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**THE ECONOMICS OF THE BROILER INDUSTRY
IN PENINSULAR MALAYSIA**

BY

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The Economics of the Broiler Industry in Peninsular Malaysia

under my supervision. The relevant comments made on the paper during its presentation have been incorporated in the present version of the paper to my full satisfaction.

I have pleasure in recommending that the graduate committee may approve the paper in partial fulfilment of the requirements for the degree of Master of Economics.

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ABSTRACT

This study attempts to give an overview of the broiler industry in Peninsular Malaysia. The economics of the operation, cost of production and various aspects of the industry is discussed. Specifically, this study focusses on the role of FAMA regarding its marketing priorities and strategies. As the primary authority entrusted with the marketing of broiler, the appropriate approach in marketing operational plan is examined.

Over the years, the industry has shown tremendous growth. Broiler now accounts more than 50% of total meat consumed. It is the cheapest meat available. However, there are some defects. Malaysia is a high-cost producer (RM3.20 compared to RM1.87 per kg. dressed in Thailand). Glut in one hand but a high-cost producer in another, seems to be contradictory. The industry is dominated by few large producers. The smallholder sector contribute little to the overall industry. Prices fluctuate violently, cost of marketing unnecessarily high while the export opportunities are limited.

The study finds that a regulatory scheme for poultry is necessary. There is a need for the government to intervene in order to ensure orderly growth, bring about price stability and prevent market manipulations for exploitive gains. It is recommended that the industry to be restructured by upgrading the smallholders. Efforts should be pursued to coordinate demand and supply, whereas production areas to be more evenly distributed and most important, the cost of production must be reduced. FAMA needs to review some of its marketing strategies.

INTRODUCTION

1

The poultry industry in Peninsular Malaysia has developed at a tremendous pace. The growth of the broiler industry in particular, has been rapid. The industry began in the early fifties with essentially a backyard operation among the rural communities. Poultry meat production increased from 78,000 metric tonnes (MT) in 1974 to 107,800 MT in 1979. The per capita consumption in 1974 was 7.9 kilograms (kg.), increased to 9.7 kg. in 1979 and 10 kg. in 1981. This rapid progress was partly due to the technological, genetical and structural changes in the industry (Leong, 1982). In 1988, production was 250,000 liveweight. The most recent data available was from January 1992 to December 1992 released by Federal Agricultural Marketing Authority (FAMA). There were 17,570 poultry farmers rearing a total of 141,196,770 birds amounting to 267,398.11 MT liveweight. Other factors include the successful replacement of local stock with genetically superior breeds complimented by technology transfer. This is possible with the government's liberal policy in the importation of breeding stocks. The establishment of feedmilling industry and the availability of credit facilities has also contributed further in the development of the industry. The general marketing pattern for broilers is summarised as in Appendix A.

1. Throughout this study, the word 'poultry' is used to denote the overall industry including layers, whereas the word 'broiler' refers specifically to those for the production of meat, even though the 'retired' (old) layers are also slaughtered for meat.

2. FAMA estimates from the 'Potensi Pasaran Barangan Terpilih'.

Statement of the Problem

The future of the poultry industry largely depends on its ability to improve production efficiency thereby lowering the production costs and to seek new markets. The production of poultry in Malaysia is characterised by the high cost of production. In spite of being the main source of meat for the country, the cost of production in Peninsular Malaysia for broilers is relatively high, as compared to Thailand¹. The cost of production in Malaysia per kg. live may range from RM2.50 to RM3.00². Even though the price of broiler is competitive to the prices of other meat domestically (beef at RM10.00/kg. and pork at 7.00/kg.), the high cost of production reduces its ability to export into the world market. What are the factors contributing to the relatively higher cost of production? Is it feed, marketing practices or some other latent factors?

Another problem is the marked seasonal demand. Demand is highly seasonal leading to high variations in prices. This is because in Malaysia, there are festive seasons where the consumption greatly increase. Appendix B (wholesale) and Appendix C (retail) show that prices normally fluctuate in two distinct cycles:

- i) prices tend to rise near the end of the year (October, November) due to festive occasions for example, Deepavali

1. This is because, most-agro-based industries in Thailand are more efficient due to relatively cheaper labour and basic inputs like feed ingredients that are locally produced in Thailand.

2. FAMA estimates as in 'Background to the Broiler Industry in Peninsular Malaysia', page 1.

and Christmas.

- ii) prices tend to fall around March - April and July - August when there are no festivals.

Prices would slowly rise again coinciding with Hari Raya ¹ 'Wasa' and Adha and the Chinese rituals in September. Prices will later fall till November and rise again in late December and early January until Chinese New Year (January to February). Then prices will fall again. Figure 1 shows the typical price fluctuations in a year for 1991 and 1992 in Kuala Lumpur.

However, these cycles were rather 'smoothed out' when taking the averages of each month of the year, say for 11-years period, as shown in Appendix D. The average prices were at retail level for pullets from two selected centres, i.e., Kuala Lumpur and Johor Bahru.

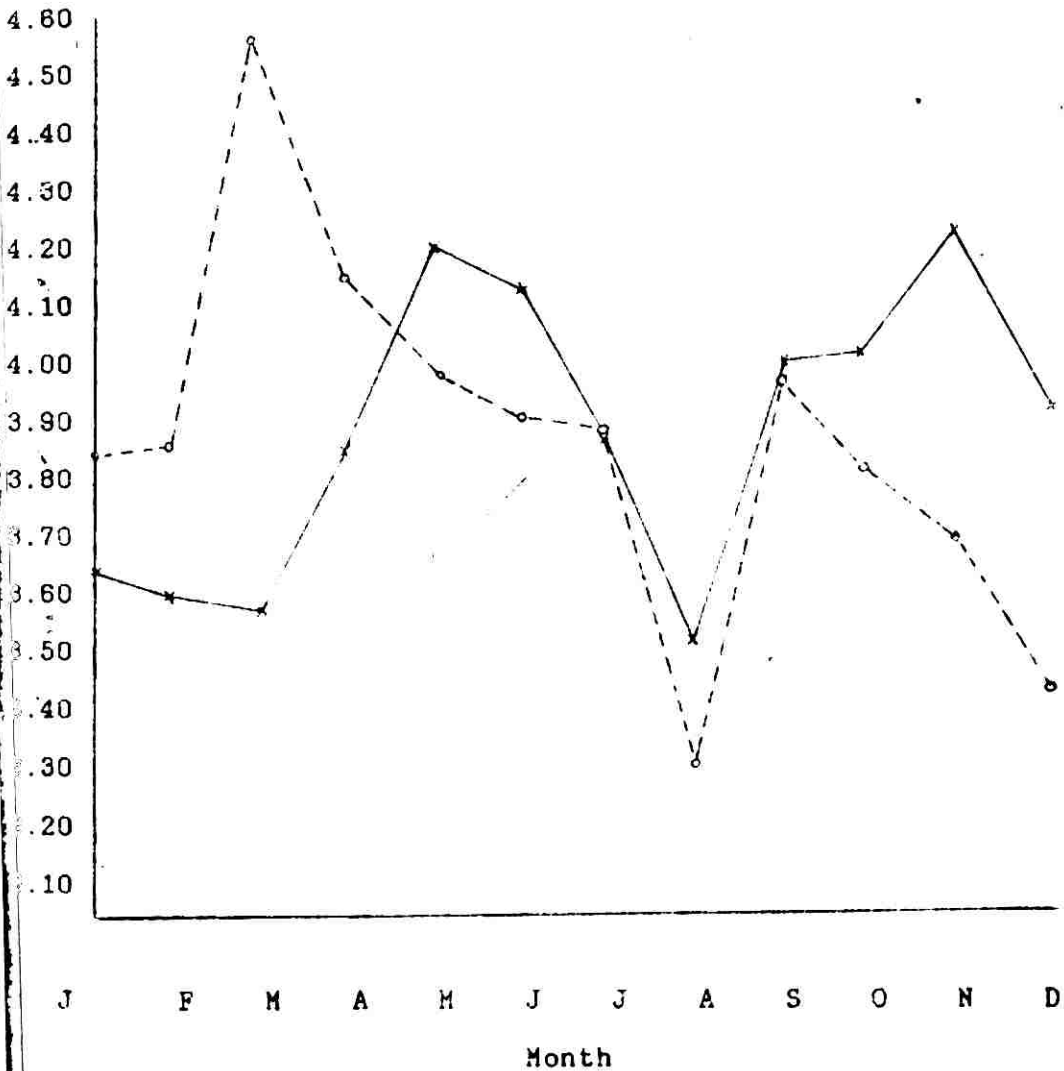
Seeing as it is, price fluctuations due to seasons are not such a problem. Large-scale producers are well aware of these seasonal demands and often have planned their production accordingly. However, there are occasions when such programmes do not work out resulting in unexpected gluts or shortages. Are there any marketing strategies that can 'formalise' long term production with long term supply?

It is also known that the industry is dominated by a limited number of large-scale commercial producers and wholesalers whereas the smallholders have little or no impact on the overall

Since the Muslim Hari Rayas follow the Lunar Calendar, these occasions may occur in different times of the year, progressive-

Figure 1
 AVERAGE MONTHLY RETAIL PRICES OF BROILER
 IN KUALA LUMPUR, 1991 AND 1992

RM/KG.



X ——— X 1991

o - - - - o 1992

Source: Derived from data in Appendix C

industry. The few but large producers are 'powerful' through their association - The Federation of Livestock Farmers Association. What steps that can be adopted so that the power in manipulating the prices do not lie in too few hands? What programmes that can be feasibly implemented by the Federal Agricultural Marketing Authority (FAMA) as the authority in agricultural marketing? Briefly, it is the programme to improve the overall marketing system.

There is also occasional problems of glut either due to over-production or smuggling. In case of smuggling which is the peculiar feature of the industry in the northern state of Kelantan, poultry is being smuggled from Thailand via illegal entry points at Rantau Panjang, Tanah Merah and Tumpat. This is the direct result of lower production cost in Thailand. Smuggled chicken were sold at RM2.45/kg. dressed in Kota Bharu in 1991. The poultry farmers in Kelantan claimed that RM28 million were lost in just two years¹ As for the glut, there was a nationwide fear of its occurrence² In such occasion, some farmers resorted to destroy their day-old chicks to prevent further price drop.³ There was even such drastic measure as burning live chicks as

1. See THE STAR dated January 7th, 1986, page 3.

2. See 'Self-interest - Root of Glut', page 22 in MALAYSIAN BUSINESS, September 1st, 1986 issue.

3. Destroying chicks by burning is an offence. The Department of Veterinary Services (DVS) in 1989 charged several offended farmers in court for mass killing of day-old chicks.

it happened in Kluang in 1987¹ What then, is the conceptual framework which defines the thrust and the operational policy that FAMA would take as the primary marketing agency for the broilers? Glut in one hand but a high production cost in another, seems to be contradictory.

All the above problems need to be viewed seriously. There is therefore a need for the public sector to be involved in the broiler industry to remedy the various defects mentioned as well as to steer the industry in a proper direction for the benefits of both consumers and producers. This is where the role of FAMA need to be synchronised.

Literature Review

The industry in 1970s was very different. FAMA conducted a survey in 1975² and found that in Muar, the cost of production ranged from \$1.15 to \$1.25 per kati.³ In Kuala Selangor, it was 1.29 per kati whereas in Seremban, \$1.40 to \$1.50 per kati, in the same year. The study revealed that firstly, the cost of production depends on the management of the farm in reducing feed consumed while minimising mortality rate. Secondly, that the selection of good quality day-old chicks is a factor in ensuring better production efficiency. A wide range of production from

See THE STAR dated November 8th, 1986 page 5, titled 'Chicken not Expected Nationwide'.

'A Report on the Marketing of Poultry Eggs and Poultry Meat in Peninsular Malaysia', July 1976, pages 15 - 18.

Conversion to kg. is necessary (1 kati = 600 gms. = 0.6 kg.) while noting the actual dollar value in 1975 as compared to present. In the 1970's, measurements were not yet in metric.

\$1.10 to \$1.50 per kati of bird meat at that time indicated that it is possible for the high-cost producers to improve their production efficiency. With ex-farm price of broiler meat at \$1.50 to \$1.60 per kati, the more efficient farms would be able to cover production cost and obtain a reasonable return to their investments. Regarding marketing margins, the survey indicated that apart from Bukit Mertajam (in Pulau Pinang) and Pekan Nanas (in Johor) which have their market outlets at distant places, the marketing channel involved was relatively simple, such as from the farmers to the wholesalers, to the retailers and finally to the consumers (as depicted in Appendix A).

Che Wan (1978) who studied the smallholders' costs of production per bird per cycle in the Klang-Kapar area (1,000 birds per stock) found that the cost of producing one chicken was \$3.39 or \$1.21 per kati making a profit of \$0.81 per bird or \$0.29 per kati in 70 to 75 days. She also found that the profit was \$748 and the return on investment was 22% per cycle. Surprisingly however, she found that the stock size has no relationship to production level or to profitability. In other words, to a certain extent, the level of production do not determine the profitability and the cost of production. The economies of scale is not felt with small variations of the number of stock reared. Che Wan claimed that much depends on the management abilities of the individual farmers. Regarding the returns per dollar in weight in relation to per dollar cost on feed, Che Wan found that the average weight increases steadily for the first 4 weeks. After the fifth week, the marginal increment in weight tends to be more or less constant

decreases after the tenth week onwards.

According to Tang (1989), the marketing margins do not show anything about the producer's income. He claims that this area causes a lot of emotion, especially in terms of consumer dollar to the farmer. His study shows that the farm prices expressed as percentages of retail prices in three centres do differ quite considerably (see Table 1).

FARMERS' SHARE OF RETAIL PRICES OF CROSS-BRED PULLETS,
1980 - 1988

Year	Kuala Lumpur		Johor Bahru		Pulau Pinang		Simple average of 3 places.
	Farm price	Farm price as % retail	Farm price	Farm price as % retail	Farm price	Farm price as % retail	
1980	2.86	79.44	2.66	74.09	2.49	75.22	76.25
1981	2.76	70.95	2.78	71.09	2.71	76.33	72.79
1982	3.39	78.11	2.84	67.45	2.60	70.08	71.88
1983	2.67	69.90	2.27	57.47	2.27	65.42	64.26
1984	2.44	66.49	2.41	60.45	2.34	70.91	65.88
1985	2.28	67.66	2.61	58.50	1.91	59.69	61.95
1986	2.30	69.70	2.19	60.33	2.12	70.00	66.68
1987	2.32	71.61	2.11	65.30	2.20	62.68	66.54
1988	2.41	73.00	2.03	59.40	2.22	68.10	66.80

Source: Tang, L.B., 'Marketing of Broilers in Peninsular Malaysia', page 8.

From the above table, there is indication that either the marketing costs were increasing or that the marketing system was getting more sophisticated. There was a discernable reduction in the percentage of retail price accounted for by the farm price especially for Johor Bahru. Marketing margin is basically a product of volume and the difference between cost and price obtained.

Tang also found that as the marketing system gets more sophisticated with more handling and other activities added in

the movement of the product from the farm to the final consumer, the lower will be the percentage of farm price to the retail price. The impact upon prices due to the changes in farm prices will get correspondingly less. It was found that the major portion of marketing cost, as determined by the percentage of the retail price was the cost of transport (7.1%), profit of the retailer (7.9%) and the cost of retailing involves feeding the chicken before sale, utilities, rental and labour in retailing. It is admitted that the above results need not necessarily reflect the actual situation for the whole country. However, it is an indication that the major area of marketing costs are the retailing and the profit margin of the retailers.

Objectives of the Study

- v. Given the above scenario, this study intends to:
 - .. give an overview of the industry in Peninsular Malaysia
 - i. estimate the cost of production per kg. of dressed broiler meat.
 - ii. provide manual of reference for new entrepreneurs wishing to take up broiler production.
- v. to ascertain the role of FAMA regarding its marketing priorities and strategies.

Justification of the Study

This study is proposed based on the following considerations:

Out of the 3 main sources of meat protein, i.e., beef, pork and poultry, poultry is the cheapest. Thus it is important

to know the factors which contribute to the peculiar features of the industry.

- ii. There is a need to compromise between the importance of production efficiency in order to provide reasonably cheap source of animal protein to consumers, compared to the need for restructuring the industry as viewed from the relevant authorities.
- iii. The export market potentials need to be tapped, e.g., through proper contract farming and healthy marketing practices.

Scope and Limitation

- i. This study covers Peninsular Malaysia only (excluding Sabah and Sarawak)
- ii. Only broiler sector is considered (layers, 'kampong' chicken, quails, ducks, etc., are not covered)
- iii. This study is not intended to evaluate the effectiveness of the marketing programmes already implemented by FAMA.
- iv. It is not intended to seek ways and means to reduce the monopolistic status of the large-scale producers.
- v. The main thrust of this study is to provide a fair outlook into the industry and how the relevant authorities can play their respective roles effectively.
- vi. Due to time, budget constraint and semesterial workload, more emphasis will be given on the utilisation of secondary data or information. Thus this study is more descriptive in nature.

PART I

GENERAL OVERVIEW OF THE BROILER INDUSTRY

Poultry meat is the main source of meat in the country. Poultry meat, eggs and pork contributed about 80% of the total livestock production output. Poultry egg and meat provide the cheapest source of animal protein. It has the highest and quickest turnover rate, among the livestock. It is also consumed by all the ethnic groups in Malaysia. Due to the increasing population, demand for broiler is projected to increase by more than 100% by the year 2000, i.e., an increase from 217,209 MT in 1986 to an estimated 415,262 MT in year 2000. Similarly, the consumption per capita was 10 kg. in 1981 is estimated to be 23.7 kg. in year 2000 (Anon., 1986). There are about 4,930 breeding farms and hatcheries in Peninsular Malaysia (Appendix E). They are mainly found in Pulau Pinang, Melaka, Perak, Johor, Selangor and Negeri Sembilan. The imported broiler parent stock chicks were 1.38 million in 1985 and the output of breeding farms was 130 million broiler chicks in that year (Sh, 1986). A survey by FAMA conducted in 1982 showed that poultry meat accounted for 49.8% of all meat consumed in Malaysia.

The broiler industry is undergoing another stage of development. This is known as vertical integration. The fast food chains, (e.g., the Kentucky Fried Chicken) and feed manufacturers have integrated downstream towards production by

1. 'Survey on Consumption of Selected Commodities'. This survey was carried out throughout Malaysia by the Malaysian Survey Research Sdn. Bhd. on behalf of FAMA.

operating their own farms. Similarly, upstream integration is being practised towards developing consumption side by operating their own processing plants, wholesaling or retail outlets. These outlets not only offer all cuts of broiler but also products like chicken sausages, rolls, balls and burgers.

The Malaysian broiler industry continues to progress despite stiff competition from neighbouring countries. This is the direct result of technological improvement which leads to an increase in quality and quantity of output. The value of poultry production was more than RM1,500 million per year. In 1988, Malaysia exported 52 million live broilers, 8.2 million live ducks, 17.2 million chicks, 383.3 million eggs and 1,786 million MT frozen chicken. The total export valued at RM223.19 million.¹

Before 1988, Malaysia did not have any grand parent stock farm. Thus breeder chicks were imported either from USA, Canada, Europe or Thailand. In 1984 for example, Malaysia imported 14.9 million day-old chicks. But in 1988, the import figure reduced to only 4 million. Export of day-old chicks however, increased from 3.39 million in 1984 to 17.2 million in 1989.

At present, there are about 65 commercial hatchery farms specialising in the production of broiler chicks.² The common breeds are Arbor Acres, Lohmann, Indian River, Tegal, Anak, Hubbard and Avian.³ Other breeds are Hybro, Peterson, Orgal,

1. As reported by BERITA HARIAN dated August 7th, 1990 page 4.

2. According to the Federation of Livestock Farmers Association.

3. According to a survey on 29 farms by MARDI in Report No. 117 titled 'Management Practices of Poultry Breeding Farms and Hatcheries in Peninsular Malaysia - a Survey', 1987.

Local, Cobb, Shaver, Tatum, Hypeco and Kabir. Example is the Syarikat Avian Farm (M) Sdn. Bhd. which is involved, specifically, in the production of the Avian breed. Initially, in 1987, it imported its grand parent stock for inbreeding, but now is able to produce 1 million chicks of that breed as parent stock in a year. In terms of foreign exchange, about RM14 million was saved when parent stock were supplied locally (import-substitution). Another example is the poultry producer Leong Hup Holdings Bhd. who has projected a RM11.3 million pre-tax profit and RM70 million turnover for the year ending March 31st, 1991. Broiler is a big business as demonstrated by this company alone who made a profit of RM49.6 million in 1986.¹ At present, this company has 14 breeder farms, 12 broiler farms and 4 hatcheries.

In terms of processing, more facilities are made available² such as the multi-national Dindings Poultry Processing Sdn. Bhd. at Sitiawan, Perak, which is of international capacity for export to Japan. Various subsidiaries such as Dindings Soya and Multifeeds, Dindings Grandparent Stock Farms, Dindings Broiler Breeder Farms and Dindings Poultry Development Centre are only some of the examples of the recent development in the broiler industry.

Regarding prices, for the last 7 years, prices have remained

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1. As reported in the NEW STRAITS TIMES, August 23rd, 1990.
 2. It is a joint-venture project between the Malayan Flour Mills Bhd., the Perak State Agricultural Development Corporation and Japanese Firms Mitsui & Co. Ltd., and Daiichi Broiler Incorporated.

rather unstable. Even in some cases, prices have decreased. For example, the average retail prices of live birds in Kuala Lumpur in the year 1980, 1982, 1984, 1985 and 1988 were RM3.60, RM4.34, RM3.67, RM3.66 and RM3.30 per kg. respectively. These prices are relatively cheap and resulted in broiler contributing 67.7% of all meat consumed in 1988 compared to about 54% in 1980. Generally, the price of pullets is higher than cockerel. The price for pullets in 1992 on the whole indicated a decreasing trend at both the retail and wholesale levels, compared to the previous year. The marked decrease in prices was due to increase in supply from additional number of producers and expansion of commercial farms. At the wholesale level, the highest price in Kuala Lumpur was recorded at RM406.92/100 kg., i.e., in March 1992.

The following table shows the importance of broiler compared to the other meat:

Table 11
CONSUMPTION OF BROILER AND OTHER MEAT, 1988

Type	Quantity (MT) dressed equi- valent	% meat consumed	Per capita consumption*
Beef	42,293.8	15.2	3.04
Mutton	6,523.6	2.3	0.47
Pork	14,332.6	14.8	2.97
Broiler	188,895.1**	67.7	13.5

* Population for Peninsular Malaysia in 1988 = 13,927,200
Market for broilers:

** Assuming 1.2 kg. per dressed bird, market = 188,895.1 MT
divided by 1.2 kg., giving 157,412,580 birds.

Source: FAMA Consumption Survey (1989) & Population Census,
Department of Statistics.

1. Quoted from 'Jabatan Pengesanan Bekalan' FAMA Ibupejabat.

In 1989, broiler output was valued at RM2.641 billion and in 1990 at RM2.9 billion. The industry is projected to grow to RM4.6 billion by 1995 and subsequently to RM7.5 billion in the year 2000. Taking the population growth of Peninsular Malaysia at about 3% per year, the projected human population is expected to be 19.04 million with per capita consumption of 23.7 kg. with total poultry production of 510,000 MT. In terms of dressed carcass weight, by the year 2000, the amount would be 415,000 MT from 296 million birds.

The following figures are rounded and projection is derived from the estimates made by the Ministry of Agriculture, as depicted in the following table:

Table III
POULTRY MEAT PRODUCTION IN PENINSULAR MALAYSIA
1981 - 2000

Year	Human population (mil.)	Per capita consumption (kg.)	Total poultry meat production ('000 MT)	Broiler	
				Dressed carcass weight ('000 MT)	No. of birds (mil.)
1981	12.15	10.6	130	85	63
1982	12.43	11.6	140	95	70
1983	12.73	12.3	160	120	90
1984	13.03	13.6	180	128	95
1985	13.31	15.9	220	185	122
1986	13.66	16.6	242	289	140
1987	13.98	17.0	265	285	155
1990	15.02	19.0	320	250	185
1995*	16.91	21.2	400	320	230
2000*	19.04	23.7	510	415	296

Source: Ministry of Agriculture. [* forecasted]

The growth of the industry has been estimated at 8% to 10% per year over the past few years. Production of day-old chicks

by integrated companies in 1989 contributed about 50% of the total chick production, compared to 30% in 1988. Parent stock farms and hatcheries in 1989 and 1990 were as in Appendix F. In 1990, the number of breeding farms reduced by 10, whereas the contract breeder growers decreased by 3, compared to the year 1989. However, the reduction was due to more breeder farms being transformed into integrator breeding farms, even though there was only one breeder who achieved the 40 million to 80 million chick output per annum. Production of day-old chicks by integrators¹ and non-integrators according to farm size in the year 1990 to 1991 were shown in Appendix G. It is clear that the percentage of broiler chicks contributed by the non-integrators accounted for 54.9% in 1990 but decreased to 48.6% in 1991. As for the integrators, the production in 1991 was more than in 1990 by 6.3%.

There is a need for the integration system to work equitably. After 1986, the industry merely expanded locally. This was partly due to the failure to gain additional or new export markets. Thus the industry just cater for the regular increase in domestic demand. This led to 'saturation' and then the industry turned complacent. The market vagaries, frequent slumps in farm-gate prices, had disheartened many broiler farmers. It has been commented that the broiler industry lacks organised structure and the working premises to set the strategy and define the direction for further development. The industry

1. Those who act as consignors of the contract farming, usually the large or leading producers.

s said to lack coordination and synchronisation. Even the government and her agencies have been blamed for putting too much restrictions in the industry.¹ This may, admittedly, proved counter-productive at times.

PART II

ECONOMICS OF BROILER PRODUCTION

Since the reduction of costs in the processing and marketing areas would offer little scope for further improvement, the only reduction area would be from the cost of production. The normal cost of production is comprised as follows:

Cost of feed (approximately)	70%
Other costs (labour, rent, depreciation, chick, equipments, etc.)	30%

Structure of Production Costs

The typical breakdown of the costs according to the Federation of Livestock Farmers Association are:

Feed	73%
Day-old chick	15%
Housing and equipment depreciation	4%
Health care	4%
Labour	3%
Miscellaneous	1%

Factors influencing costs are feed and optimum slaughtering

One of the 'heated' points raised by the Assistant Director-general of DVS in a Regional Seminar on the Future Development in the Poultry Industry, held in Kuala Lumpur from August 30th to September 2nd, 1985.

age, feed conversion ratio (FCR), chick costs and mortality, livestock depreciation and labour.

1) Feed and Optimum Slaughtering Age

This is the value of the product resulting from the body growth. The main economic concern is the relationship between total feed input and meat output. Broiler efficiency as feed converter is progressively declining with age. In other words, as the bird grows older, the conversion efficiency declines at an increasing rate. Thus increasing the cost per unit output. At given prices for feed and broiler meat, the value of each additional kg. of meat will leave a smaller margin over the marginal cost of production. The optimum age to market the bird is when the total cost of additional feed is equal to the additional value added of the liveweight. Considering an hypothetical example: Table IV

FEED AND OPTIMUM SLAUGHTERING WEIGHT

Feed eaten (kg.)	Average live-weight (kg.)	Added feed eaten (kg.)	Added live-weight (kg.)	Cost of added feed @ \$0.42/kg	Value of added live-wt. @ \$2.65/kg
0.12	0.1370				
0.52	0.3100	0.40	0.1730	0.168	0.458
0.92	0.5120	0.40	0.2020	0.168	0.535
1.32	0.8130	0.40	0.3010	0.168	0.798
1.72	1.1100	0.40	0.2970	0.168	0.787
2.12	1.3520	0.40	0.2420	0.168	0.641
2.52	1.5500	0.40	0.1980	0.168	0.525
2.92	1.7310	0.40	0.1810	0.168	0.480
3.32	1.8800	0.40	0.1490	0.168	0.395
3.72	1.9900	0.40	0.1100	0.168	0.292
4.12	2.0535	0.40	0.0835	0.168	0.188
4.52	2.1100	0.40	0.0565	0.168	0.150
4.92	2.1350	0.40	0.0250	0.168	0.066

Source: MARDI Livestock Research Division

From the above data, the optimum selling weights depend on the broiler/feed price ratio. The higher the ratio, the heavier the selling weight is where the added feed per kg. liveweight gain is equal to the broiler/feed price ratio.

$$\frac{\text{Added feed eaten}}{\text{Added liveweight gain}} = \frac{\text{price per unit liveweight}}{\text{price per unit feed}}$$

Thus the optimum selling weight is 2.05 kg. From experience, the farmer can roughly determine at what age the birds are ready to be sold. The best marketing weight often depends on other factors too. Example is the contractual arrangements or number of flocks per cycle. The input/output data provide indication for increasing or decreasing profits.

(i) Feed Conversion Ratio (FCR)

Closely related to the above, is the ability to convert feed into meat. This depends on quality of feed, genetic ability of the bird and management practices. Significant reduction in costs is possible through improved FCR since feed is the major cost item.

(ii) Cost of Chicks and Mortality

It is important to ensure that the price of chicks bears some resemblance of their quality. This is obvious since the outlay of chicks amounts to 15% of the total broiler production cost. Better FCR comes from better bred chicks, besides reduced mortality and rapid growth rate. Mortality is another important determinant. The death rate of 4% or 5% is acceptably normal. However, higher rate than this will effect the financial status considerably. The higher the mortality, the higher will be the