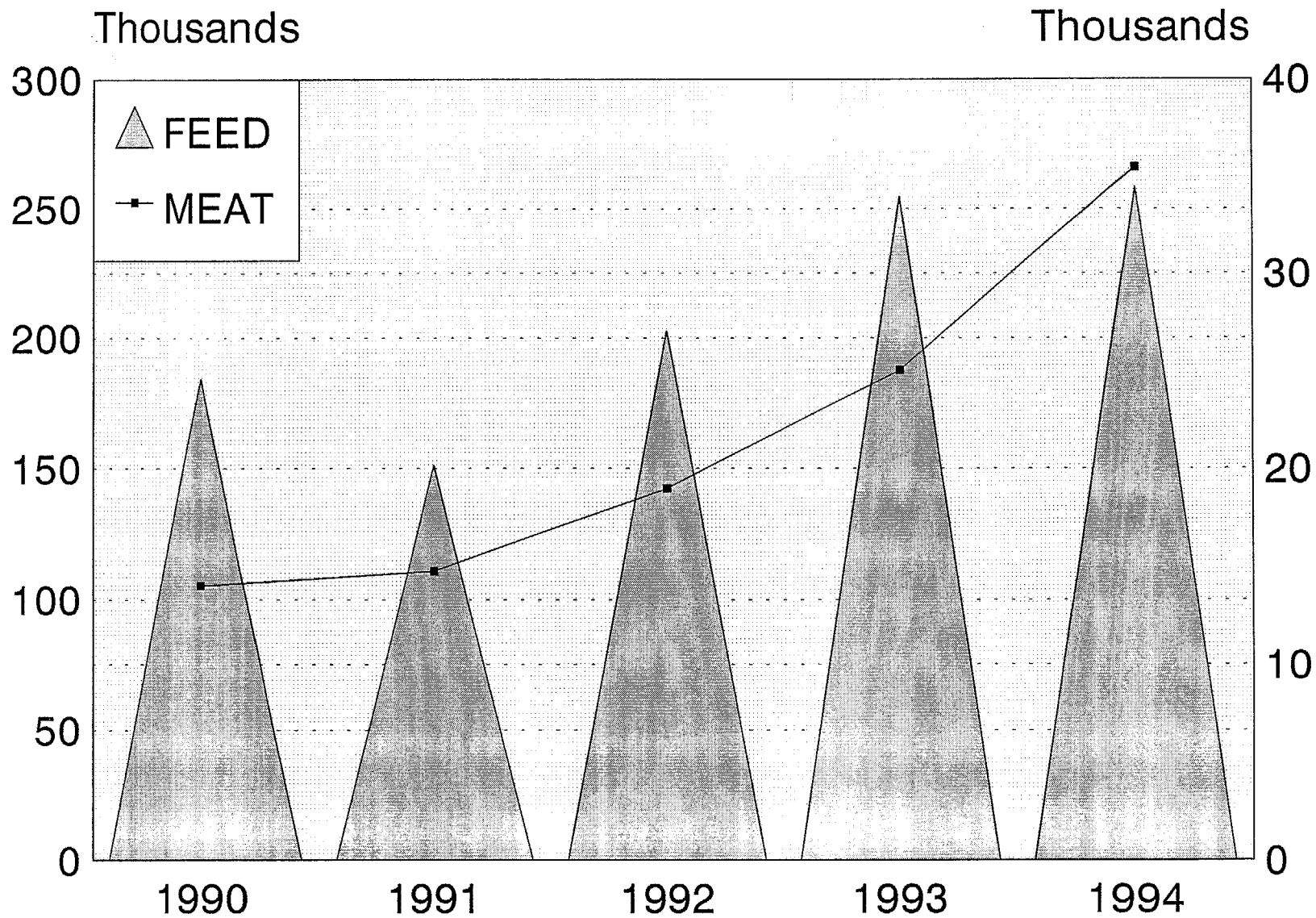
1983 to 1999 in metric tons



Trend line $y = -1699 + 2375X$

FIGURE 2: PRODUCTION OF POULTRY FEED AND POULTRY MEAT

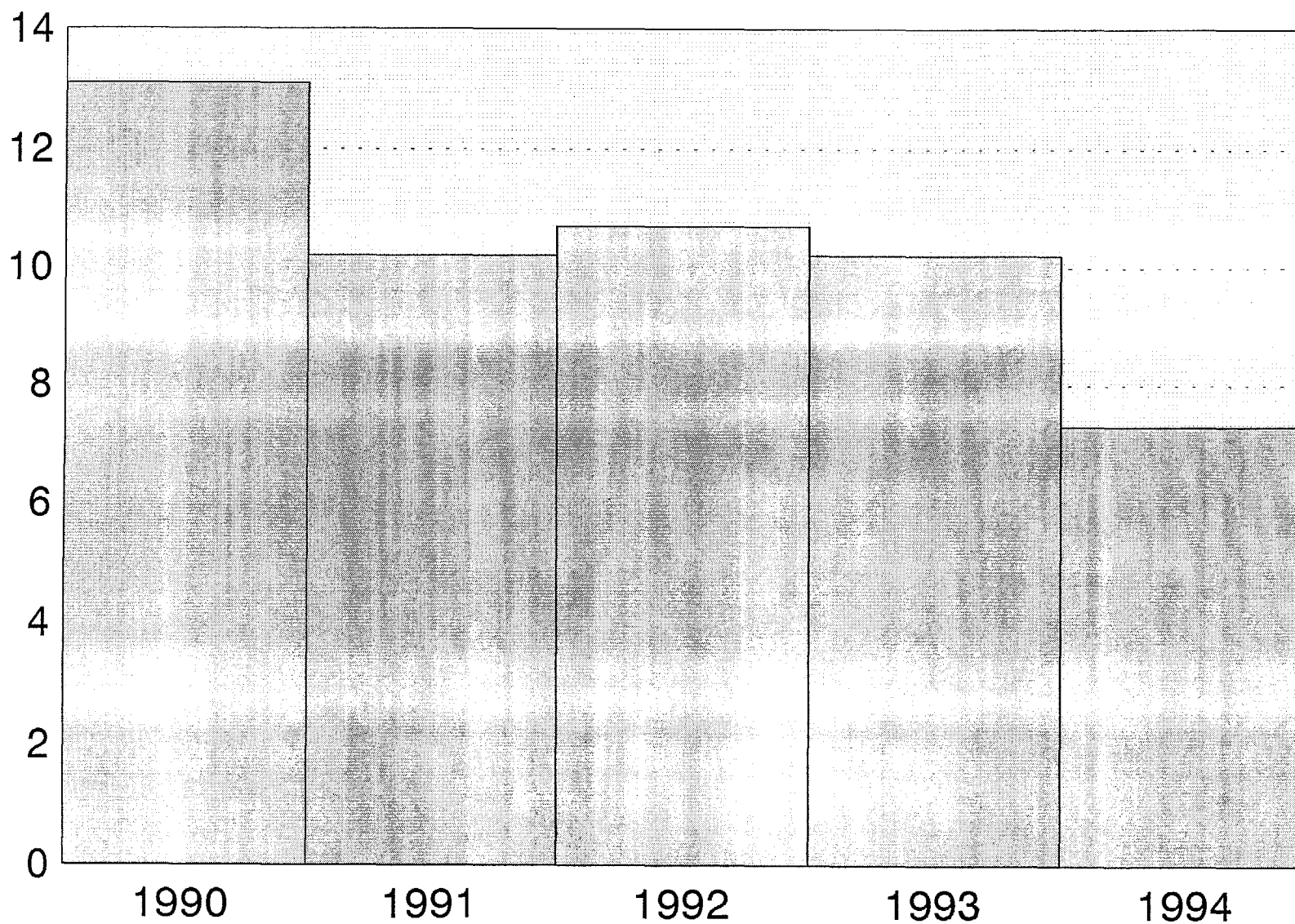
Metric tons



12

FIGURE 3: AVERAGE PRODUCTION OF POULTRY FEED

Kg of Feed per Kg of Chicken (Dressed)



Total Availability

The total availability of chicken increased from 3,000 metric tons in 1983 to 36,000 metric tons in 1994. As Table 1 shows, imports increased sharply in 1990 (to accommodate increased demand) but declined thereafter, probably as a result of the doubling of production between 1991 and 1994. As a fraction of total supply, however, imports are by and large insignificant.

While total availability multiplied by a factor of 12 over the reference period, per capita availability multiplied by a factor of 10, the difference being due to population growth. The average Sri Lankan now consumes around 2 kg of chicken per annum as compared to 0.2 kg in 1983, but this is only a minute fraction of what is consumed by the average citizen in North America. We could safely predict that a rapid growth of real per capita income will trigger a dramatic increase in per capita consumption of chicken in Sri Lanka.

In the early 1990s, the retail price of beef increased sharply and due to cross-price elasticity effects, the demand for this item fell while the demand for chicken further increased, as reflected in recent changes in per capita availability (Figure 4). It is possible that consumers are substituting chicken for fish as well, given that the latter has also become relatively expensive.

Figure 5 shows that between 1993 and 1994, the contribution of chicken to total protein availability increased from 1.04 grams to 1.47 grams while that of beef decreased from 0.87 grams to 0.61 grams per capita per day. The share of fish declined from 10.69 grams to 9.23 grams while that of eggs remained constant (1.00 gram). The share of milk products, on the other hand, increased from 2.93 grams to 3.14 grams. The share of animal protein in total protein availability fell from 28.7 percent to 25.5 percent. (Not shown in graph).

TABLE 1: AVAILABILITY OF CHICKEN

Year	Production (m.t.)	Imports (m.t.)	Food Nett (m.t.)	Per Capita (kg/year)
1983	2,740	380	3,120	0.20
1984	2,830	117	2,947	0.18
1985	9,290	120	9,410	0.59
1986	7,800	170	7,970	0.49
1987	9,500	100	9,600	0.59
1988	10,670	140	10,810	0.65
1989	13,700	150	15,200	0.90
1990	14,050	-	14,050	0.83
1991	14,800	470	15,270	0.89
1992	19,000	380	19,380	1.11
1993	25,000	340	25,540	1.47
1994	35,470	400*	36,080	2.07

* Stocks = -200 metric tons.

Source: Department of Census and Statistics, Food Balance Sheets.

FIGURE 4: AVAILABILITY OF CHICKEN AND BEEF

Kilograms per Capita per Annum

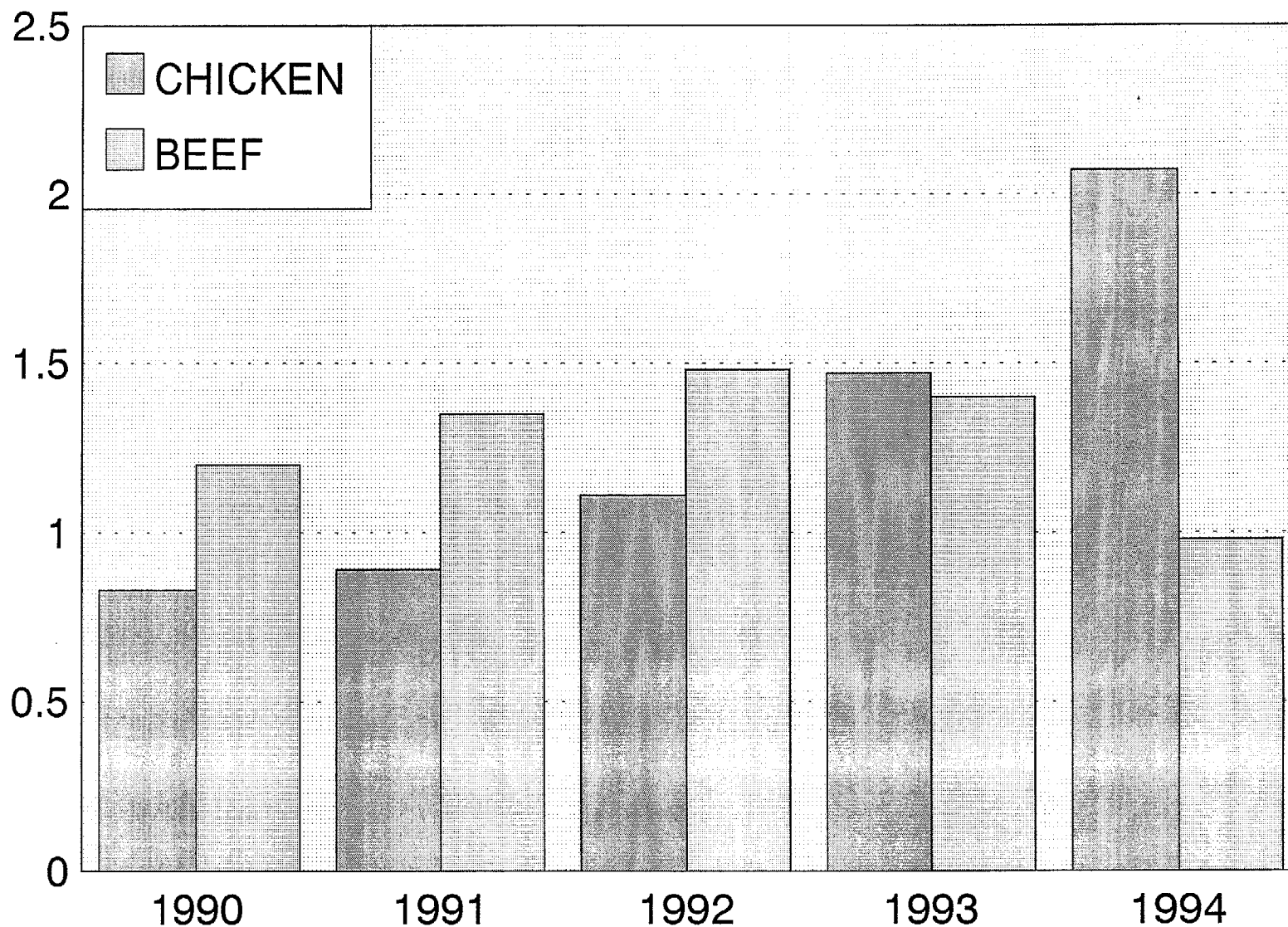
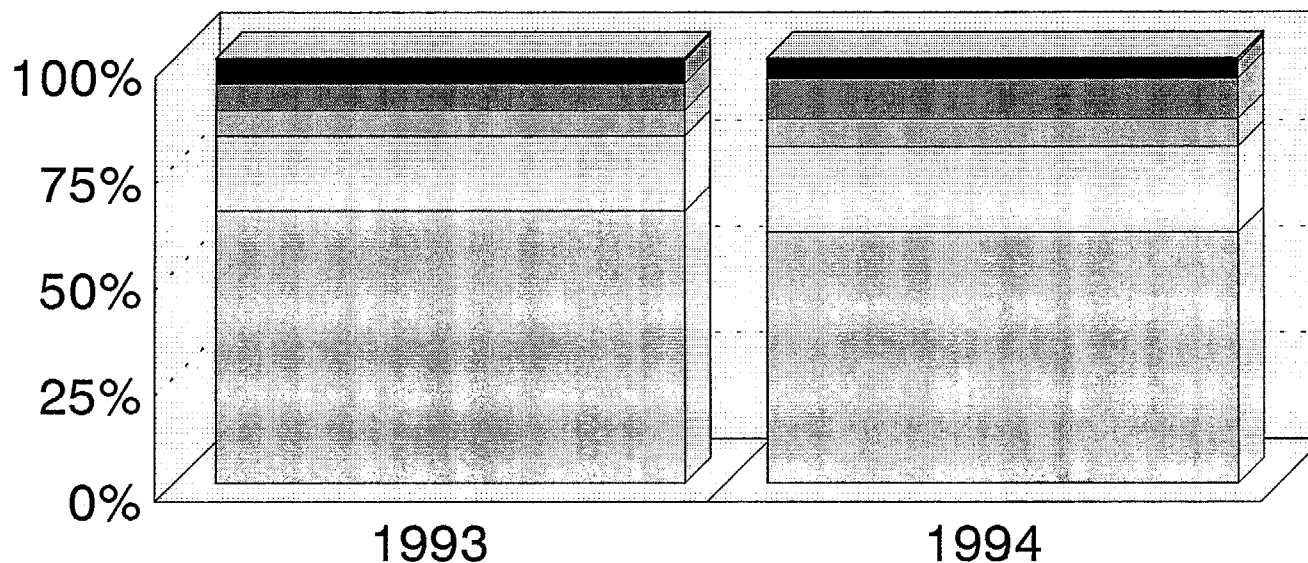


FIGURE 5: PER CAPITA AVAILABILITY OF ANIMAL PROTEIN

Grams per Day



PORK	0.04	0.04
MUTTON	0.08	0.1
BEEF	0.87	0.61
CHICKEN	1.04	1.47
EGGS	1	1.01
MILK PRODUCTS	2.93	3.14
FISH	10.69	9.23

Projected Demand

Annual demand projections are displayed in Table 2 for the period 1991 to 2000. To arrive at these estimates, the following assumptions were made: (a) annual consumption of chicken by Sri Lankan households in 1991 = 0.82 kg per capita; (b) expenditure elasticity of demand and cross-price elasticity of demand for chicken (with respect to beef) = 2.1 and 0.5, respectively; (c) real per capita GDP growth = 4.1 percent per annum (from 1995 onwards); (d) population growth = 1.3 percent per annum (from 1995 onwards); and (e) service-sector demand (tourist hotels, restaurants, government establishments, armed forces, hospitals, etc.) = 80% of estimated household demand.¹⁰

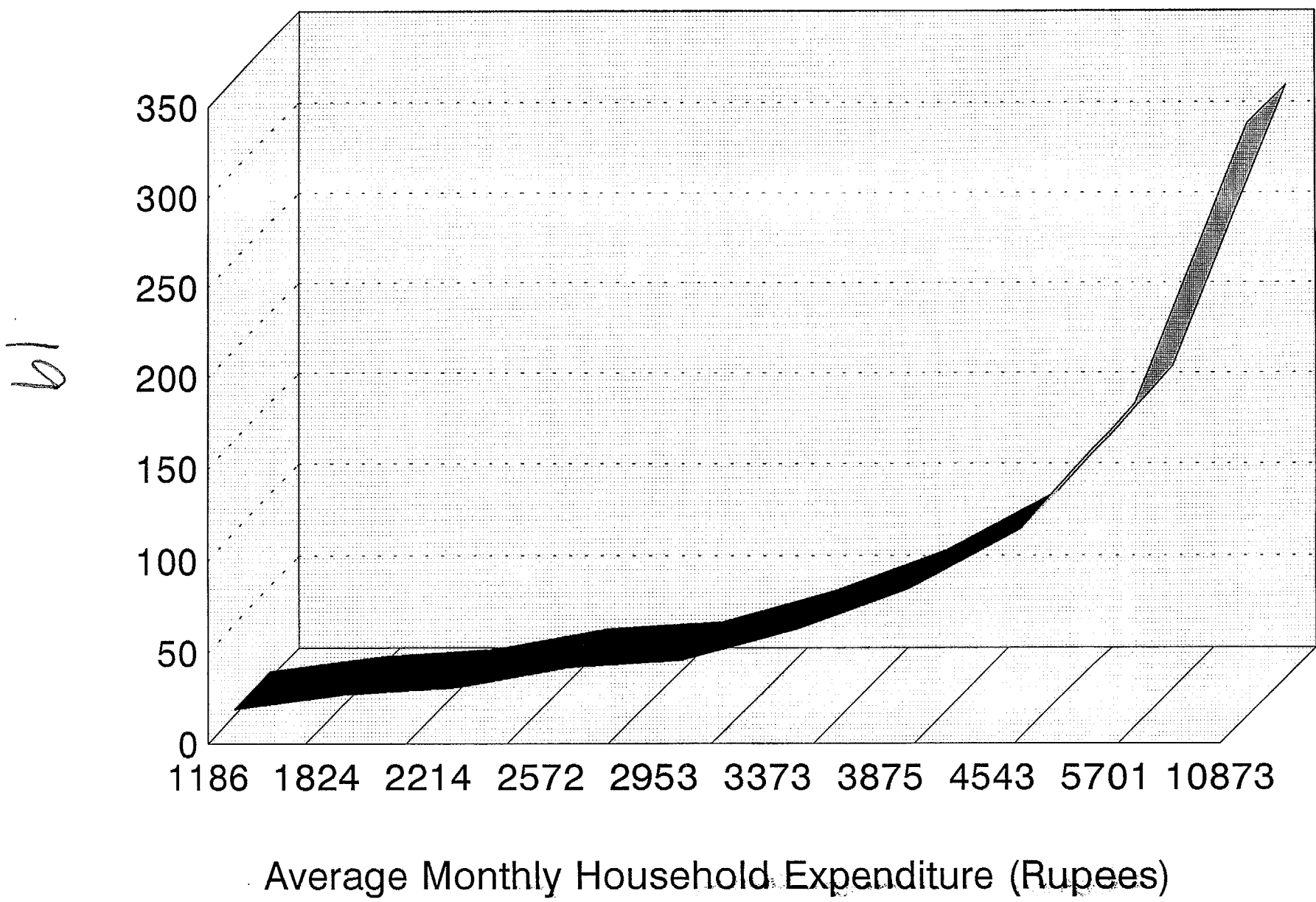
TABLE 2: PROJECTED DEMAND FOR POULTRY MEAT

Year	Population (000)	Demand per Capita (kg)	Demand Household (m.t.)	Demand Service (m.t.)	Demand Total (m.t.)
1991	17,247	0.82	14,142	11,314	25,456
1992	17,405	0.88	15,793	12,634	28,427
1993	17,619	0.98	17,267	13,814	31,081
1994	17,865	1.10	19,651	15,721	35,372
1995	18,401	1.22	22,449	17,959	40,408
1996	18,953	1.35	25,586	20,469	46,055
1997	19,521	1.49	29,086	23,269	52,355
1998	20,107	1.65	33,177	26,542	59,719
1999	20,710	1.82	37,692	30,154	67,846
2000	21,312	2.01	42,875	34,300	77,175

¹⁰ Assumptions (a) and (b) are based on household income and expenditure data published by the Department of Census and Statistics (1990/91 survey) and related price statistics; assumptions (c) and (d) are based on data obtained from Central Bank Annual Reports, 1991 to 1994; assumption (e) is based on information provided by experts in the poultry industry, hence it is an educated guess. (We should note that new restaurants create new demand. For example, Kentucky Fried Chicken, which recently commence business in Sri Lanka, will boost production by creating an additional demand of around 60,000 kg a month - a figure that is likely to expand continually in the future, given the ripple effect of the shift in consumer preference away from beef towards chicken.) The expenditure elasticity of demand for chicken is imputed from the relationship illustrated in Figure 6.

FIGURE 6: EXPENDITURE ON MEAT BY HOUSEHOLD EXPENDITURE DECILE

Rupees per Month per Household



For each year, total household demand was calculated on the basis of the following function $D = P[C(1+(2.6 \times 4.1\%))]$ where D = Demand; P = Size of population; and C = Annual per capita consumption of chicken, excluding service sector. To get total demand, estimated service demand was added to estimated household demand.

According to our calculations, the total demand for chicken is likely to triple between 1991 and 2000 due to population growth and income and cross-price elasticity effects. It should be noted that in 1994, actual production more or less equaled estimated demand, i.e., approximately 35,000 metric tons. Thus over the remaining part of this decade, there is scope for a doubling of production.

However, there are three reasons why production may not increase at this rate: First, the poultry industry is closely linked to the service sector and anything that dampens the service sector will also dampen the poultry industry. At present, growth of the service sector is being sharply curtailed by the internal security situation. For example, restaurants are closing early in Colombo and other major cities and tourism is on the decline. Hence, in reality, service demand may be significantly lower than what our estimates show.

Second, the outbreak of infectious bursal disease (also known as Gumboro virus) in April-May 1996 may cause a temporary setback in poultry production as it tends to inflict a high mortality rate among brooder chicks. The problem has affected large numbers of outgrowers in the poultry belt. Experts indicate that the disease could be eradicated within six months *provided adequate measures are taken*. Nevertheless, the likely scenario for the latter half of 1996 is declining production and rising prices.

Third, the current power crisis in Sri Lanka, which is unlikely to be resolved in the short run, has seriously affected all business categories, including the poultry industry.

Retail Prices

The increase in the retail price of chicken during the past ten years or so has been modest compared to that of beef. In 1985, consumers paid an average of Rs 45.31 for a kilo of broiler chicken as compared to an average of Rs 23.46 for a kilo of beef. In 1994, the corresponding prices were Rs 88.75 and Rs 77.95, respectively (Figure 7). The price ratio

of chicken to beef hence decreased from 1.93 to 1.10, which explains why the substitution effects described above have taken place.

IV. MARKET FOR EGGS

Production

The production of eggs increased from 576 million in 1983 to 815 million in 1987. Over the next seven years, however, production increased by only 48 million eggs. Thus growth of the layer industry since 1987 has been sluggish. The trend line (Figure 8) shows output exceeding one billion eggs by 2000, which may be an optimistic forecast.

Total Availability

Since Sri Lanka does not import eggs, total availability equals production. The per capita availability increased from 37 eggs in 1983 to 48 eggs in 1994 (Table 3). This amounts only to a 30 percent increase for eggs as compared to a tenfold increase for chicken.

TABLE 3: AVAILABILITY OF EGGS

Year	Production (DAPH) (000)	Population (DCS) (000)	Per Capita (Number)
1983	567,137	15,416	37
1984	561,084	15,599	36
1985	617,142	15,837	39
1986	667,025	16,117	41
1987	814,874	16,361	50
1988	777,710	16,586	47
1989	833,746	16,806	50
1990	817,349	16,993	48
1991	784,772	17,247	46
1992	812,264	17,405	47
1993	856,824	17,619	49
1994	863,303	17,865	48

FIGURE 7: RETAIL PRICE OF CHICKEN AND BEEF
Rupees per Kilogram

92

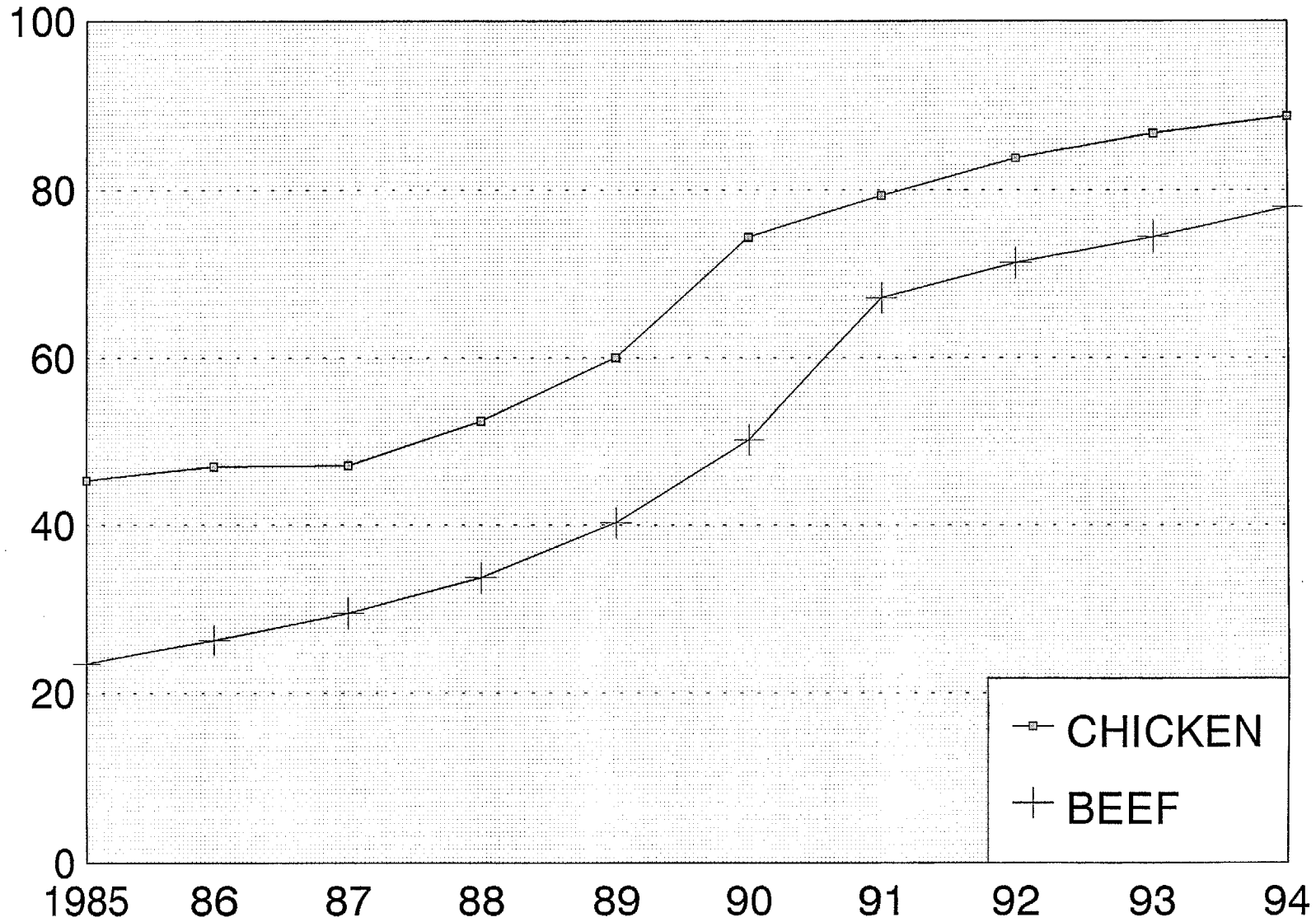
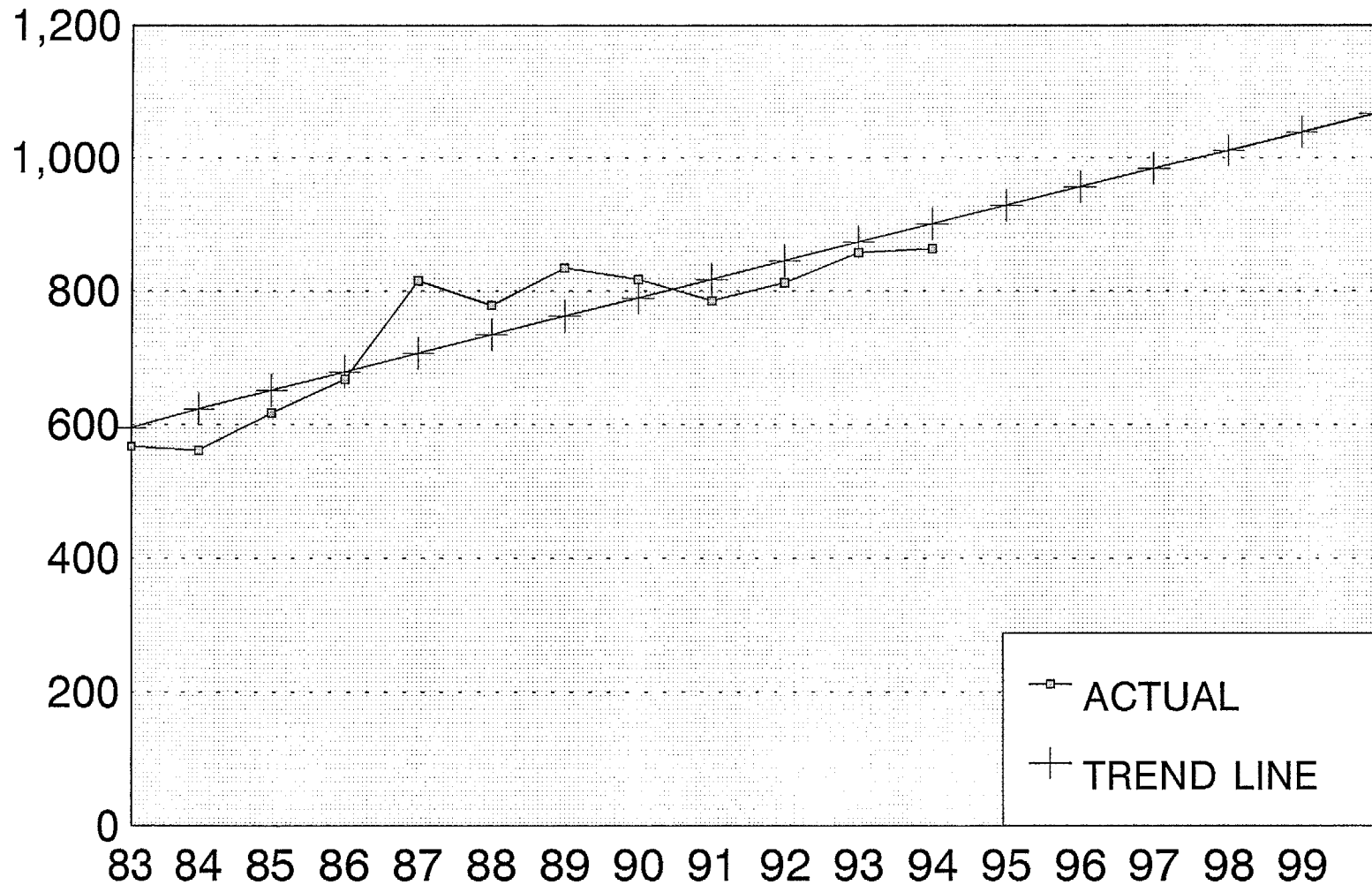


FIGURE 8: PRODUCTION OF EGGS

Millions



Trend line $Y = 567370 + 27753X$

Projected Demand

In calculating the future demand for eggs, we have used the same assumptions as those for chicken with respect to growth of population and real per capita income. The other assumptions were that (a) per capita consumption = 29.64 eggs in 1991 (as reported by the 1990/91 survey; (b) expenditure elasticity of demand = 1.4 (derived from the relationship as shown in Figure 9); and (c) service-sector demand = 30 percent of estimated household demand.

Accordingly, total demand for eggs is estimated to grow from 716 million to 1.5 billion over the period 1991- 2000, which is roughly a twofold increase (Figure 10). The corresponding per capita values are 41 and 69, respectively. We saw earlier that total production amounted to 863 million eggs in 1994. This is almost equal to the estimated demand for that year (888 million eggs).

V. FEED PRICES

By international standards, Sri Lanka is a high-cost producer of chicken. For example, a kilo of broiler chicken (dressed) is about 35 percent cheaper in New York than in Colombo. The main reason appears to be the high cost of poultry feed production in Sri Lanka. Countries which are internationally competitive in poultry production, such as the United States, Brazil and China, are by and large self-sufficient in feed grains. The Sri Lankan feed industry, on the other hand, imports over 90 percent of its raw materials because local supplies of feed grains (maize and soybeans) are not only small but highly erratic (Figure 11).

Prices of locally processed feeds are hence directly related to the international prices of feed grains and protein materials.¹¹ As Table 4 shows, international prices have increased steeply due to a scarcity of supply. Although the prices of locally processed feed are following a similar pattern, they are lower than they would otherwise be due to the present tariff policy, which allows feed processors to import feed grains as well as processed feed duty free.

¹¹ The raw materials purchased by local feed millers include rice polish, maize, soybeans, soybean meal, fish meal, coconut poonac, shell grits, and vitamin-mineral premix. Most of these materials are imported.

FIGURE 9: CONSUMPTION OF EGGS BY HOUSEHOLD EXPENDITURE DECILE
Per Month per Household

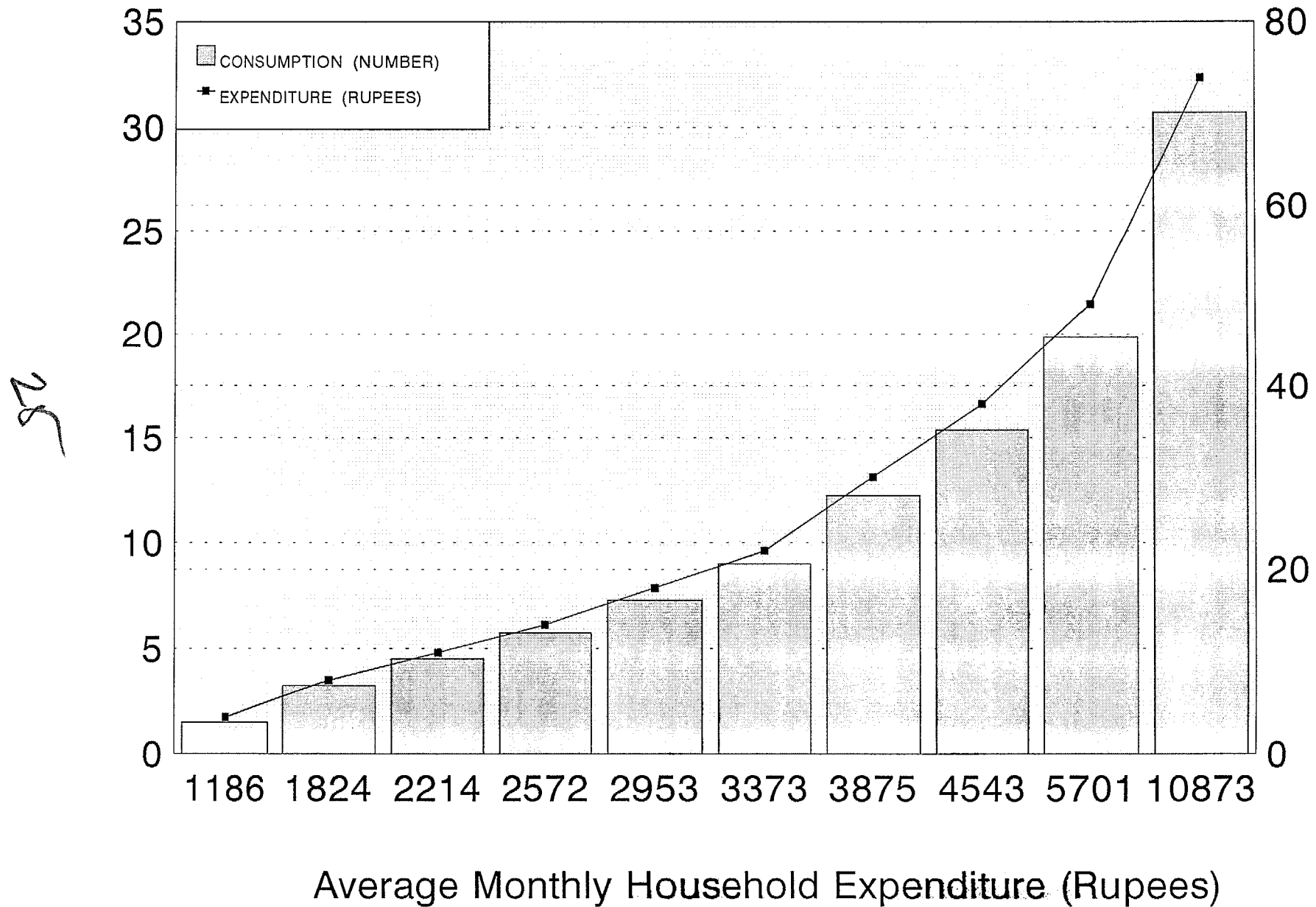
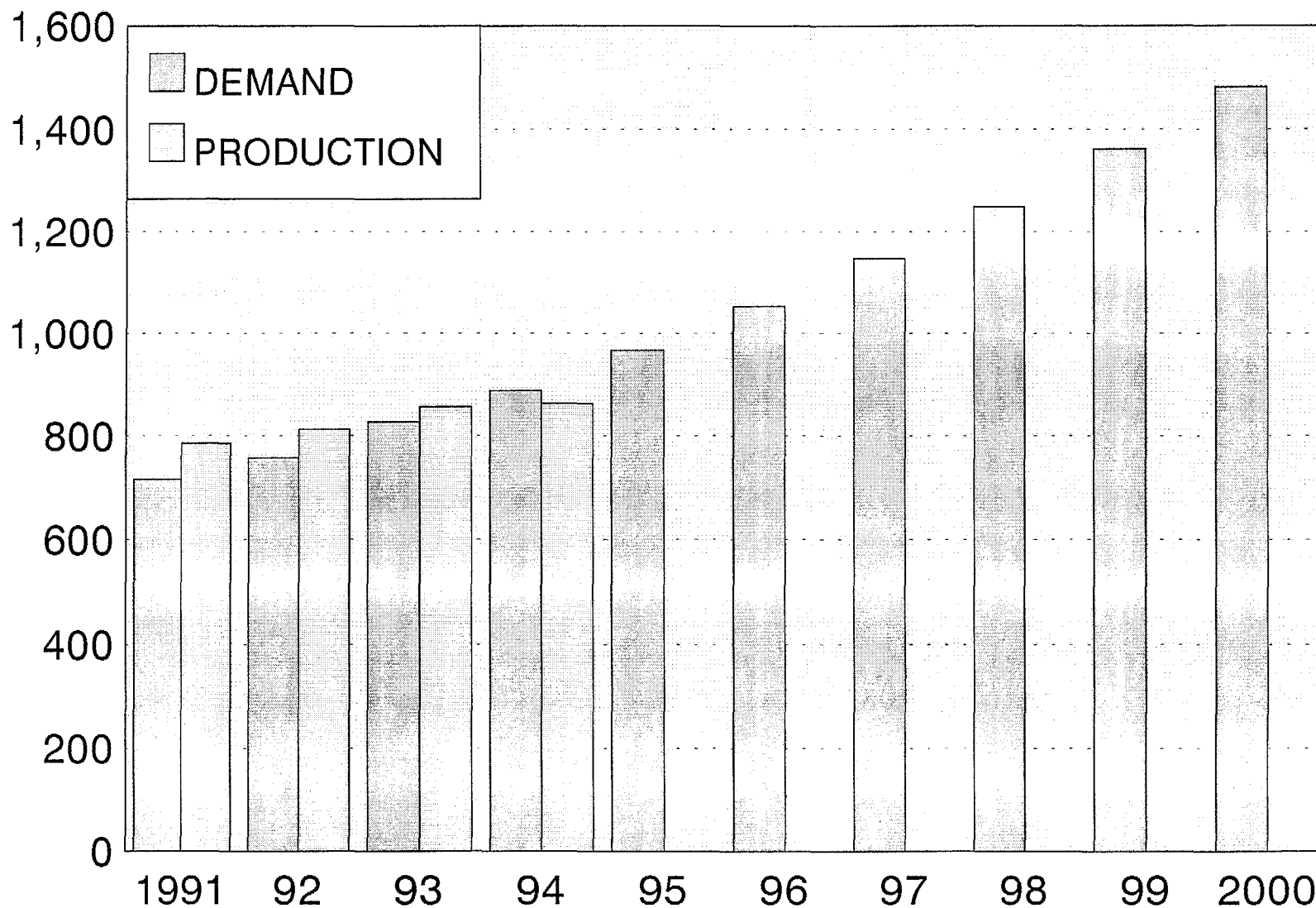


FIGURE 10: PROJECTED DEMAND FOR EGGS

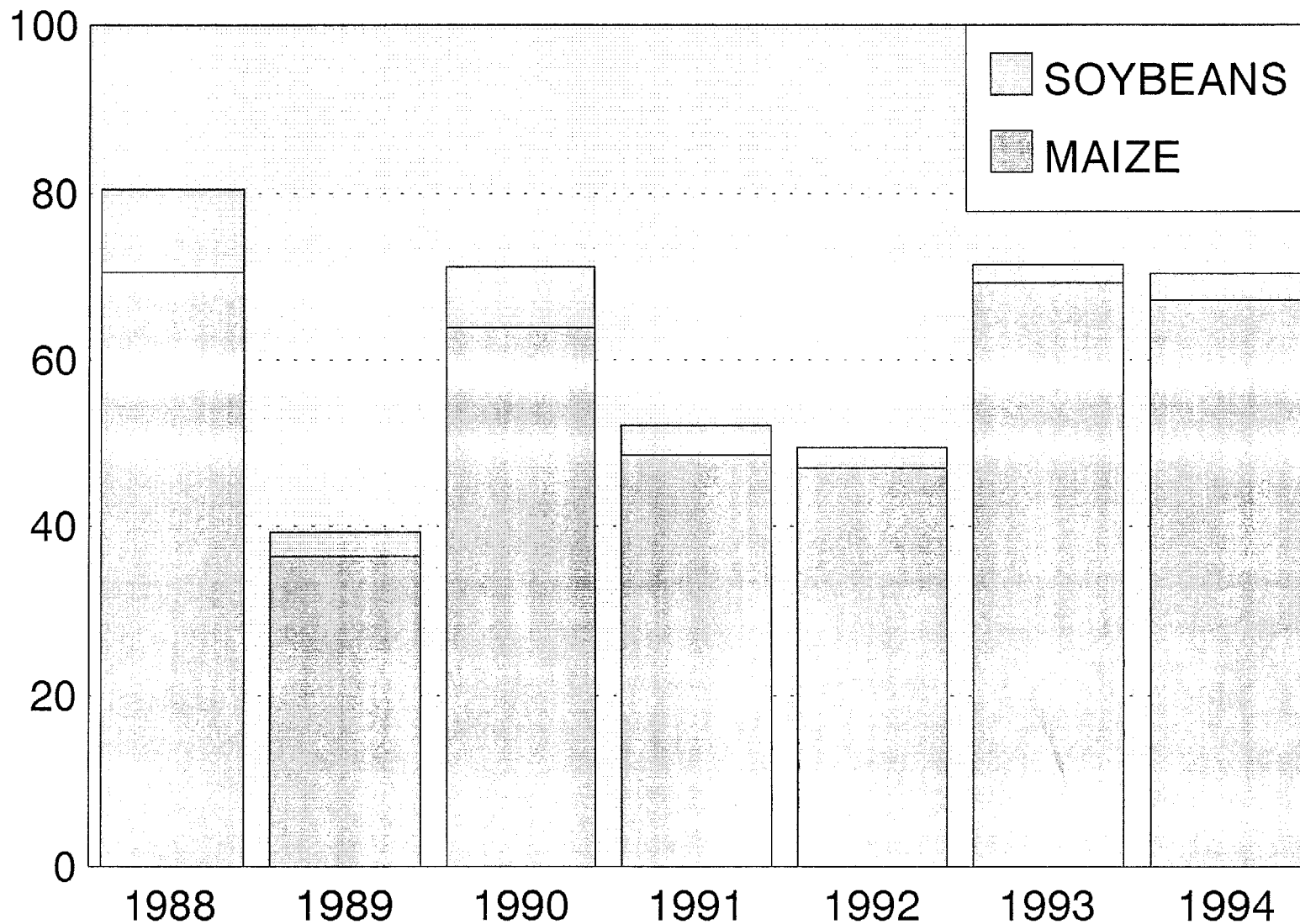
Millions



26

FIGURE 11: PRODUCTION OF FEED GRAINS

Thousand Metric Tons



27

TABLE 4: WORLD PRICES OF SELECTED FEED INPUTS
(in US\$)

Commodity	Unit	April 1996	April 1995
Wheat Bran	metric ton	116.00	49.50
Corn	bushel	4.44	2.48
Soybean Meal	metric ton	227.00	144.50
Soybeans	bushel	7.71	5.68
Wheat	bushel	6.81	4.00

Source: Asian Wall Street Journal, April 30, 1996.

As a fraction of total supply, processed feed imports are negligible. The island is therefore largely self-sufficient in feed production. But in order to reduce costs of production, it has to achieve a high degree of import substitution in feed grains.

Table 5 compares the prices of two feed millers: one relatively small, one relatively large. The former company (9), procures feed grains mainly from local producers while the latter company (14), procures them primarily from the world market. The two companies produce 1,500 and 5,500 metric tons of feed per month, respectively, on the average. It will be seen that the prices of company (9) are 15-25 percent lower than the company (14), which suggests that feeds produced with local grains are cheaper than those produced with imported grains.

TABLE 5: PRICES OF SELECTED POULTRY FEEDS

Item	Unit	Price (Rs)
Breeder Starter Mash	25 kg	330.75* 414.00**
Broiler Breeder Mash	25 kg	350.75* 405.00**

* The enterprise (9)

** The enterprise (14)

Source: (9)/(14) Price Lists (January 1996).

There is hence a strong case for import substitution of feed grains in Sri Lanka. Since local maize is produced at an internationally competitive price, it has the potential to play a key role in the expansion of the domestic feed industry.¹² The quality of imported maize, however, is superior to that of local maize. The main problem with local maize appears to be a high moisture content. Imported maize has an average moisture content of around 12 percent and can be stored for as long as 8-9 months, whereas local maize, with an average moisture content of 16 percent, can be stored for only 3-4 months.

Local maize producers therefore need to be educated on proper techniques of storage, moisture control, and quality control. Under the AgEnt project, technical and institutional innovations are being promoted for maize so as to promote import substitution of feed grains.

VI. IMPORT POLICY

A uniform tariff of 35 percent is applied to the majority of food items imported into Sri Lanka. Import tariffs are a double-edged sword for they protect producers on the one hand, and hurt consumers on the other. The average Sri Lankan household devotes around 60 percent of its total expenditure to food, which suggests that domestic food prices are high relative to per capita income. When food prices rise, consumers spend less money on

¹² Although the enterprise (14) is more expensive than the enterprise (9), the former produces a more nutritious feed. Outgrowers claim that on the average, broilers raised on the enterprise (14) weigh 10-15 percent more than those raised on the enterprise (9) feed at the age of 45 days.

industrial goods, and vice versa. It could be argued that the high general food price level is one of the key economic factors hampering industrialization in Sri Lanka.

Table 6 illustrates the likely impact on the poultry market of a change in the import policy on chicken. The analysis is based on 1994 data and provides three alternative scenarios: the first ("base") shows the actual situation in 1994; the second ("no imports") predicts the outcome of an import ban on chicken; and the third ("free imports") shows what is likely to happen if the import duty on chicken is abolished.

According to our analysis, the impacts of an import ban on the base scenario are not significant as production accounts for about 99 percent of supply. The impacts of a free import policy, on the other hand, are highly significant. The retail price of chicken meat will fall from Rs 88.75 to Rs 74.51 and cause the following changes: domestic supply will decrease by 7,534 metric tons, demand will increase by 5,540 metric tons, and imports will rise by 13,074 metric tons. (Note, these estimates are based on 1994 data as recent data are not available).

A free import policy (given our elasticity assumptions) is unlikely to alter net economic welfare as the gain in consumer surplus will more or less equal the loss in producer surplus. Consequently the welfare index will remain at 100.

Policy Guidelines

The poultry industry has received little government attention to date in respect of institutional and policy guidelines (perhaps because it is dominated by the private sector). The Livestock Development Strategy, published in 1984, has a small section on poultry which is more conceptual than analytical in nature.

The Strategy makes a clear distinction between the extensive backyard sector and the intensive commercial sector and gives high priority to the latter. While advocating minimum government involvement in development of the intensive commercial sector, it identifies extension and veterinary services as two key areas for government support. We would add that import substitution in feed grain production is perhaps the most critical issue in terms of government policy action.

TABLE 6: IMPACTS OF ALTERNATIVE IMPORT POLICIES ON CHICKEN

Variable	Unit	Base Scenario	No Imports	Free Imports
Production	Metric Tons	35,470	35,700	27,936
Imports	Metric Tons	400	0	13,474
Demand	000 Tons	35,870	35,700	41,410
Wholesale				
Price	Rs/Kg	73.75	74.19	59.51
Retail Price	Rs/Kg	88.75	89.19	74.51
Consumer				
Surplus	Rs Mn	1,653	1,638	2,110
Producer				
Surplus	Rs Mn	1,189	1,204	726
Total Welfare	Rs Mn	2,842	2,842	2,836
Total Welfare	US\$ Mn	57.4	57.4	57.3
Consumer				
Surplus	Index, Rs	100	99	128
Producer				
Surplus	Index, Rs	100	101	61
Total Welfare	Index, US\$	100	100	100
Total Welfare	Index, US\$	100	100	100

Notes: (a) Price elasticities of demand and supply = -0.7 and 1.1, respectively; (demand assumed to be inelastic because beef, pork, and mutton are weak substitutes for chicken); (b) base wholesale price of chicken = Rs 73.75 (imputed from 1994 retail price); (c) C.I.F. price of chicken = Rs. 59.51 (imputed from 1994 F.O.B. price); (d) US\$ 1 = Rs 49.98 (end 1994).

VII. THE ROLE OF AgEnt IN THE POULTRY INDUSTRY

AgEnt has been playing an active role in the development of the poultry industry during the past two and a half years. Its main emphasis has been promoting technological change among two important groups of entrepreneurs: breeders and processors.

Adoption of improved technology cannot occur without a change in values and goals on the part of the entrepreneur. This concept, in other words, implies that he has become profit-oriented and that in order to accumulate wealth, he is prepared to innovate and take risks. The project has been attempting to promote such behavioral change in three fundamental ways: (a) creating realization, or awareness, of the "art of the possible" among its clients; (b) encouraging them to formulate a goal, based on an assessment of strengths, weaknesses, opportunities and threats (i.e., a SWOT analysis); and (c) assisting them to take concrete and decisive steps towards attaining that goal, such as adopting a new production technology or an innovative marketing strategy through the mechanism of investment grants.

In actual practice, the approach of AgEnt is to take each client on his merit. Figuratively speaking, entrepreneurs could be evaluated in terms of their location on the "information and knowledge" spectrum; at one extreme are those who are highly informed and motivated and know exactly where they want to go, while at the other are those who have limited knowledge and information and no concept of the art of the possible. The majority of AgEnt clients (poultry breeders and processors) fall in the middle of the spectrum in respect of their entrepreneurial capabilities, and it is this group that has benefited mostly from project assistance. The project has also tried to target assistance to the two ends of the spectrum but has met with limited success, due to either resistance or a lack of interest and motivation on the part of "strong" and "weak" entrepreneurs, respectively.

In recent years, most of AgEnt's clients have acquired new knowledge and information and adopted improved technology, as reflected in specific "change" indicators, such as investment and sales. It cannot be assumed, however, that without AgEnt, no significant increase in sales and investment would have occurred, since the poultry industry had begun to show signs of dynamism and rapid growth well before the inception of the

project. It would be more appropriate to say that AgEnt came in at the right time and has played the role of a catalyst in further promoting further growth and behavioral change.

One of the troublesome aspects of this particular monitoring and evaluation (M&E) exercise is how to capture the incremental gains realized through project intervention. There are several problems in this regard, which include the following: (a) the project has been in existence for only four years; (b) different clients have received assistance at different times; (c) the nature of the assistance has also varied from client to client; and (d) the relationship between qualitative inputs (such as information and knowledge) and productivity is not conducive to quantitative measurement. Due to these drawbacks, we have adopted certain criteria which are somewhat arbitrary, but which nevertheless provide a basis for estimating the impact of the project on the poultry industry.

AgEnt has 9 active clients in the poultry industry, namely the enterprises (1), (4), (3), (2), (5), (6), (7), (8), and (9). Some of the clients are specializing in only one commodity, while others are specializing in two or more, as shown in Table 7. We note that breeding and processing is the most frequent combination among these clients as a whole.

The enterprises (1), (3), and (7) are suppliers of dressed broiler chicken and day old chicks (DOCs), while (4) and (6) are suppliers of dressed chicken only. Clients (5) and (2) are suppliers of dressed chicken, DOCs, and eggs. (The latter also owns a small feed mill which supplies feed for its layers). Farms (8) and (9) specialize in DOCs and poultry feed, respectively. Many of the processors and breeders operate buy-back schemes for broiler chickens.

In addition to the 9 active clients, there are two other clients (10 and 11) who could be viewed as non-active for the following reasons: (a) the owner of (10) (who has received 2 travel grants from AgEnt) has chosen to give up poultry and concentrate on pig farming (on which he is an expert); and (b) the owner of (11) has not yet implemented his proposal to purchase plant and equipment, which was approved for funding by AgEnt in early 1996.

TABLE 7: TYPOLOGY OF AgEnt CLIENTS

Company	Broilers Dressed	DOCs	Eggs	Feed	Nucleus Farm	Contract Growers
(1)	*	*			*	*
(2)	*	*	*	*	*	
(3)	*	*			*	*
(4)	*					*
(5)	*	*	*		*	
(6)	*					*
(7)	*	*			*	*
(8)		*			*	*
(9)				*		

VIII. IMPACT OF PROJECT ASSISTANCE ON THE POULTRY INDUSTRY

The four basic entrepreneurial categories in the poultry industry, as we saw, are the breeders, egg suppliers, broiler processors, and feed millers. Although AgEnt is seeking to promote development and expansion of all four categories, it has concentrated mainly on the breeders and processors in terms of assistance. This has happened virtually by default as these two categories (among whom there is considerable overlap) have been more

receptive to the project than others. One of the merits of the AgEnt project is that it is highly proactive and aggressively searches for clients. Through the proactive method it has been able to identify clients who are likely to make maximum use of the project and to focus attention on these.

Nature of Project Assistance

AgEnt provides assistance to selected clients on a cost-sharing basis. A client who wishes to obtain either a travel grant or an investment grant from AgEnt is required to submit a formal proposal to the managing Director. In order to simplify procedures, the client is asked to formulate his proposal along guidelines established by the project. Both the proposal and the background of the client are carefully studied before a decision is made whether or not to support the client. If the proposal is approved, AgEnt will agree in writing to support the client by providing a grant equal to roughly 50 percent of the estimated expenditure.

The total assistance provided by the project to its clients in the poultry industry (up to May 1986) amounts to \$ 202,591, of which a major share (86 percent) consists of investment/T.A. grants.¹³ Table 8 shows at a glance how much and what type of assistance each client has received. It will be seen that the bulk of the assistance (87 percent) has gone to five firms, namely the enterprises (4), (5), (6), (8) and (1). The largest single recipient of AgEnt assistance to date is the enterprise (4) (\$ 54,791). All the funding for poultry-industry clients, as we have seen, is done on a cost-sharing basis. This mechanism has enabled the following equipment to be procured: (a) two Chickmaster incubators (5 and 8); (b) two semi-automated broiler processing plants (4 and 6); and (c) one poultry shed evaporative cooling system (1). These items were all imported from the U.S. with the assistance of AgEnt. All the AgEnt clients (with the exception of 5) have also made use of the cost-sharing mechanism to participate in international trade fairs and exhibitions and gain new knowledge, information and business contacts. Although travel grants are an important instrument of behavioral change, they comprise only 7.4 percent of the total assistance provided to AgEnt's clients in the poultry industry .

¹³ This figure does not include funds provided for local training activities, such as seminars and workshops.

TABLE 8: GRANTS RECEIVED BY AgEnt CLIENTS

Client	Trade Fairs/Expos (\$)	Equipment/T.A (\$)	Other Assistance (\$)	Total (\$)
(1)	659	24,000		24,659
	(1)	(1)		(2)*
(2)	1,958			1,958
	(3)			(3)
(3)	1,687		247	1,934
	(1)		(1)	(2)
(4)	3,741	46,050	5,000	54,791
	(2)	(2)	(1)	(5)
(5)		45,659		45,659
		(1)		(1)
(6)	1,428	29,177	5,359	35,964
	(1)	(2)	(1)	(4)
(7)	1,484	22,664		24,148
	(2)	(1)		(3)
(8)	986	22,123		23,109
	(1)	(1)		(2)
(9)	825	9,928		10,753
	(1)	(1)		(2)
(10)**	1,455			1,455
	(2)			(2)
(11)**	825			825
	(1)			(1)
Total	15,048	199,601	10,606	225,255
	(15)	(9)	(3)	(27)

* Number of grants.

** Non-active clients.

Guidelines for Calculating Indicators of Behavioral Change

The economic impact of AgEnt on the poultry industry has been assessed primarily in terms of four quantitative variables which serve as proxies for behavioral change, namely sales, investment, employment, and income. For this purpose, we have followed the M&E guidelines formulated by the project, especially with regard to calculating upstream and downstream employment benefits as well as the overall employment impact on the economy, i.e., the multiplier effect.

Each client was assessed separately and the data were subsequently aggregated in order to arrive at the general picture. The evaluation sheets prepared by the project, which are periodically updated, served as the "template" for this analysis. The guidelines provided by the project for calculating each of the four "change" indicators are as follows:

Sales

Calculate cumulative sales figures for each AgEnt client from the baseline (start of AgEnt grant) until the end of 1995.

Investment

Calculate cumulative (non-USAID) investments from the baseline until the end of 1995. Perform this exercise separately for the AgEnt clients (factory level) and outgrowers supplying them with raw materials (farm level). Calculate investment in land by outgrowers on the basis of land value coefficients developed by the project for various commodities. Where applicable, calculate the demonstration effect, i.e., new investment in land by farmers who observe what is going on in the outgrowers fields and decide to produce as well. (This calculation is done on the basis of actual field observations or available published information on the subject).

Employment

Calculate the employment effects (upstream benefits) for AgEnt clients from the baseline until the end of 1995. As with investment, perform this exercise at both the factory level and the farm level. Show factory employment according to gender and according to

whether it is full-time or part-time. (Two part-time workers are assumed to be equivalent to one full-time worker.) Calculate on-farm employment effects on the basis of labor coefficients developed by the project for various commodities. Calculate demonstration effect labor on the basis of actual field observations or available published information.

Use a factor of 0.20 on factory and farm labor, including demonstration effect labor, as the coefficient for calculating downstream employment benefits, i.e., backward and forward linkages. To capture the overall employment impact on the economy (i.e., the multiplier effect), multiply the total labor figure by a factor of 3.¹⁴

Income

To estimate the total income generated by the project, multiply the labor equivalents by Rs. 24,000, the (annual) minimum wage. Given the relatively high levels of unemployment and underemployment in Sri Lanka, assume that the opportunity cost of labor is zero.

Quantitative Assessment of Project Impact

In defining and calculating indicators of behavioral change, we have followed the broad guidelines, as stated above. The question these guidelines do not address, however, is what proportion of the increase in sales, investment, employment and income to attribute to the project.¹⁵ This will obviously vary depending on the nature of the assistance. To simplify matters, we have assumed that this ratio is (a) 50 percent if the client has received one or more large investment grants; (b) 25 percent if the client has received one or more travel grants; and (c) 75 percent if the client has received at least one large investment grant and at least one travel grant.

Using these assumptions, we have calculated the incremental component with respect to each of the four change indicators - sales, investment, employment and income - from the baseline up to the end of 1995. The results are shown below in tabulated form.

¹⁴ According to a report by Econsult (1996), this is the value assigned by the Central Bank to the food and beverage sector.

¹⁵ For the sake of clarity, we shall call it the incremental component.

**TABLE 9: SALES IMPACT OF AgEnt
(Rs 000,000)**

Client	First Grant Date	Base	New Sales (Up to Dec '95)	Coefficient	Project Influen (Incremental Component)
(1)	Nov 1993	504.61	974.9	0.75	731.2
(2)	Nov 1993	9.1	21.3	0.25	5.3
(3)	Dec 1993	26.8	61.4	0.25	15.4
(4)	May 1993	65.9	324.9	0.75	243.7
(5)	June 1995	24.3	10.0	0.50	5.0
(6)	Dec 1993	31.7	110.4	0.75	82.8
(7)	Nov 1993	3.9	8.8	0.75	6.6
(8)	Dec 1993	0.3	8.2	0.75	6.2
(9)	June 1994	186.4	214.6	0.25	53.7
Total (Rs Mn)	-	853.0	1,734.5	-	1,149.9
Total (US\$ Mn)	-	16.09	32.7	-	21.7

**TABLE 10: INVESTMENT IMPACT OF AgEnt
(Rs 000,000)**

Client	Base Factory*	New Inv. Factory*	New Inv. Outgrow.**	Coefficient	Project Influence
(1)	124.0	306.4	1.8	0.75	231.2
(2)	0	19.9	0	0.25	5.0
(3)	4.1	11.7	0.575	0.25	3.1
(4)	6.3	36.1	11.4	0.75	35.6
(5)	10.6	18.63	0	0.5	9.3
(6)	8.5	40.62	2.2	0.75	32.1
(7)	0	0.647	0.675	0.75	1.0
(8)	0	67.2	0.625	0.75	50.9
(9)	9.3	18.7	0	0.25	4.7
Total (Rs Mn)	162.8	519.9	17.3	-	372.9
Total (US\$ Mn)	3.1	9.8	0.3	-	7.0

* Plant equipment, machinery, land, buildings, etc.

** Investment by new outgrowers in poultry sheds and equipment (approximately Rs 25,000 each on the basis of an average figure of 500 birds per outgrower).

TABLE 11: EMPLOYMENT IMPACT OF AgEnt - FACTORY LEVEL

Client	Base (M)	Base (F)	New Labor (M)	New Labor (F)	New Labor Total*	Coeff.	Project Impact
(1)	418	62	1	-6	-5	0.75	-3.75
(2)	140.5	162	-19	-16	-35	0.25	-8.75
(3)	44	30	19	31.5	50.5	0.25	12.63
(4)	77	1	115	38	153	0.75	114.75
(5)	80	29	7	4	11	0.5	5.50
(6)	42.5	6.5	22.5	25.5	48	0.75	36
(7)	6	4	4.5	0.5	5	0.75	3.75
(8)	5	0	6.5	3	9.5	0.75	7.13
(9)	100.5	14	46.5	19	65.5	0.25	16.38
Total	913.5	308.5	203	99.5	302.5	-	183.64

* Total Labor = Permanent Labor + Part-time Labor/2

TABLE 12: EMPLOYMENT IMPACT OF AgEnt - FARM LEVEL

Client	Base (M)	Base (F)	New Labor (M)	New Labor (F)	New Labor (Total)	Coeff.	Project Impact
(1)	284	47	64	8	72	0.75	54
(2)	0	0	0	0	0	0.25	0
(3)	87	30	12	11	23	0.25	5.75
(4)	47	106	148	307	455	0.75	341.25
(5)	0	0	0	0	0	0.5	0
(6)	80	0	87	0	87	0.75	65.25
(7)	0	0	20	7	27	0.75	20.25
(8)	5	0	25	0	25	0.75	18.75
(9)	0	0	0	0	0	0.25	0
Total	503	183	356	333	689	-	505.25

TABLE 13: EMPLOYMENT IMPACT OF AgEnt - ENTIRE ECONOMY

New Jobs (Factory + Farm)	Demonstration Effect (x 10%)	Backward and Forward Linkages (x 20%)	Total Beneficiaries	Multiplier Effect (x 3)
962 (689)*	96.2 (69)*	192.4 (138)*	1,250.6 (895)*	3,752 (2,686)*

* AgEnt's degree of influence.

Sales

As shown in Table 9, the project has had a significant impact on the growth and expansion of the poultry industry. The total volume of new sales generated by the nine active clients over the past two years (1994-95) was \$ 32.7 million, to which enterprises (1), (4) and (9) contributed 56.2 percent, 18.7 percent, and 12.4 percent, respectively. AgEnt's "degree of influence" in stimulating new sales is estimated at \$ 21.7 million. In other words, of the \$ 32.7 million, the project can take credit for around 66 percent. The data suggest that the project has had the largest impact on the enterprise (4), which increased its sales nearly fivefold after receiving project assistance.

Investment

There has been a significant growth of investment as a result of AgEnt's involvement in the poultry industry (Table 10). Around 97 percent of the new investment generated over the past two years was in the form of factory investment (plant equipment, machinery, land, buildings, etc.). Compared to factory investment, farm investment has been negligible because the capital outlay is only around \$ 500 per outgrower on the average. Accordingly, the nine active AgEnt clients generated \$ 9.8 million worth of investments in contrast to the contract growers, who generated only 0.3 million. The shares of enterprises (1), (8), (6) and (4) in factory investment were 58.9 percent, 12.9 percent, 7.8 percent, and 6.9 percent, respectively.

Due to its catalytic role in promoting new factory and farm investment via technology transfer, training and workshops, we estimate that its degree of influence in this instance is around \$ 7 million (i.e., 70 percent of the total of \$ 10.1 million). The project has clearly had a major impact on the enterprise (8), which has gone from zero investment to \$ 1.3 million in two years.

Employment

The growth of factory level and farm level employment is shown separately in Tables 11 and 12, respectively. The nine active clients created a total of 302 new jobs for factory workers during the reference period. Of these beneficiaries, 67 percent were male and 33 percent were female. Although the overall growth of factory-level employment was positive, it should be noted that in two firms (1 and 2), it was negative. On net balance, AgEnt can take credit for around 184 new jobs (i.e., 61 percent of the total). The largest impact has been on the enterprise (4), which has doubled its work force in two years.

In contrast to factory-level employment, which increased by 25 percent over two years, farm-level employment increased by 100 percent, i.e., from 686 to 1,375. Of the 689 new outgrowers, 52 percent were male and 48 percent were female, while previously the gender split was 73 percent male and 27 percent female. The project has therefore had a significant gender impact on farm-level employment. According to our assessment, the AgEnt's role in promoting employment has resulted in the creation of 505 new jobs at the farm level (i.e., around 73 percent of the total). The greatest influence has been on farm (4), who has aggressively expanded his business and created productive employment for 455 new outgrowers, of whom the majority (67 percent) are women. Compared to the baseline figure, this amounts to a tripling of farm-level employment over two years.

In estimating the employment impact of project assistance on the economy as a whole, we have used the methodology described earlier and arrived at the following figures: (a) 1,251 jobs (total upstream and downstream benefits) and (b) 3,752 jobs (multiplier effect). As shown in Table 13, AgEnt's degree of influence is around 72 percent in terms of the overall employment impact. Hence, we can conclude that as a result of AgEnt's involvement in the poultry industry, significant employment benefits have been realized.

Income

As discussed above, the employment equivalents are multiplied by Rs 24,000 to obtain an estimate of the income generated through the project. On this basis we can assume that the income generated through project assistance is around Rs 90 million (\$ 1.7 million).

Qualitative Assessment of Project Impact

AgEnt has been relatively successful in promoting growth and expansion of the poultry industry by transferring knowledge and technology to receptive clients. This transfer has been achieved mainly through two financial mechanisms, namely travel grants and investment grants. Of the 9 active clients, 8 have received travel grants and 6 have received investment grants, to date. As we have seen, this assistance has paid handsome dividends in terms of increased sales, investment, and employment.

Travel Grants

The travel grants have enabled AgEnt clients to attend international trade fairs and exhibitions and obtain first-hand knowledge of the latest developments in poultry breeding and processing technology. These visits have also enabled them to make important contacts in North America and Europe, many of whom are playing a useful role in helping these clients to improve their business vis-à-vis the transfer of knowledge and information.

In some cases, participation in international trade fairs has resulted in direct technology transfer, especially in the area of poultry breeding. Some of the clients began importing improved strains, such as Shaver and Arbor Acre, only after attending trade fairs and meeting representatives from these firms. Others have observed improved practices in the management of layers and broilers and adopted similar techniques after returning to Sri Lanka. Some of the clients knew little about biosecurity and became educated only after meeting experts in this field overseas. Exposure to improved processing technology has also encouraged some of the AgEnt clients to modernize their factories and adopt more efficient management practices.

Last, but not least, as a result of the exposure they have received at international trade fairs, the AgEnt clients have become highly motivated, competitive, and quality-

conscious. In other words, they have undergone significant behavioral change. As one client put it: "These trade fairs opened my eyes and made me see the world in a different light." This client is now a well-established breeder and processor in the poultry belt, whose business has undergone steady growth and expansion in recent years.

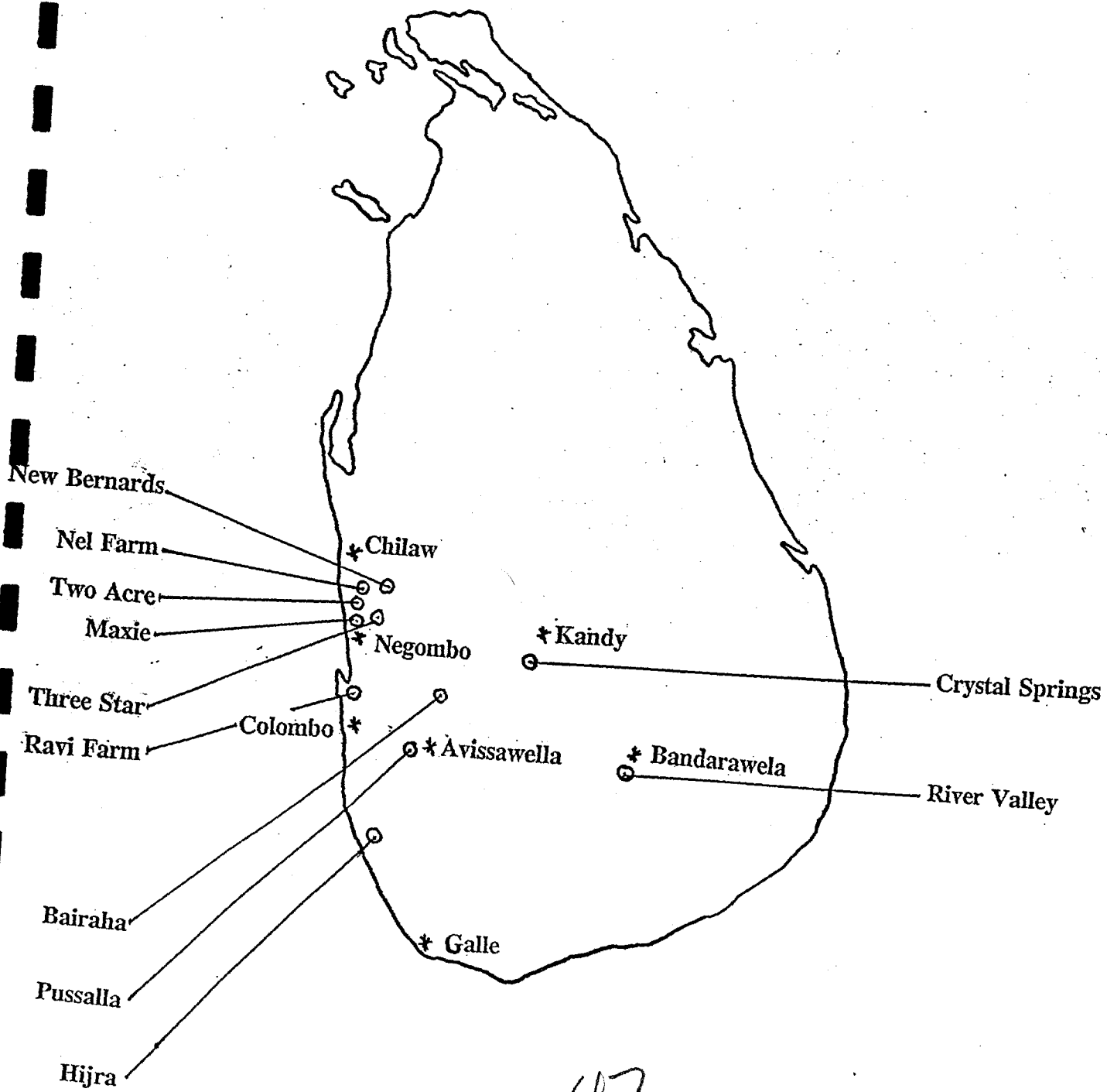
Investment Grants

The investment grants have served as a key instrument of technical change in the poultry industry. Many of the active clients have used this mechanism to obtain the following equipment with the assistance of AgEnt: (a) Chickmaster incubator system clients (5 and 8); (b) Brower semi-automated processing plant clients (4 and 6); (c) poultry shed evaporative cooling system client (1); (d) blast freezing plant client (4); (e) laboratory equipment client (9); and (f) waster water treatment and disposal system client (6).

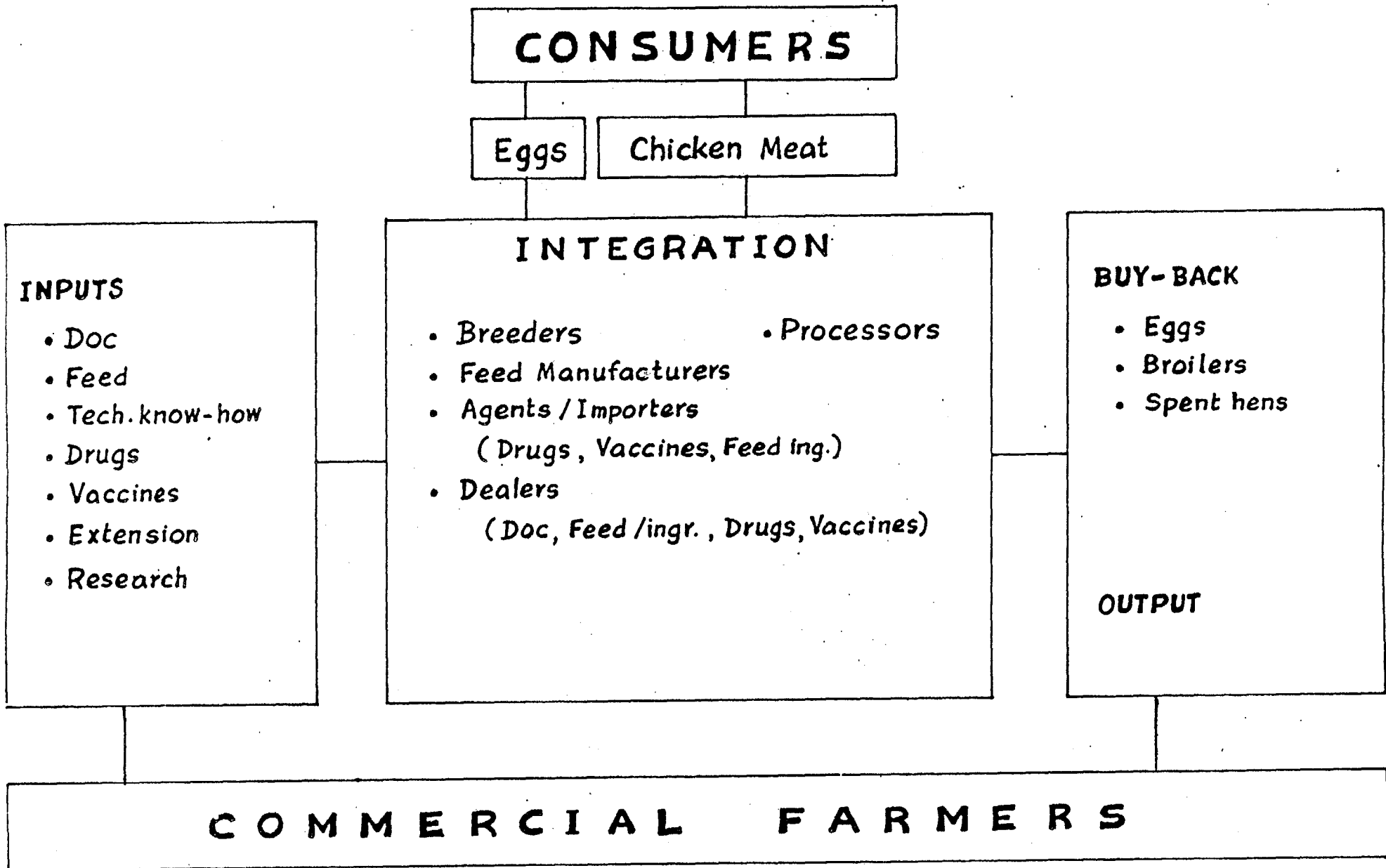
The investment grants have enabled several important enterprises, such as (4), (6), (8) and (5), to undergo rapid modernization and realize economies of scale. These grants have also served as catalysts in the sense that they have caused a chain reaction in terms of technical change. The enterprise (8), for example, wants to modernize every aspect of its business and is constantly adopting improved management practices. The initial innovation (purchase of an incubator system) has therefore led to many others, including increased biosecurity and a new poultry shed design for providing improved ventilation. Client (5) is also seeking to modernize every aspect of its hatchery. Through their catalytic role, the investment grants have enabled AgEnt clients to achieve significantly higher levels of productivity and efficiency.

Another important aspect of technical change is its demonstration effect. Poultry breeders and processors have become highly competitive over the past ten years, hence, new innovations are likely to spread rapidly through the industry. Although AgEnt has successfully promoted behavioral change among its clients, it is too early yet to assess its demonstration effect since this is a relatively recent occurrence. One problem in this regard is that plant and equipment are expensive, hence, AgEnt should continue playing its catalytic role in the poultry industry in order to enable more and more entrepreneurs to gain access to improved technology.

ANNEX A : SPATIAL DISTRIBUTION OF AgEnt CLIENTS



ANNEX B: THE STRUCTURE OF THE POULTRY INDUSTRY



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