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Economic and marketing evaluation of the designer egg industry in Malaysia

(Penilaian ekonomi dan pasaran ke atas industri telur designer di Malaysia)

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Keywords: designer eggs, market structure, market concentration, market share

Abstract

The main purpose of this study is to review the current status and market potential of a designer egg industry and to analyse industry and market structures for designer eggs in Malaysia. A multistage purposive sampling method was applied to select approximately 70% (N = 42) of designer and specialty poultry egg producers in Malaysia. Gini coefficient analysis was applied to identify the industry and market structures for designer eggs. The coefficient was high at 0.764, implying market shares and revenues among designer egg producers were significantly inequitably distributed. This result was consistent with the calculation of Herfindahl-Hirshman Index (HHI) at 0.386, classified as oligopolistic market structure which tends to increase the concentration of wealth and income of the producers, resulting in high barriers to enter the market and industry. Theoretically, this structure reflected inefficient marketing mechanisms in the industry and oligopolistic nature of the market which revealed that the production was monopolized by large scale operators. Determining this structural market in the industry provided a basis for policy measures towards creating a fairer market competition through minimizing collusion and facilitating easier entry. This would ensure the development of a more efficient and competitive designer egg industry in the long run.

Introduction

Agricultural practices have been revolutionized in recent years for pertaining to several significant forces comprising agricultural sustainability, food security and safety, climate variability, agricultural eco-system and conservation, consumers' lifestyle, health concerns, diseases resistance and many other factors which have pushed researchers, scientists and innovators to generate new and value-added technologies. In the United States and Europe, the emphasis of research and practice has shifted from combating nutrient deficiencies to addressing nutrient needs for good health throughout the life style in this century (Anderson 1992).

One of the important commercialized technologies contributing to value-added agricultural products is designer eggs. Designer or specialty eggs, which refer to nutrient content of eggs, have been modified and genetically engineered from generic eggs through chickens' diet. The most substantial contents of these eggs include enriched selenium and omega-3

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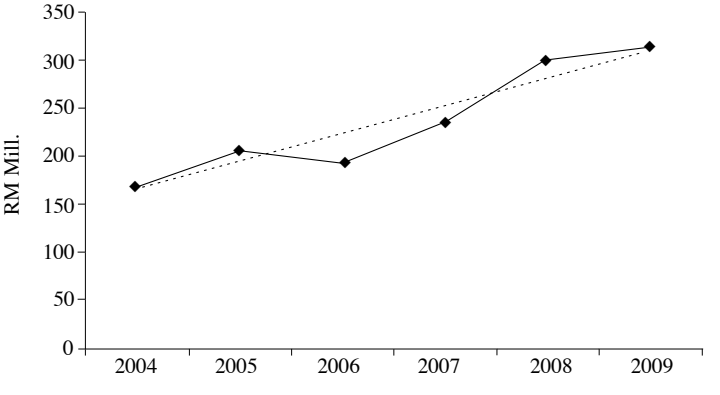
fatty acids (polyunsaturated fatty acids – PUFAs), which could enhance the human brain functions as well as normal growth (Department of Agriculture, University of Florida). The fatty acids have been proven to prevent several diseases such as heart disease, diabetes, rheumatoid arthritis, osteoporosis, depression, bipolar disorder and many others (University of Maryland Medical Centre).

In the United States, 90% of consumers preferred natural nutritious foods to dietary supplements (FMI/Prevention 1999, Healthfocus 1999). Hasler (2000) identified eggs as nature's original functional foods packed with a number of valuable and beneficial nutrients including vitamins, minerals and protein. Thus, designer and specialty eggs have been developed in order to meet the growing demand of health conscious consumers and these eggs have been proven to contain much higher nutrients than generic eggs. For example, the docosahexaenoic acid (DHA) and Omega-3 of generic eggs is 18 and 33 mg respectively compared to 100 – 150 mg in designer eggs. Subsequently, designer eggs are becoming increasingly popular in the US market among health conscious consumers and these eggs now comprise nearly 5% of the USD3 billion egg markets (Associated Press of Los Angeles).

In Malaysia, the production of designer eggs is increasing to satisfy the demands of health conscious consumers, particularly for lowered/reduced cholesterol and enriched Omega-3 egg products (Federation of Livestock Farmers' Associations of Malaysia). Previous research revealed that most Malaysians were highly conscious on consuming food products due to their chemical contents and they believed that organic products and low chemical content could improve their health (Siti Nor Bayaah and Nurita 2010). In addition, the export values of eggs showed increasing trends from RM166 million in 2004 to RM311 million in 2009 (*Figure 1*) indicating that Malaysia's egg products are one of the potential agricultural export products in the international markets and the production of designer and specialty egg products are dominated by two major companies including LTKM Bhd. (LTK) and Lay Hong Bhd. (Nutriplus). Since the value added agricultural food products provide significant advantages and benefits for producers, consumers and the environment, subsequently, this value-added technology is pertinent to be adopted and utilized by producers.

This study is crucial to assess the producers' participation and perceptions towards this relatively new technology for ensuring sustainable production of these high value products due to increasing demand by domestic and global markets. Rogers (1983) found that knowledge and



Source: Global Trade Information Service (2004 – 2009)

Figure 1. Malaysia's export to the world (HS: 0407), Bird's eggs in shell (2004 – 2009)

awareness of new technologies as the initial phase in making decisions either to adopt or reject the technology.

Thus, the objectives of this study are:

(i) to review and analyze the current status, performance and market potential of the designer egg industry in determining industry and market structures for designer eggs,
(ii) to assess the participation and adoption of designer egg technologies among producers in Malaysia, and
(iii) to determine the farmers' awareness and perceptions on value-added agricultural technologies involving biological processes to produce organic fresh egg products.

Methodology

Both primary and secondary data were utilized in this study. The major components of data which included business participation, technology practices and economic impacts were obtained from Malaysian farmers, involving large to micro scales in designer and specialty egg industry. A multistage purposive sampling method was applied to select approximately 70% (N = 42) of designer and specialty poultry egg producers in Malaysia (excluding Sabah and Sarawak). The primary data was collected from these samples using structured questionnaires through in-depth interviews and was analyzed using several statistical tools, comprising cross-tabulation, bivariate correlation, Gini Coefficient Index (GI) and Herfindhal-Hirshcman Index (HHI). The major approach, Gini coefficient analysis, was applied in this study to identify the industry and market structures for designer eggs and the generic formulation can be specified as:

$$GI = 1 - \sum_{i=1}^{k} X_i Y_i$$

where X_i = the population and Y_i = the income of *i* group. The Gini coefficient is a measure of inequality of a distribution. It is defined as a ratio with values between 0 and 1. A low Gini index indicates a more equal distribution, while a higher Gini coefficient indicates a more unequal distribution. Another widely used measure is the Hirfendahl-Hirschman Index (HHI). For *n* firms in an industry with market shares Si, (i=1,2, ... , n), the HHI is defined as:

$$HHI = \sum_{i=1}^{N} S_i^2$$

where S_i is the market share of firm *i* in the market and *N* is the number of firms. The index can be written as an increasing function of the population variance of market shares. The more 'equal' the firm's size is, the smaller the index would be. By definition $(1/n) < HHI < 1$, where *n* is the number of firms in an industry. The maximum concentration of unity occurs when one firm has all the sales, output, etc. Minimum concentration (*1/n*) occurs when each firm has an equal share of *1/n*. Correlation analysis was applied to measure relationships between two or more variables. Correlation coefficients can range from –1.00 to +1.00. The value of –1.00 represents a perfect negative correlation, while a value of +1.00 represents a perfect positive correlation. A positive correlation indicates a positive association between the variables (increasing values in one variable corresponds to increasing values in the other variables), while a negative correlation indicates a negative association between the variables (increasing values in one variable corresponds to decreasing values in the other variables). A correlation value close to zero indicates no association between the variables. The formula for calculating the coefficient can be written as:

$$r = \frac{1}{n-1} \sum \left(\frac{x - \bar{x}}{S_x}\right) \left(\frac{y - \bar{y}}{S_y}\right)$$

Scenario of the industry

The market for specialty value-added agricultural foods has been expanding in recent years. The demand for these products, which started in the developed country markets, was also catching middle income markets including Malaysia. One of the industries which is fast expanding to meet increasing demands in this country is the 'designer-eggs'. Because of increased attention to consumers' health, environmental concerns and issues from the animal welfare groups, designer and specialty eggs are niches in the egg market worth examining. Organic eggs, range eggs, cage-free eggs and Omega-3 eggs are some examples of niches that are of interest and have experienced growth in the marketplace.

The Federation of Livestock Farmers Association of Malaysia revealed that there is growth in the production of designer eggs to meet the demand for healthier eggs deemed to be lower in cholesterol and higher in Omega-3 fatty acids. The majority of designer egg producers in Malaysia are located in Malacca (42.9%), followed by Selangor (21.4%), Johor (14.3%) and Penang (7.1%) (*Figure 2*).

Large scale operators with chicken populations ranging from 340,000 to 2.5 million dominated designer egg markets which accounted for 70% private limited companies and the remaining were public listed. Partially local samples were producing Omega (31.8%) and lowered cholesterol (27.3%), followed by Selenium (18.2%), vitaminized (13.6%) and organic (9.1%). In terms of production, omega and organic eggs devoted substantial total quantities of production which were 34.3% and 29.2% respectively, followed by lowered cholesterol (19.2%), vitaminized (14%) and selenium (3.3%) (*Figure 3)*.

Results and discussion

The summary of the respondents' background is presented in *Table 1*. The majority of producers operated in Malacca and Selangor (>50%). Most of

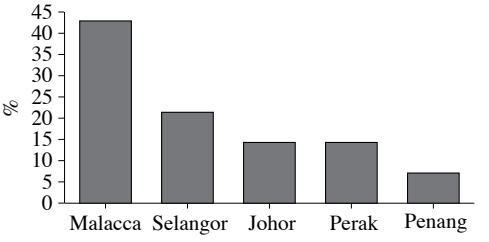


Figure 2. The population of designer egg producers in Malaysia

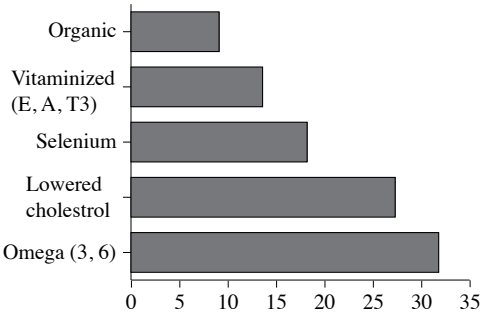


Figure 3. The percentage of respondents producing designer eggs by category

Table 1. Background of respondents (n = 42)

Variables	Category	Percentage (%)
States	Malacca	42.9
	Selangor	21.4
	Johor	14.3
	Perak	14.3
	Penang	7.1
Business entity	Sole proprietor	3.8
	Private limited	90.4
	Public listed	5.8
Designer egg production	Omega	31.8
	Lowered cholesterol	27.3
	Selenium	18.2
	Vitaminized	13.6
	Organic	9.1
Sources of technology	Asia	27.3
	Europe	18.2
	South America	18.2
	United States	18.2
Technologies	Feed formulation	81.8
	Housing and equipment	9.1
	Pullets	9.1

the companies are private limited business (90.4%). The main production is Omega-3 and lowered cholesterol eggs (>50%). The major source of technology is from Asian countries particularly Taiwan, China and Thailand. The most significant technology for designer eggs is feed formulation (81.8%) compared to pullets and housing technologies.

The lowered cholesterol eggs indicated the highest cost of production as compared to the others, followed by omega, organic, vitaminized and selenium (*Table 2*). However, the highest selling price was organic eggs (RM0.47/each), followed by lowered cholesterol eggs (RM0.44/each) in average at producer level. The selling price of designer eggs was higher at 23.4 – 31.7% of the production cost in average. In terms of technology, the majority (81.8%) used imported technology in producing designer eggs, which included feed formulation and additives, mainly from the United States and China (50%). Others were from Belgium, Germany, Thailand, etc.

The correlation analysis was conducted to identify the relationship between variables including the production costs, imported technologies, sales revenue and the period of technology practices. The results showed that production cost positively correlated to the imported technology, indicating that increasing application of imported technology would increase in cost of production for designer eggs. However, the results indicated a weak relationship since the coefficient was not significant (0.319).

Table 2. Descriptive statistics of production cost for designer eggs (RM/each)

Designer eggs	Mean	Std. Dev.	Min.	Max.
Lowered cholesterol	0.36	0.06	0.29	0.44
Omega - (3,6)	0.33	0.06	0.25	0.40
Organic	0.33	0.06	0.29	0.40
Vitaminized (E, A)	0.30	0.01	0.29	0.30
Selenium	0.28	0.04	0.25	0.30

The period of technology practices was significantly correlated to both sales revenue and gross margins. The positive coefficients were at 0.633 and 0.749 (level of significance = 0.05) respectively, indicating strong relationships. The period also showed a positive correlation to the imported technology which was at 0.632 (level of significance = 0.05), meaning that the established businesses preferred to practice imported technologies, while the fresh producers favored technologies from local.

Gini coefficient analysis was applied in this study to identify the industry and market structures for designer eggs. The coefficient was high at 0.764 ($G = 1 - \Sigma_{i=1}^{k} XiYi > 0.35$), implying market shares and revenues among designer egg producers were significantly inequitably distributed. This result was consistent with the calculation of Herfindahl-Hirshman Index (HHI) at 0.386 ($H = \Sigma_{i=1}^{N} S_i^2 > 0.25$), classified as oligopolistic market structure which tends to increase the concentration of wealth and income of the producers, resulting in high barriers to enter the market and industry. Determining this structural market in the industry provided a basis for policy measures towards creating a fairer market competition.

Conclusion

This study revealed that market structure of designer eggs was biased towards major players in the industry. The inequitable distribution of market shares and revenues which affected highly concentrated markets resulted in higher barriers to entry and the oligopolistic nature of the market which revealed that the production was being monopolized by large scale operators. This market scenario is also significantly related to fostering wealth creation by major stakeholders of the industry. Empirical evidence of the marketing patterns and market structure of the industry can be used as a guide in policy formulation with respect to developing a freer and more

equitable marketing environment within the industry. These findings can be a basis for policy measures to minimize collusion and to facilitate easier entry and ensuring the development of a more efficient and competitive designer egg industry in the long run.

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Abstrak

Objektif utama kajian ini adalah untuk mengkaji situasi semasa industri telur designer di Malaysia dengan menilai potensi pasaran dan menganalisis struktur pasaran. Kaedah persampelan tertuju telah dilaksanakan bagi memilih lebih kurang 70% (N = 42) responden daripada pengeluar telur designer di Malaysia. Analisis indeks Gini telah digunakan untuk mengenal pasti struktur pasaran dan industri telur designer. Nilai indeks yang tinggi dan signifikan iaitu 0.764, menjelaskan pembahagian syer dan hasil pasaran telur designer di kalangan pengeluar adalah tidak seimbang. Dapatan ini juga adalah konsisten dengan pengiraan indeks Herfindhal-Hirshman (HHI), iaitu 0.386 yang menyatakan struktur pasaran telah diklasifikasikan sebagai struktur oligopolistik yang mewujudkan konsentrasi terhadap nilai kekayaan dan pendapatan di kalangan pengeluar. Senario ini telah menyebabkan halangan yang tinggi terhadap pengeluar baharu dalam pasaran dan industri tersebut. Secara teori, struktur ini adalah refleksi daripada mekanisme pasaran yang tidak cekap ke dalam industri dan struktur oligopolistik membuktikan pengeluaran telur designer telah dimonopoli oleh pengeluar berskala besar. Kajian ini telah memberi garis panduan terhadap formulasi dasar dan polisi ke arah mewujudkan persaingan pasaran yang seimbang, komplikasi yang minimum serta memudah-cara pengeluar untuk memajukan industri tersebut. Dengan ini, industri telur designer akan membangun dengan lebih cekap dan berdaya-saing, terutamanya bagi jangka panjang.