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Economic and Social Commission for Asia and the Pacific

CAPSA WORKING PAPER No. 79

# Prospects of Feed Crops in Malaysia

Tunku Mahmud bin Tunku Yahya
Sarmin bin Sukir

United Nations
ESCAP

## UNESCAP-CAPSA

The Centre for Alleviation of Poverty through Secondary Crops' Development in Asia and the Pacific (CAPSA) is a subsidiary body of UNESCAP. It was established as the Regional Co-ordination Centre for Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) in 1981 and was renamed CAPSA in 2004.

**Objectives**

CAPSA promotes a more supportive policy environment in member countries to enhance the living conditions of rural poor populations in disadvantaged areas, particularly those who rely on secondary crop agriculture for their livelihood, and to promote research and development related to agriculture to alleviate poverty in the Asian and Pacific region

**Functions**

1. Coordination of socio-economic and policy research on secondary crops.
2. Networking and partnership with other international organizations and key stakeholders.
3. Research and analysis of trends and opportunities with regard to improving the economic status of rural populations.
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# Prospects of Feed Crops in Malaysia

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**WORKING PAPER 79**

# Prospects of Feed Crops in Malaysia

**Tunku Mahmud bin Tunku Yahya**
**Sarmin bin Sukir**

**UNESCAP-CAPSA**
Centre for Alleviation of Poverty
through Secondary Crops' Development
in Asia and the Pacific

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# Foreword

During the last few decades a rapid increase has occurred in the demand for meat, milk and eggs throughout the world. This increase is attributed not only to increases in population but to a large increase in per capita consumption connected to changes in lifestyles and to economic growth.

By 2002, in general, the increasing demand for livestock products will equal or exceed the demand for food from direct plant origin (cereals, vegetables and pulses). This process is known as "the Livestock Revolution".

Coarse grains, pulses, roots and tuber crops are very important components of farming systems in Asia and the Pacific. Feed is one of the important end products of CGPRT crops.

Responding to this need, UNESCAP-CAPSA implemented a research project "Prospects of Feed Crops in Southeast Asian Countries (FEEDSEA)" in collaboration with partners from four Southeast Asian countries namely: Indonesia, Malaysia, the Philippines and Thailand. It is a continuation of the research project "Prospects of Feed Crops in South Asia (FEED)" conducted from 2001 to 2003 with the participation of four countries in South Asia, namely: India, Nepal, Pakistan and Sri Lanka.

It is my pleasure that the first output of this project **Prospects of Feed Crops in Malaysia** is now available to the public. This volume covers topics such as investigating and identifying opportunities for improvements in rural income through new and different utilization of CGPRT crops in the feed industry in Malaysia.

I thank Mr. Tunku Mahmud bin Tunku Yahya and his team for his earnest and fruitful work. Dr. Budiman Hutabarat, Senior Researcher, Indonesian Center for Agricultural Socio Economic Research and Development (ICASERD), Ministry of Agriculture of Indonesia, and Dr. Erna Maria Lokollo provided useful comments and guidance at various stage of the study as the regional advisor and programme leader respectively. I also thank Mr. Matthew L. Burrows for his editing services throughout the publication of the report, and Ms. Agustina Mardyanti for typing and formatting the final document. I would like to express my highest appreciation to the Government of Japan for funding the project.

March 2005

J.W. Taco Bottema
Director
UNESCAP-CAPSA

# Preface and Acknowledgements

The FEEDSEA project for Southeast Asian countries was initiated by UNESCAP-CAPSA during the second quarter of 2003. There are four countries involved in the study, namely Indonesia, Malaysia, the Philippines and Thailand. A planning meeting for the above project was held on 27-28 August 2003, at UNESCAP-CAPSA, Bogor, Indonesia, with national experts from the four countries attending. The project within the individual countries commenced thereafter and the findings were presented at a workshop in August 2004.

I wish to express my sincere appreciation to the Director General of the Malaysian Agricultural Research and Development Institute (MARDI), Datuk Dr. Hj. Saharan bin Hj. Anang for nominating me as the national expert to the FEEDSEA project. I would also like to thank Dr. Nobuyoshi Maeno, former Director, UNESCAP-CAPSA for accepting the nomination and to the UNESCAP Secretariat in Bangkok for the funding and approval of the contract.

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Tunku Mahmud bin Tunku Yahya

# Executive Summary

The study was initiated with the objectives of elucidating and analyzing potentials, weaknesses, opportunities, constraints and policy options in the development of feed crop farming with an emphasis on secondary crops in Southeast Asian developing countries. Most of the countries in the region have experienced rapid development of their livestock and fish culture industries, and the demand for cereal feed use is projected to increase annually by 2.7 per cent. The demand for cereals as food is increasing annually at 2.3 per cent per year. Therefore, the total demand for cereals as both feed and food will increase by at least 5 per cent per year.

In Malaysia, feed crops currently contribute not much to employment, income generation, import substitution and export promotion because the sub-sector is small. The agricultural output of Malaysia is dominated (70-80 per cent) by oil palm, rubber, cocoa and coconut; 10-15 per cent paddy and the remainder other commodities. Currently, maize (4,795 ha), cassava (1,834 ha) and groundnut (245 ha) are grown by smallholders for direct human consumption. However, substantial amounts of maize (2.4 million tons), soybean (400,000 tons) and soybean meal (580,000 tons) are imported for the domestic animal feed industry. In fact, 95 per cent of the raw materials required for the animal feed industry are imported. In 2003, imports of feeding stuffs for animals jumped to RM 2.2 billion (US$ 0.6 billion) and constituted about 17.2 per cent of the RM 13 billion (US$ 3.42 billion) total food imports bill, becoming the most significant item.

Per capita consumption of poultry and eggs in 2001 was 28.52 kg and 293 eggs respectively. In the same year, the self-sufficiency level (SSL) for poultry was 123 per cent and for eggs 109 per cent. Per capita consumption of pork is on the decline, from 10.4 kg in 1995 to 7.4 kg in 2001, and it is a major component of the diet about 30 per cent of the Malaysian population. In 2003, SSL for swine went up to 100 per cent. Per capita consumption of beef and mutton in 2000 was 5.5 kg and 0.75 kg respectively but decreased slightly to 5.3 kg for beef and increased slightly to 0.79 kg for mutton in 2001. Currently, 78 per cent of the domestic demand for beef and 92 per cent for mutton are met by imports. The average per capita consumption of fish in Malaysia is higher than poultry at 53 kg.

The domestic feed milling industry developed in parallel with the development of the swine and poultry industry. Currently there are 47 feed mills operating in Malaysia with 38 located in Peninsular Malaysia and 9 located in Sabah and Sarawak. The latest development is towards an integrated poultry operation where the business incorporates feed milling, hatcheries, contract farming, the production of broilers and layers to eggs, poultry processing and a marketing network.

The Third National Agricultural Policy (NAP3 1998-2010) retains the objective of the Second National Agricultural Policy to maximize income through the optimal utilization of resources in the sector. The policy for feed crops comes under the ‘other economic crops’ product group. One of the policy directions highlighted under this product group is that reverse investment will be encouraged to secure the adequate supply of quality raw materials to take advantage of cheaper costs of production in other countries. Except for rice, market forces determine the prices of commodities in Malaysia. External trade is of great importance to the development of the Malaysian economy and Malaysia places high importance on a strong, open and viable trading system. There are six main objectives of Malaysia’s trade policy. One of the objectives is to strengthen intra-ASEAN trade through closer economic and trade cooperation.

An economic model was developed for maize as food and feed. The results indicate that the demand for maize as feed is dependent on its own price, the price of prepared feeds, and the

quantity of maize demanded in the previous 1 and 2 years. The forecast of the demand for grain maize as feed in 2015 is 2.78 million tons valued at RM 2.2 billion (US$ 0.58 billion). As Malaysia does not produce grain maize, the supply of grain maize to Malaysia is from the world's supply. The quantity demanded for maize as food is dependent on the producer price of maize, the price of maize flakes, per capita income and the quantity demanded for maize as food in the previous 1 and 2 years. The forecast of the demand for maize as food in 2015 is 27,308 tons valued at RM 42 million (US$ 11.05 million). The quantity supplied for maize as food is dependent on maize acreage, the maize acreage in the previous year and the producer price. The forecast of the supply of maize for food in 2015 is 17,880 tons valued at RM 28 million (US$ 7.37 million).

An economic model was also developed for soybean meal. The results indicate that the quantity of soybean meal demanded for feed is dependent on its own price, the price of imported maize, poultry production, the price of fish meal and the quantity of soybean meal demanded in the previous 1 and 2 years. The forecast of the demand for soybean meal as feed in 2015 is 1.07 million tons valued at RM 858 million (US$ 225.8 million). The supply of soybean meal for Malaysia comes from the world's supply of soybean meal plus local by-product production after the extraction of oil from the soybean.

An economic model for soybean indicates that the quantity of soybean demanded is dependent on its own price, the population and per capita income. The forecast of the demand for soybean in 2015 is 761 thousand tons valued at RM 1.01 billion (US$ 0.27 billion). As Malaysia does not grow soybean, the supply comes from the world's supply.

A SWOT analysis was carried out for feed crops in Malaysia. Malaysia's strength is not in production; it is in processing and marketing, where the strong, manufactured feeds industry offers a ready market for domestically grown feed crops. There are too many weaknesses in production such as high costs of production, serious labour constraints, competition for land use and no large tract of contiguous flat land for easy mechanization. Even in terms of processing, domestically produced feedstuffs such as cassava refuse, rice bran and broken rice are not price competitive. Nevertheless, there are opportunities such as reverse investment in favourable neighbouring countries and the huge RM 200 billion (US$ 53 billion) 'halal' food market which will open the door for poultry products thereby stimulating the demand for feed crops. The threat of a worldwide supply shortage of raw materials remains while the spread of diseases such as the Nipah virus and Avian flu can cripple the livestock industry and the manufactured feeds industry.

The conclusion is that the potential lies in food crops that have dual uses as food and feed. Rice and sweet corn already offer this potential. There is potential for ruminant feeds because of the by-products from the oil palm mills as well as the OPF from plantations that can be used by beef and dairy cattle. The recommendation is to continue to concentrate on doing what Malaysia does best i.e. continue to import maize, manufacture non-ruminant feeds and enter the world market of prepared feeds, continue with R&D on finding substitutes for maize in non-ruminant feeds and to focus on oil palm as a possible crop for ruminant feeds.

# 1. Introduction

## 1.1 Background and justification

Feed crops or annual crops have achieved limited success as contributors of employment, income generation, and import substitution and export promotion in Malaysian agriculture. A small number of commodities dominate the agricultural output of Malaysia and can be summarized as follows:

- Commodities such as oil palm, rubber, cocoa and coconut account for about 70-80 per cent of agricultural output and area;
- About 10-15 per cent is paddy; and
- The remaining area and output are from other commodities.

The other commodities comprise of crops such as fruits, vegetables, floriculture and other annual crops including feed crops. Currently, feed crops such as maize and cassava are grown by smallholders for direct human consumption. This is the case because the prices received for food produce are higher than crops produced for animal feed. It is also difficult to compete with the cheaper import prices of maize and cassava for animal feeds. Although feed crops are not significantly grown in the country, the freedom to import feed crops such as maize, cassava chips, soybean, soybean meal and other feedstuffs is important in the development of the domestic animal feed industry. There are no quotas or import tariffs on imported feedstuffs. The feed crops that are significant in the animal feed industry of Malaysia as well as the development of the livestock sector are described below.

### Maize

Malaysia imports substantial amounts of grain maize consisting of unmilled maize (maize seed), groats and meal of maize, rolled or flake grains of maize and other maize. In 2001, the amount of grain maize imported was 2.4 million tons valued at RM 1.03 billion (US$ 270 million). Malaysia is the biggest buyer of maize among the Southeast Asian nations, buying from the United States, Argentina, China and lately India. Grain maize is used extensively in the animal feed industry, making up between 40 and 50 per cent of swine and poultry feed formulations. Although there is the potential for import substitution of grain maize due to the abundant sunshine and rain in Malaysia, the cost of producing grain maize is much higher than the cost of imported grain maize. Nevertheless, Malaysia has become one of the most efficient producers of secondary products from grain maize, namely prepared animal feeds and subsequently pork and poultry products. The swine and poultry industries depend on the prepared animal feed industry for their continued growth.

Most of the maize grown in Malaysia is for human consumption. It is consumed as corn-on-the-cob, corn-in-the-cup or as corn in canned containers. It is generally grown as a rotation crop after rice in single crop/rainfed areas or as a cash crop in immature rubber or oil palm areas. The reported acreage under maize in 2000 was 4,795 hectares. It is a lucrative business for smallholders because the output price is high due to limited supply and good demand. Malaysia also imports baby corn (mainly from Thailand) for direct human consumption.

### Soybean

As with maize, there are production problems with soybean and therefore, it is not produced but substantial amounts of soybean and soybean meal for food and feeds are imported. In the food industry, soybean is used to produce fermented and non-fermented products.

Fermented products include soysauce, soybean paste and tempeh. Non-fermented products include soybean oil, soybean milk, and various types of soybean curd and soybean sprouts. Soybean meal is used in animal feed and Malaysia uses the imported soybean to extract oil and produces soybean meal as a by-product. Annual production of soybean meal from imported beans is about 400,000 tons but this is still insufficient to support the domestic animal feed industry. In 2001, Malaysia imported about 580,000 tons of soybean meal valued at RM 465 million (US$ 122.3 million). The prepared animal feed industry uses soybean meal at between 20 and 25 per cent of the swine and poultry feed formulations.

### Cassava

The area under cassava has been declining and in 2000 the acreage reported was 1,834 hectares. Once a major industry, it has been in decline ever since the import duty on cassava flour was removed in 1987 and the shift of government development programmes towards industrialization. Faced with stiff foreign competition, smallholders switched to other lucrative crops such as oil palm, fruits and vegetables. While smallholders in every state around the country generally grow the crop, the major areas in 2000 were found to be in the states of Johor, Selangor, Perak, Kedah and Kelantan. Most of the crop is grown for food with the exception of farms in Perak where there are two companies that still produce cassava flour. Cassava chips are no longer produced due to the high drying cost and are thus unavailable to the feed millers. In a study conducted in 1989, Malaysia was found to have comparative advantage in cassava starch production but not cassava chip or pellet production (Chiew and T. Y. Tunku Mahmud, 1989). Despite this, the acreage continued to decline due to foreign competition, conversion of agricultural land to housing and the lack of a large tract of flat land for the easy mechanization of cassava farms. To meet the needs of the animal feed industry, Malaysia continues to import cassava meal, pearls and flakes. In 2001, imported cassava amounted to 1,937 tons valued at RM 1.6 million (US$ 0.42 million).

### Groundnut

Smallholders in Kelantan and Perak used to grow this crop for food but due to shortages and high costs of labour, acreage has declined substantially. In 2000, the acreage reported was 245 hectares. In the animal feed industry, groundnut cake is no longer used due to problems of rancidity, aflatoxins and poisoning issues. The amount imported in 2000 was nil and in 2001 about 20 tons were imported valued at RM 21,569 (US$ 5,676).

## 1.2 Objectives

The general objectives of this research are to elucidate and analyze potentials, weaknesses, opportunities, constraints and policy options for the development of feed crop farming with an emphasis placed on coarse grains, pulses, roots and tuber (CGPRT or secondary) crops in Southeast Asian developing countries in balance with the rapid development of livestock and fish culture industries in Southeast Asia. More specifically, the objectives may be further broken down into:

1 To analyze historical dynamics and future trends of demand and supply for feed crop products;
2 To evaluate potentials, weaknesses, opportunities and constraints for expanding feed crop farming with an emphasis placed on secondary crops in the participating countries;
3 To propose possible cooperation schemes for trade and development of feed crops/products among Southeast Asian countries; and
4 To formulate policy options to promote the sustainable development of feed crop farming in the participating countries.

## 1.3 Scope of the study and commodity coverage

The scope of the study is limited to the dominant non-ruminant sector of the livestock industry. This sector, particularly poultry and swine, has not only experienced rapid growth but also produces more than is required for domestic consumption and thus exports to neighbouring countries.

The prime commodities commonly used for animal feeds such as maize, soybean and cassava cannot be grown economically in Malaysia. To support the dynamic animal feed industry, Malaysia imports substantial amounts of maize, soybean and soybean meal and to a lesser extend, fish meal and cassava chips. Although growing maize for animal feed is not viable, growing maize for food is. The reported acreage of maize is primarily used for human consumption. Since maize and soybean meal are the major ingredients in poultry and swine feeds and they are major imported commodities, more detailed focus will be accorded to them rather than the other commodities mentioned. Cassava chips are no longer in production and their importation is also in decline. Similarly for groundnut meal, it is no longer in use due to problems of rancidity, aflatoxins and poisoning issues. Meat and bone meals have also been discontinued due to the prevalence of Mad Cow disease.

# 2. Methodological Approach

## 2.1 Conceptual framework

The first step in seeking to understand the functioning of a system is to build a theoretical model. All models are inevitably simplifications of reality, and the model builder seeks to capture the fundamental features of the system being studied. Economic theory is used to construct the model and identification of explanatory variables. The simplest functional forms that are consistent with the a priori specifications are used.

### 2.1.1 Definitions

*Feed*

Feed is the range of food or feeding stuffs available to an animal. Feeding stuffs are one of the range of potential feeds available to farm livestock. Feed can also be classified as conventional feedstuffs and non-conventional feedstuffs. Conventional feedstuffs are feedstuffs that have been traditionally used for decades or even centuries. They are normally abundant and are purposely cultivated to support animal production. Examples are maize, rice, cassava, fish meal and copra meal. Non-conventional feedstuffs are defined as by-products derived from industrial processing of the main products and those feeds which have not been traditionally used in animal feeding or not normally used in commercially produced rations for livestock.

*Concentrates*

Concentrates are animal feeding stuffs that have a high feed value relative to their volume. They are low fibre, high energy feeds that are concentrated by the factory-blended nutrients needed to increase the nutritional adequacy of feed supplements.

*Feed crops*

Feed crops are crops that are utilized as fresh or processed for feeding animals.

*Data*

All data relating to the quantity imported or demanded will be expressed in tons per annum. Price data is expressed in Malaysian Ringgits (RM). The time series data used in the analysis does not exceed 15 years as agreed. The exchange rate is pegged to the United States Dollar (US$) at RM 3.80 to US$ 1.

### 2.1.2 Analytical approach

As Malaysia imports a substantial amount of maize for the animal feed industry (about 50 per cent of the total import value of feeding stuffs in 2003), strong emphasis is placed on maize. Firstly, the supply for maize as food (sweet corn) is explored, followed by its demand and the market clearing identity. This is then followed by the demand for maize as feed. The import demand for grain maize is similar to the demand for maize as feed. As Malaysia does not produce grain maize, there is no domestic supply curve and the supply of grain maize for Malaysia is from the world's supply of grain maize.

Malaysia also imports substantial amounts of soybean and soybean meal. Soybean is used for food, while the by-products (soybean meal), after the extraction of oil, are used for feed. The import demand for soybean and soybean meal is estimated but the supply of soybean and soybean meal for Malaysia is from the world's supply.

## 2.2 Model formulation

The model formulation will be as follows:

a) Maize for domestic food supply

$$MS_t = a_0 + a_1 PPM_t + a_2 MA_t + a_3 MA_{t-1} + u_t$$

Where,

$MS_t$ = Domestic maize production for food in year t (tons)

$PPM_t$ = Producer price of maize for food in year t (RM/t)

$MA_t$ = Domestic maize acreage for food in year t (ha)

$MA_{t-1}$ = Lagged variable of domestic maize acreage for food

$u_t$ = Error term

The expected signs of the parameters are: $a_1, a_2 > 0$ and $0 < a_3 < 1$

b) Maize for domestic food demand

$$MFood_t = b_0 + b_1 PPM_t + b_2 PCI_t + b_3 PMF_t + u_t$$

Where,

$MFood_t$ = Quantity of maize demanded for food in year t (tons)

$PPM_t$ = Producer price of maize for food in year t (RM/t)

$PCI_t$ = Per capita income in year t (RM)

$PMF_t$ = Price of maize flake in year t (RM/t)

$u_t$ = Error term

The expected signs of the parameters are: $b_1, b_2 > 0$ and $b_3 > 0$

c) Market clearing identity

$$MS_t = Mfood_t$$

d) Forecast of the demand for maize as food

$$DH_t = DH_{t-1}\left(1 + \sum_{i==1-3}^{j=1-3}(\gamma\gamma i \rho j)\right)$$

Where,

$DH_t$ = Demand for maize as food in year t

$DH_{t-1}$ = Demand for maize as food in year t-1

$\gamma_1$ = Elasticity of demand for maize as food w.r.t. its own price

$\rho_1$ = Growth rate of price of maize

$\gamma_2$ = Elasticity of demand for maize as food w.r.t. price of maize flakes

$\rho_2$ = Growth rate of price of maize flakes

$\gamma_3$ = Elasticity of demand for maize as food w.r.t. income

$\rho_3$ = Growth rate of income

e) Forecast of the supply of maize for food

$$SF_t = SF_{t-1}\left(1 + \sum_{i=1-3}^{j=1-3}(\varepsilon ipj)\right)$$

Where,

$SF_t$ = Supply of maize for food in year t

$SF_{t-1}$ = Supply of maize for food in year t-1

$\varepsilon_1$ = Elasticity of supply of maize for food w.r.t. its own price

$\rho_1$ = Growth rate of price of maize

$\varepsilon_2$ = Elasticity of supply of maize for food w.r.t. acreage

$\rho_2$ = Growth rate of acreage

$\varepsilon_3$ = Elasticity of supply of maize for food w.r.t. acreage lagged 1 year

$\rho_3$ = Growth rate of acreage lagged 1 year

f) Maize for domestic feed demand

$$MFeed_t = c_0 + c_1 PGM_t + c_2 PPFeed_t + c_3 PSBMeal_t + c_4 PPMeal_t + c_5 PPEgg_t + c_6 PCI_t + u_t$$

Where,

$MFeed_t$ = Quantity of maize demanded for feed in year t (tons)

$PGM_t$ = Price of imported grain maize in year t (RM/ton)

$PPFeed_t$ = Price of prepared feed in year t (RM/ton)

$PSBMeal_t$ = Price of imported soybean meal in year t (RM/ton)

$PPMeal_t$ = Price of poultry meat in year t (RM/kg)

$PPEgg_t$ = Price of poultry eggs in year t (RM/kg)

$PCI_t$ = Per capita income in year t (RM)

$u_t$ = Error term

The expected signs of the parameters are: $c_1 < 0$ and $c_2, c_3, c_4, c_5, c_6 > 0$

g) Forecast of the demand for maize for feed

$$DF_1 = DF_{t-1}\left(1 + \sum_{i=1-2}^{j=1-2}(\alpha i \rho j)\right)$$

Where,

$DF_1$ = Demand for maize as feed in year t

$DF_{t-1}$ = Demand for maize as feed in year t-1

$\alpha_1$ = Elasticity of demand for maize as feed w.r.t. its own price

$\rho_1$ = Annual growth rate of price of imported grain maize

$\alpha_2$ = Elasticity of demand for maize as feed w.r.t. the price of feed

$\rho_2$ = Annual growth rate of the price of feed

h) Maize for domestic feed supply

Malaysia does not produce maize domestically for feed and as such, there is no domestic supply. All of the maize for feed is met by imports. Although Malaysia's imports of maize are quite substantial i.e. around 2.3 million tons, this is still small compared to the largest importers i.e. Japan at 16.2 million tons, Republic of Korea (8.2 million tons), Taiwan (5.3 million tons), or Mexico (4.8 million tons). As such, Malaysia is a price taker and has no major influence on the price of maize in the world market. Malaysia faces a horizontal supply curve of grain maize in the world market.

i) Soybean meal for domestic feed demand

$$SBM_t = d_0 + d_1 PSBM_t + d_2 PGM_t + d_3 PP_t + d_4 PFM_t + u_t$$

Where,

$SBM_t$ = Quantity of soybean meal demanded for feed in year t (tons)

$PSBM_t$ = Price of imported soybean meal in year t (RM/t)

$PGM_t$ = Price of imported grain maize (RM/t)

$PP_t$ = Poultry production in year t (tons)

$PFM_t$ = Price of imported fish meal in year t (RM/t)

j) Forecast of the demand for soybean meal for feed

$$DSM_t = DSM_{t-1}\left(1 + \sum_{i==1-4}^{j=1-4}(\varpi i \rho j)\right)$$

Where,

$DSM_t$ = Demand for soybean meal in year t

$DSM_{t-1}$ = Demand for soybean meal in year t-1

$\omega_1$ = Elasticity of demand for soybean meal w.r.t. its own price

$\rho_1$ = Annual growth rate of the price of imported soybean meal

$\omega_2$ = Elasticity of demand for soybean meal w.r.t. the price of imported grain maize

$\rho_2$ = Annual growth rate of the price of imported grain maize

$\omega_3$ = Elasticity of demand for soybean meal w.r.t. poultry production

$\rho_3$ = Annual growth rate of poultry production

$\omega_4$ = Elasticity of demand for soybean meal w.r.t. the price of imported fish meal

$\rho_4$ = Annual growth rate of the price of imported fish meal

k) Soybean for domestic food and feed demand

$$SB_t = e_0 + e_1 PSB_t + e_2 POP_t + e_3 PCI_t + u_t$$

Where,

$SB_t$ = Demand for soybean in year t (tons)

$PSB_t$ = Price of imported soybean in year t (RM/t)

$POP_t$ = Population in year t (Nos)

$PCI_t$ = Per capita income in year t (RM)

l) Forecast of the demand for soybean for food and feed

$$DS_t = DS_{t-1}\left(1 + \sum_{i==1-3}^{j=1-3}(\tau i \rho j)\right)$$

Where,

$DS_t$ = Demand for soybean in year t

$DS_{t-1}$ = Demand for soybean in year t-1

$\tau_1$ = Elasticity of demand for soybean w.r.t. its own price

$\rho_1$ = Annual growth rate of the price of imported soybean

$\tau_2$ = Elasticity of demand for soybean w.r.t. population

$\rho_2$ = Annual growth rate of population

$\tau_3$ = Elasticity of demand for soybean w.r.t. per capita income

$\rho_3$ = Annual growth rate of per capita income

m) Soybean and soybean meal for domestic feed supply

Malaysia does not produce soybean domestically and therefore there is no domestic supply. Domestic soybean demand is met by imports. Malaysia imported about 580 thousand tons of soybean in 2001/2002, which is small compared to the amount imported by China (4.6 million tons), Japan (3.7 million tons), Taiwan (2.2 million tons) and Korea (1.2 million tons). Thus, Malaysia is a price taker and has no major influence on the price of soybean in the world market. Malaysia faces a

horizontal supply curve of soybean in the world market. As for soybean meal, Malaysia extracts the oil from the imported soybean and obtains soybean meal as a by-product. The requirement of soybean meal for feed is met by both imports and by local production (the by-product). In 2001, local production of soybean meal was 400,000 tons and the imported soybean meal amounted to 580,000 tons. However, as time series data for local production of soybean meal is limited to the extent of being insufficient, the domestic supply of soybean meal cannot be estimated.

## 2.3 Sources and coverage of data

Data used in the models is time series data collected from various sources. Most of the production figures are from the Department of Agriculture, import and export figures from Malaysia External Trade Development Corporation (MATRADE) and the rest of the data from the statistics department. It was decided at the plenary meeting of country consultants that not more than 15 years of data (1987-2001) would be used.

# 3. General and Socio-Economic Features

## 3.1 Population

During the seventies, Malaysia's population grew at a rate of 2.8 per cent per annum and in 1979 the population stood at 13.5 million. During the eighties, the rate of growth declined to 2.5 per cent per annum and the population in 1989 was 17.7 million. During the nineties, the rate of growth declined again to 2.3 per cent per annum. Between 2000 and 2003, the growth rate was about 2.0 per cent growing from 22.08 million in 2000 to 23.42 million in 2003. In 2005 the population is projected to increase to 26.16 million with the urban population expected to increase to 16.47 million or about 63 per cent of the total population. It is also projected that in 2005 the proportion of the working age group 15-64 will constitute 64.2 per cent, with 31.5 per cent below the age of 15 and 4.3 per cent in the age group of 65 and above.

The population of non-citizens increased from 1.41 million in 2000 to 1.66 million in 2003 giving an average annual growth rate of 5.6 per cent. This is due to more employment of foreign workers, particularly in the manufacturing, construction and plantation sectors (Mid-Term Review).

## 3.2 General economy

The Malaysian economy has undergone significant structural changes in the last two decades. The economy today is identified with the production and export of industrial goods, a drastic change from the agricultural based economy in the seventies. It is an open economy and growth is influenced by developments in the international economy.

Table 3.1 gives the Gross Domestic Product (GDP) of Malaysia by industry in three separate years. For comparison purposes, all values are converted to 1978 prices. In 1990, the GDP was about RM 80 billion; in 1995 about RM 120 billion and in 2000 about RM 177 billion. The increase in absolute value from 1990 to 2000, within a span of 10 years was more than twofold. The major contributor came from the manufacturing sector, which rose from RM 21.3 billion in 1990 to RM 40 billion in 1995 and to RM 66.3 billion in 2000, a threefold increase. Agriculture's contribution also increased, from RM 14.8 billion in 1990 to RM 16.4 billion in 1995 and to RM 18.5 billion in 2000, but the growth has been slower.

The relative contribution of industry to GDP can be looked at from the point of view of percentage contributions. It can be seen that the contribution of agriculture to GDP has declined from 18.7 per cent in 1990 to 13.6 per cent in 1995 and to 10.5 per cent in 2000. The manufacturing sector continues to dominate from 26.9 per cent in 1990, to 33.1 per cent in 1995 and 37.5 per cent in 2000.

**Table 3.1 The gross domestic product of Malaysia by industry for the years 1990, 1995 and 2000**

| Source | RM Million (at 1978 prices) | | | Share of GDP (%) | | |
|---|---|---|---|---|---|---|
| | 1990 | 1995 | 2000 | 1990 | 1995 | 2000 |
| 1. Agriculture, forestry, livestock and fishing | 14,827 | 16,406 | 18,460 | 18.7 | 13.6 | 10.5 |
| 2. Mining and quarrying | 7,757 | 8,938 | 10,023 | 9.8 | 7.4 | 5.7 |
| 3. Manufacturing | 21,340 | 39,825 | 66,251 | 26.9 | 33.1 | 37.5 |
| 4. Construction | 2,832 | 5,277 | 8,560 | 3.6 | 4.4 | 4.8 |
| 5. Electricity, gas and water | 5,487 | 8,787 | 14,599 | 6.9 | 7.3 | 8.3 |
| 6. Transport, storage and communications | 8,806 | 14,568 | 22,378 | 11.1 | 12.1 | 12.7 |
| 7. Wholesale and retail trade, hotels and restaurants | 7,758 | 12,884 | 20,977 | 9.8 | 10.7 | 11.9 |
| 8. Finance, insurance, real estate and business services | 8,447 | 11,683 | 14,354 | 10.6 | 9.7 | 8.1 |
| 9. Government services | 1,678 | 2,436 | 3,749 | 2.1 | 2.0 | 2.1 |
| 10. Other services | 4,076 | 8,414 | 13,242 | 5.1 | 7.0 | 7.5 |
| (-) Imputed bank service charges | 2,947 | 5,101 | 5,840 | 3.7 | 4.3 | 3.2 |
| (-) Imputed bank service charges | | | | | | |
| GDP at purchasers' value | 79,329 | 120,316 | 176,635 | 100.0 | 100.0 | 100.0 |

Source: Economic Planning Unit, Prime Minister's Department, Malaysia. Seventh Malaysia Plan 1996-2000, p.52. May 6, 1996.

The gross domestic product (GDP) at 2000 prices was RM 343 billion (US$ 90.3 billion). The services sector accounted for 52.1 per cent of the GDP, manufacturing 32.0 per cent, agriculture 8.6 per cent, and mining 7.3 per cent. Malaysia's major exports are semi-conductors and electronic products, petroleum and petroleum products, palm oil, wood and wood products, rubber and textiles. The major imports are machinery and transportation equipment, manufacturing equipment, chemicals, fuel and food. Per capita income in 2000 was RM 13,352 (US$ 3,514).

GDP in 2003 rose to RM 386 billion (US$ 101.6 billion) with the services sector dominating at 54 per cent of GDP, manufacturing 30.6 per cent, agriculture 8.2 per cent and mining 7.2 per cent. During the 2001-2003 period, due to the global economic downturn, the manufacturing sector grew at 1.5 per cent per annum, much lower than the Eighth Plan target of 8.9 per cent per annum. This was due to the 5.8 per cent contraction in 2001. Export-oriented industries were adversely affected by the economic slowdown in the major industrial countries. Domestic-oriented industries become the major contributors to growth during the period. Per capita income in 2003 was RM 14,343 (US$ 3,774).

## 3.3 Agricultural sector

The Malaysian agricultural sector can primarily be grouped into the agro-industrial sub-sector comprising oil palm, rubber, cocoa and timber; the food sub-sector comprising paddy, fruits and vegetables; livestock and fisheries; and a miscellaneous group consisting of tobacco, pepper, coconut, sugarcane, cassava, sweet potato, maize, tea and coffee. Another sub-sector exists consisting of the 'newly emerging' agro-industries such as floriculture, sago, and aquarium fish and aquatic plants.

Agricultural land use in Malaysia between 1990 and 2000 for selected commodities is shown in Table 3.2. The acreage of rubber, cocoa and coconut declined but the acreage of oil palm expanded substantially due to new land development and the conversion of rubber and cocoa plantations into oil palm cultivation. The acreage of 'food commodities' increased largely due to paddy, fruits and vegetables.

**Table 3.2 Agricultural land use (hectares), 1990-2000**

| Item | 1990 | 1995 | 2000 |
|---|---|---|---|
| Agro-industrial commodities | | | |
| Rubber | 1,823,100 | 1,696,000 | 1,431,000 |
| Oil palm | 2,029,464 | 2,479,000 | 3,377,000 |
| Cocoa | 419,793 | 275,000 | 76,000 |
| Pepper | 11,467 | 8,600 | 13,000 |
| Pineapple | 9,302 | 11,835 | 14,742 |
| Tobacco | 10,168 | 10,539 | 15,000 |
| Food commodities | | | |
| Paddy | 662,617 | 666,321 | 699,000 |
| Coconut | 314,136 | 283,954 | 158,000 |
| Vegetable | 31,447 | 36,325 | 39,000 |
| Fruits | 177,311 | 244,471 | 289,000 |
| Others | 57,475 | 57,144 | 56,292 |
| Total | 5,546,280 | 5,769,189 | 6,111,742 |

Source: Economic Planning Unit, Prime Minister's Department, Malaysia. Seventh Malaysia Plan 1996-2000, p.231. 6 May 1996.

During 2000-2003, the agricultural sector recorded average growth of 1.5 per cent per annum. This growth came from the food sub-sector, which grew at 4.0 per cent per annum. There was negative growth of -0.1 per cent per annum for the agro-industrial sub-sector. The negative growth can be attributed mainly to a decline in cocoa production and a reduction in the quantity of sawlogs and sawn timber in compliance with guidelines regarding sustainable forest management issued by the International Tropical Timber Organization (ITTO). Within the food sub-sector, vegetables and fruits recorded impressive growth primarily due to the expansion of cultivated areas. Livestock also witnessed remarkable progress due to higher demand from end-users and the export market.

Total export earnings from agriculture increased by 26.1 per cent from RM 23 billion in 2000 to RM 29 billion in 2003, with palm oil accounting for more than half of the total agricultural export value. The sector's value added increased from RM 18.1 billion in 2000 to RM 18.9 billion in 2003. The agro-industrial sub-sector remained the largest contributor accounting for about 60 per cent of agricultural value added with the rest coming from the food sub-sector and significant increases in production of livestock, fisheries, fruits and vegetables.

## 3.4 Contribution of trade

Malaysia is fundamentally a trade-oriented economy with exports and imports of goods and services accounting for more than 70 per cent of the GDP (Mohamed Ariff *et al*., 1996). The volume of trade expanded almost sixfold between 1985 and 1996, from RM 68.5 billion in 1985 to almost RM 394 billion in 1996. Trade in agriculture and agricultural products stood at RM 52.4 billion in 1995. Of this, exports amounted to RM 35.4 billion, while imports were about RM 17 billion. Malaysia's agricultural trade balance always registered surpluses during the 1985-1995 period, growing from RM 8.8 billion to RM 18.5 billion over the period. It was these surpluses from agriculture that reduced the overall Malaysian trade deficit during the last three years of the period (1994-1996).

However, during 2000 to 2003, export-oriented industries (electrical and electronics, chemicals, wood products, textiles and apparel, palm oil and rubber product industries) were adversely affected by the economic slowdown in the major industrial countries. The exports of manufactured goods declined by 1.2 per cent due mainly to decreases in the exports of electrical and electronic products, which accounted for 66.2 per cent of the total exports of manufactured goods in 2003. Imports of goods and non-factor services in real terms also declined at an average rate of 0.9 per cent per annum, largely due to the substantial 8.6 per cent decline in

2001 as a result of the slowdown in export-oriented manufacturing activities which dampened the demand for intermediate and capital goods.

Malaysia was ranked as the eighteenth largest exporting country in the world in 2001. The major markets for manufactured exports were the Association of Southeast Asian Nations (ASEAN), mainly Singapore, followed by the United States of America (USA), the European Union (EU), Japan and China. New markets include West Asia and Latin American countries.

In 2003, Malaysia's external trade balance registered a surplus of RM 75 billion as compared to RM 51.5 billion in 2004. Total exports rose by 8.0 per cent to RM 382.3 billion while imports rose by 1.5 per cent to RM 307.3 billion when compared with RM 354.1 billion (exports) and RM 302.6 billion (imports) in the previous year. Electrical and electronic products continued to be Malaysia's largest export earner at RM 194.8 billion or 50.9 per cent of total export revenue, followed by palm oil and palm oil based products (RM 27.7 billion), timber and timber-based products (RM 16.6 billion), crude petroleum (RM 15.7 billion) and liquefied natural gas (LNG) at RM 13.3 billion. A substantial amount of intermediate goods, worth RM 223.5 billion or 72.7 per cent of total imports are imported, followed by capital goods (RM 42.7 billion) and consumption goods (RM18.9 billion).

## 3.5 Commodity balance sheets

Most of Malaysia's agricultural exports consist of primary commodities from palm oil, rubber, cocoa, sawlogs, sawn timber and other forest products. In 1995, these products accounted for 76.2 per cent of total agricultural exports, while food accounted for only 12.7 per cent. Agricultural imports consist mainly of food products. In 1995, total food imports amounted to almost RM 8.0 billion increasing in 1997 to RM 10.0 billion. The major imports are wheat, maize, sugar, rice, dairy and meat products. The trade balance in the food sector continues to be in favour of imports.

During the 2000-2003 period, the terms of trade improved at an average rate of 0.6 per cent per annum with export prices increasing by 0.7 per cent per annum compared with a 0.1 per cent increase in import prices. The improvements in export prices were mainly due to the increase in the average price of crude palm oil from RM 1,000 per ton in 2000 to RM 1,400 per ton in 2003 and the increase in the export price of dried cocoa beans to RM 7,209 per ton in October 2002, the highest in 17 years. Exports of food items increased from RM 6.4 billion in 2000 to RM 8 billion in 2003, with imports increasing from RM 11.4 billion in 2000 to RM 13 billion in 2003. The major import item in 2003, valued at RM 2.2 billion was feeding stuffs for animals, followed by cereals and cereal preparations (RM 1.9 billion); coffee, cocoa, tea and spice (RM 1.4 billion); vegetables (RM 1.3 billion); and dairy products (RM 1.2 billion). During the period, the average annual growth rates for exports and imports were 7.1 per cent and 4.5 per cent respectively. However, in absolute terms, Malaysia continues to be a net importer of food items.

# 4. Review of the Current Situation

## 4.1 Livestock production and product consumption

The output value of livestock in Malaysia for 2000 was about RM 4.8 billion (US$ 1.26 billion). The poultry industry made up RM 3.59 billion (poultry meat RM 2.54 billion and eggs RM 1.05 billion) or 75.3 per cent of the output value. The estimated output value of livestock in 2003 increased to RMs 5.89 billion (US$ 1.55 billion), with the poultry industry contributing about RM 4.27 billion (poultry meat RM 3.06 billion and eggs about RM 1.21 billion). Broiler chicken production, which is largely undertaken by integrators, collectively produced 75 per cent of total production. In terms of marketing, approximately 60 per cent of broiler chickens are marketed by wholesalers and retailers through wet markets.

The production of livestock products in Peninsular Malaysia from 1990 to 2001 is shown in Table 4.1.

**Table 4.1 Production of livestock products in Peninsular Malaysia**

| Year | Poultry ('000 mt) | Eggs (Mill eggs) | Beef (mt) | Mutton (mt) | Pork (mt) | Milk (Mill Lit) |
|---|---|---|---|---|---|---|
| 1990 | 348.50 | 5,029 | 12,244 | 658 | 197,301 | 26.20 |
| 1991 | 391.00 | 5,030 | 12,704 | 672 | 204,823 | 26.80 |
| 1992 | 497.30 | 5,780 | 13,338 | 658 | 222,373 | 27.71 |
| 1993 | 560.70 | 5,688 | 13,663 | 607 | 231,140 | 29.23 |
| 1994 | 594.40 | 5,921 | 13,527 | 616 | 249,278 | 30.88 |
| 1995 | 631.40 | 6,145 | 15,395 | 530 | 246,623 | 31.87 |
| 1996 | 584.40 | 6,132 | 14,915 | 529 | 242,772 | 32.17 |
| 1997 | 642.70 | 6,114 | 15,204 | 509 | 246,576 | 29.42 |
| 1998 | 608.00 | 5,975 | 15,838 | 686 | 234,095 | 27.28 |
| 1999 | 628.10 | 5,687 | 17,392 | 817 | 134,169 | 23.94 |
| 2000 | 639.30 | 5,810 | 16,630 | 819 | 137,744 | 24.42 |
| 2001 | 680.00 | 6,087 | 18,289 | 898 | 145,177 | 27.13 |
| AGR (%) | 6.08 | 1.74 | 3.65 | 2.82 | -2.79 | 0.32 |

Source: http://agrolink.moa.my/jph/dvs/statistics
AGR – Author's own calculation.

It can be seen from Table 4.1 that poultry, eggs and pork are the most significant livestock products in Malaysia. The non-ruminant sector has dominated the domestic scene for over a decade. The annual growth rate of poultry is still the highest at 6.08 per cent while pork production has shown negative growth. Ruminant (beef and dairy cattle) and small ruminant (goats and sheep) production are still small-scale but their annual growth rates are increasing. Malaysia imports from India, Australia, New Zealand and the USA to meet the shortages of beef, mutton and milk.

The ex-farm values of livestock products (RM) in Peninsular Malaysia from 1990 to 2001 are given in Table 4.2. It can be seen from the table that the annual growth rate of poultry is the highest at 8.79 per cent. However, the annual growth rates of eggs and pork are slower than that of ruminants.

**Table 4.2 The ex-farm value of livestock products in Peninsular Malaysia**

| Year | Poultry (RM'000) | Eggs (RM'000) | Beef (RM'000) | Mutton (RM'000) | Pork (RM'000) | Milk (RM'000) |
|---|---|---|---|---|---|---|
| 1990 | 1,074,000 | 756,350 | 118,548 | 7,583 | 875,298 | 18,836 |
| 1991 | 1,058,600 | 848,753 | 135,966 | 10,238 | 704,524 | 24,381 |
| 1992 | 1,302,609 | 823,000 | 143,290 | 10,024 | 942,860 | 25,215 |
| 1993 | 1,820,327 | 861,683 | 148,109 | 13,420 | 896,823 | 23,386 |
| 1994 | 1,716,136 | 962,016 | 156,298 | 12,659 | 1,034,711 | 27,791 |
| 1995 | 1,885,083 | 931,422 | 188,814 | 9,832 | 1,139,397 | 28,679 |
| 1996 | 1,640,264 | 1,134,515 | 174,892 | 10,484 | 1,489,405 | 33,779 |
| 1997 | 2,257,208 | 1,128,966 | 192,510 | 9,233 | 1,427,675 | 33,542 |
| 1998 | 2,386,500 | 984,680 | 201,578 | 11,200 | 1,429,153 | 36,285 |
| 1999 | 2,509,070 | 997,010 | 226,730 | 13,800 | 563,510 | 38,300 |
| 2000 | 2,544,333 | 1,047,538 | 205,688 | 14,343 | 964,895 | 32,483 |
| 2001 | 2,827,170 | 1,143,080 | 228,200 | 15,530 | 1,025,310 | 42,880 |
| AGR (%) | 8.79 | 3.75 | 5.95 | 6.51 | 1.44 | 7.48 |

Source: http://agrolink.moa.my/jph/dvs/statistics
AGR – Author's own calculation.

Per capita consumption of livestock products in Peninsular Malaysia from 1990 to 2001 is given in Table 4.3. The annual growth rates (AGR) calculated show that egg and pork consumption is on the decline (negative annual growth rates). The other livestock products show an increasing consumption trend. Mutton has the highest annual growth rate at 4.16 per cent, followed by beef (3.79 per cent), milk (3.29 per cent) and poultry (3.09 per cent).

**Table 4.3 Per capita consumption of livestock products in Peninsular Malaysia**

| Year | Poultry (kg) | Eggs (Nos) | Beef (kg) | Mutton (kg) | Pork (kg) | Milk (kg) |
|---|---|---|---|---|---|---|
| 1990 | 20.31 | 310.64 | 3.49 | 0.50 | 10.29 | 38.47 |
| 1991 | 21.93 | 297.38 | 3.82 | 0.50 | 10.15 | 55.62 |
| 1992 | 28.32 | 338.93 | 3.85 | 0.59 | 10.65 | 52.00 |
| 1993 | 30.41 | 326.00 | 3.98 | 0.57 | 10.59 | 46.87 |
| 1994 | 32.57 | 329.00 | 4.36 | 0.60 | 11.24 | 33.65 |
| 1995 | 33.06 | 328.10 | 4.67 | 0.66 | 10.42 | 51.70 |
| 1996 | 29.23 | 331.59 | 5.07 | 0.86 | 10.48 | 38.34 |
| 1997 | 32.33 | 345.07 | 5.41 | 0.76 | 10.74 | 39.92 |
| 1998 | 29.76 | 316.54 | 4.70 | 0.71 | 9.83 | 35.22 |
| 1999 | 29.48 | 293.00 | 4.68 | 0.74 | 6.93 | 40.76 |
| 2000 | 29.96 | 270.00 | 5.50 | 0.75 | 7.67 | 56.62 |
| 2001 | 28.52 | 293.00 | 5.30 | 0.79 | 7.42 | 55.29 |
| AGR (%) | 3.09 | -0.53 | 3.79 | 4.16 | -2.97 | 3.29 |

Source: http://agrolink.moa.my/jph/dvs/statistics
AGR – Author's own calculation.

The self-sufficiency levels (SSL) for the livestock products are shown in the Table 4.4. Malaysia is more than self-sufficient in poultry, eggs and pork and the excess live poultry, eggs and poultry meat are exported largely to Singapore. However, Malaysia is still far from self-sufficiency in beef, mutton and milk.

**Table 4.4 Self-sufficiency levels for livestock products in Peninsular Malaysia**

| Year | Poultry (%) | Eggs (%) | Beef (%) | Mutton (%) | Pork (%) | Milk (%) |
|---|---|---|---|---|---|---|
| 1990 | 117.64 | 111.00 | 24.07 | 9.03 | 131.45 | 4.66 |
| 1991 | 119.57 | 113.44 | 22.31 | 9.04 | 135.38 | 3.23 |
| 1992 | 115.22 | 111.91 | 22.75 | 7.28 | 137.03 | 3.49 |
| 1993 | 115.17 | 112.17 | 22.04 | 6.87 | 140.21 | 4.01 |
| 1994 | 114.65 | 113.05 | 19.52 | 6.48 | 139.36 | 5.77 |
| 1995 | 111.44 | 112.37 | 19.73 | 4.84 | 141.77 | 3.69 |
| 1996 | 139.20 | 120.10 | 17.69 | 3.70 | 139.20 | 5.04 |
| 1997 | 116.93 | 104.23 | 16.54 | 3.92 | 135.20 | 4.34 |
| 1998 | 117.69 | 108.76 | 19.43 | 5.58 | 137.16 | 4.46 |
| 1999 | 120.21 | 109.40 | 20.96 | 6.21 | 109.33 | 3.31 |
| 2000 | 117.78 | 118.70 | 16.69 | 6.07 | 99.16 | 2.38 |
| 2001 | 124.24 | 108.31 | 17.97 | 5.92 | 102.02 | 2.56 |

Source: http://agrolink.moa.my/jph/dvs/statistics.

During the Avian flu outbreak in January 2004 that affected farms in neighbouring countries, poultry consumption in Malaysia also declined due to fear among the consumers. As a result, it has been reported that about 400 small poultry farms in Malaysia might be forced out of business. During this period it was reported in a local daily newspaper that the estimated annual production of the poultry industry was 330 million broilers, 5.5 billion eggs and 330 million day-old-chicks valued at RM 6 billion (The Star, 31 January 2004).

The swine industry contributed about RM 1.3 billion of the output value in 1995. However, in 2000 the outbreak of the Nipah virus reduced this figure to RM 0.96 billion or 20 per cent of the total output value. After 2000, the number of small swine farms (swine population of less than 1,000; contributing about 10 per cent of swine production) is on the decline due to the inability of the small farms to implement pollution control measures that comply with the environmental standards instituted by the government. Per capita consumption of pork is on the decline; from 10.4 kg in 1995 to 7.7 kg in 2000 and to 7.4 kg in 2001 and is a major component in the diet of about 30 per cent of the Malaysian population. The SSL in 1995 was 142 per cent and the surplus amount was exported to Singapore. However, the SSL dropped in 2000 to 99 per cent due to the massive culling of pigs during the Nipah virus outbreak in 2000. In 2003, SSL climbed back up to 100 per cent and is expected to remain there in 2005. In 2003, the estimated value of the swine industry was RM 1.22 billion.

It is small and medium sized farms that largely undertake beef and mutton production and in 2000 their output value was about RM 206 million and RM 14 million respectively. Per capita consumption of beef and mutton in 2000 was 5.5 kg and 0.75 kg respectively. In 2001, per capita consumption for beef marginally fell to 5.3 kg but mutton consumption rose slightly to 0.79 kg. The SSL of beef and mutton in 2000 was 17 per cent and 6 per cent respectively, rising to 22 per cent for beef and 8 per cent for mutton in 2003. The estimated value of beef production in 2003 was RM 384 million and for mutton RM 21 million. Currently, 78 per cent of the domestic demand for beef and 92 per cent for mutton are met by imports.

## 4.2 Aquaculture and inland fisheries

In 1995, fish output was about RM 3.2 billion. Inshore fisheries accounted for 78.1 per cent of total fish production, while deep-sea fishing and aquaculture contributed about 11.2 per cent and 10.7 per cent respectively. In 2001, total fish production was estimated at 1.4 million tons valued at RM 5.45 billion. Inshore fisheries have remained the major contributor but the percentage contribution has declined to 75.5 per cent. During the 2000-2003 period, the fisheries sub-sector recorded an increase in production with aquaculture activity achieving the highest annual growth rate of 18.9 per cent. The production of aquaculture increased from 117,000 tons in 2000 to 197,000 tons in 2003 while marine catch recorded an annual growth

rate of 4 per cent over the same period. The SSL for fish in 2000 was 89 per cent and in 2003, 90 per cent.

The average per capita consumption of fish in Malaysia is higher than poultry at 53 kg. This is due to Malaysia's long history of dependence on fish as a major protein source. Malaysia is not self-sufficient in the production of fish and has to import from neighbouring countries. Strong demand from overseas markets for high-value, fresh fish will undoubtedly stimulate the growth of local aquaculture activities. The government is also promoting large-scale expansion of aquaculture activities through gazetted Aquaculture Industrial Zones (AIZs) and towards this end, an additional 4,500 hectares will be developed as AIZs in several states.

## 4.3 Utilization of feed crops and feed ingredients

There are many feed ingredients used in prepared animal feeds for non-ruminants and most of these ingredients are imported. The major ingredients in poultry feed include maize (42-50 per cent), soybean meal (25-32 per cent), rice bran (7-16 per cent) and fish meal (5 per cent). The major ingredients in swine feed include maize (40-45 per cent), soybean meal (15-30 per cent), rice bran (12 per cent) and wheat pollard (5-10 per cent). The export and import of feed ingredients (quantity and value) from 1989 to 2001 are shown in the Appendix in Tables 1 to 23.

Grain maize is the clear favourite among feed millers because it is relatively cheap; it has good nutritional value in terms of high energy content, high metabolizable energy and high starch digestibility; the fibre content is low (critical for poultry feeds); it is rich in xanthophylls (which imparts a rich yellow colour to egg yolks and golden yellow tinge to meat); it has very low variability in quality and it is easy to handle and transport as dry grain. The major setback of grain maize is the low protein content, particularly lysine. However, this is replenished through the addition of soybean meal and fish meal in the feeds. The importation of grain maize for feed is on the increase and data from 1989 to 2001 showed that the annual growth rate is 4.5 per cent.

Soybean meal is of great importance in this feed balancing process because it is high in essential amino acids and lysine in particular. Soybean contains 21 per cent oil and 40 per cent protein. Soybean meal is produced from crushed soybeans and provides the high-protein content of feed rations for poultry and swine. Data from 1989 to 2001 showed that the quantity of soybean and soybean meal imported is growing at annual rates of 5.3 per cent and 11.6 per cent respectively. Fish meal and meat meal are also able to compete with soybean meal for a share of the animal feeds. In Malaysia, the importation of fish meal is in decline. The data regarding the importation of meat meal showed an increasing trend, but the latest development is that it is no longer in use due to the prevalence of Mad Cow disease.

The minor ingredients imported include groundnut cake, oil cakes of coconut and rapeseed, broken rice, cassava refuse, meat and bone meal, wheat pollard, mineral sources, and other micro-ingredients. However, the importation of these ingredients is on the decline, except for cassava refuse and broken rice. The importation of other preparations used in animal feeding is on the increase. The locally produced ingredients include soybean meal, fish meal, cassava refuse, rice bran, broken rice and wheat pollard but the amount produced (with the exception of wheat pollard) is still insufficient to meet the requirements of the animal feed industry.

In the case of ruminant feeds (dairy, beef, goats and sheep), locally produced feedstuffs are predominantly used. Experiments on oil palm fronds (OPF) based feed have shown that it is superior in nutritive value when compared to conventional feeds based on native grasses (Abu Bakar *et al*., 2001). Palm kernel cake (PKC), palm oil mill effluent (POME), also called sludge and brewers grains, are among the major ingredients used. Other ingredients used include rice husk, molasses, copra cake, pineapple waste, cassava refuse, cocoa meal, rubber seed meal, oyster shells and native grasses. While improved pastures are better than native grasses for cattle feeding, establishing and maintaining them in Malaysia has been found to be

uneconomical. Kenaf was tried on an experimental basis in Kluang, Johor, and found to be comparable cost-wise to that of Guinea grass if fed at the farm. However, if it is dried and turned into pellets then it becomes non-viable economically due to the high drying cost.

## 4.4 Historical growth in consumption and production of feedstuffs and feed crops

Maize and soybean meal are the major ingredients imported for the prepared animal feed industry. During 2000-2003, significant changes occurred in the importation and subsequent consumption of feedstuffs. In 2000, imports of feeding stuffs totaled RM 0.9 billion which constituted only 8.3 per cent of the RM 11.4 billion of total imports of food commodities. In 2003, imports of feeding stuffs jumped to RM 2.2 billion constituting about 17.2 per cent of the RM 13 billion of total imports of food commodities, thereby becoming the new leader (Mid-Term Review). About 50 per cent of the imported value of feeding stuffs was for grain maize, 24-26 per cent for soybean and another 20-23 per cent for soybean meal. The remainder consists of other oil cakes, rice bran, broken rice, cassava refuse etc. The prepared animal feed industry also exports its products. In 2000, the value of exports was RM 375.3 million, increasing to RM 515 million in 2003. The total export value for food in 2000 was RM 6.4 billion, increasing in 2003 to RM 8 billion.

The imports of feedstuffs from 1989 to 2001 are given in the Appendix in Tables 1 to 23. Some of the feedstuffs are re-exported to neighbouring countries in the region. As can be seen in the tables, maize, soybean and soybean meal are the major commodities imported for the animal feed industry.

Locally produced soybean meal contributes about 50 per cent of the total requirement, while locally produced fish meal about 17 per cent. Local fish meal production is irregular and is of poor quality and thus, not preferred by local feed millers. The contribution from other locally produced feedstuffs is minimal and the industry continues to import substantial amounts for the non-ruminant feeds.

Another locally produced feedstuff is a by-product from oil palm mills known PKC. It is becoming a popular ingredient in ruminant feeds. In 2002, Malaysia exported 1.5 million tons of PKC valued at RM 285.5 million (US$ 75 million). About 84 per cent went to the European Union with the rest going to Republic of Korea, Australia, New Zealand, Viet Nam and Japan. PKC as an ingredient for poultry feed is still at the research stage.

## 4.5 Agro-industrial and feedstuff processing industries and policies

The feed milling industry developed in parallel with the development of the swine and poultry industry. Commercial feed millers started their operations more than fourty years ago and currently there are 47 feed mills operating in Malaysia with 38 located in Peninsular Malaysia and 9 located in Sabah and Sarawak. There are also home mixers producing 275,000 metric tons annually (Raghavan, 2000). The latest development is towards an integrated poultry operation where the business incorporates feed milling, hatcheries, contract farming, the production of broilers and layers to eggs, poultry processing and a marketing network. There are a few top integrators in Malaysia and they are usually large companies listed on the Stock Exchange of Malaysia or Bursa Malaysia.

Progressing over the years with the development of science in animal nutrition, the formulation of feeds has developed to a high level of specificity for various types of animals and for various growth stages. Specific poultry feeds are tailored for hatchling starters, finishers, layers, breeders, breeder starters and breeder growers. The feeds enhance the growth of broilers, reduce their marketing days and bring more economic returns to the farmer. Similarly for layers, the feeds improve the overall performance of the bird. For swine feeds too, there are specific

feeds for breeders, pre-starters, starters and growers based on specific formulations to enhance their performance.

With regards to food quality, feed millers are required to establish and implement a sound quality assurance program that meets the nutritional specifications and all statutory standards. General principles of food hygiene and the Hazard Analysis Critical Control Points (HACCP) principles offer suitable approaches to quality assurance of feed. To ensure food safety, feed millers must pay more attention on the usage and levels of drugs in feed to make sure that no residues of such drugs are found in the meat, eggs or milk consumed.

The government recognizes the high cost of producing local raw materials for feedstuffs and thus, does not restrict their importation by enforcing draconian import duties. Public funded R&D on alternative feed sources from new materials and agricultural by-products is being given priority. Also, offshore production of raw materials for feed production is to be encouraged.

## 4.6 Agricultural policies

The Third National Agricultural Policy (NAP3) covers the period 1998 to 2010 and seeks to provide the gradual but effective transformation of the agricultural and forestry sectors. The policy retains the objective of the Second National Agricultural Policy to maximize income through the optimal utilization of resources in the sector. This includes maximizing agriculture's contribution to national income and export earnings as well as maximizing the income of producers. Specifically, the objectives of the policy are:

a. Enhance food security;
b. Increase productivity and competitiveness of the sector;
c. Deepen linkages with other sectors;
d. Create new sources of growth for the sector; and
e. Conserve and utilize natural resources on a sustainable basis.

The objectives will be achieved through two new approaches to agricultural development. The first is the agroforestry approach, which aims at addressing the increasingly scarce resources including land and raw material availability. The agroforestry approach views agriculture and forestry as mutually compatible and complementary and therefore provides a scope for joint development that can bring about mutual benefits. This strategy is also consonant with sustainable agricultural practices. The second new approach is the product-based approach, which is to reinforce and complement the cluster-based agro-industrial development as identified in the Second Industrial Master Plan (IMP2), 1996-2005. In this approach, key products and markets are identified based on market demand, preferences and potential. This market demand and these preferences are translated into strategies for upstream primary agricultural production to enhance the production and marketing of agricultural and forestry products.

### 4.6.1 Production policies

Under NAP3, feed crops fall under the 'other economic crops product' group. The policy directions state that where viable, production of commodities will be encouraged for import substitution and for supplying quality raw materials for the further development of downstream activities. R&D and necessary support will be further provided to enhance the development of higher value-added products. Reverse investment will be encouraged to secure the adequate supply of quality raw materials to take advantage of cheaper production costs in other countries.

The current package of incentives for the promotion of investment in food production and the new emerging areas of agriculture and agriculture related activities will be continued. Soft loans will continue to be provided to critical areas such as food production, mechanization and automation, commercialization of agricultural R&D outputs, and Bumiputera participation

in commercial agriculture. The participation of state governments in making land available and the provision of incentives are expected to increase the participation of the private sector in large-scale food production.

### 4.6.2 Price policies

The government gives rice producers a very attractive package in the form of a Guaranteed Minimum Price (GMP) for the output, a fertilizer subsidy that ranges between 10 and 50 per cent of the fertilizer price and reduced irrigation rates. However, the GMP is not extended to other commodities and thus, the forces of supply and demand determine the output prices of other commodities. Nevertheless, for poultry, the government imposes a ceiling price to curtail poultry prices. For the benefit of consumers, the Ministry of Domestic Trade and Industry are the enforcement agency that not only monitor the price of live poultry and poultry meat but also the prices of essential food items especially during festive seasons to ensure that the general price level remains low. In addition, efforts are made to ensure that the growth of money supply is consistent with price stability.

## 4.7 General marketing and trade policies

External trade is of great importance to the development of the Malaysian economy and Malaysia places high importance on a strong, open and viable trading system (General Agreement on Tariff and Trade (GATT) 1993). The main objectives of Malaysia's trade policies are:

i) Improved market access for Malaysia's exports of primary commodities and manufactured products;
ii) The development and promotion of higher value-added exports and resource based products;
iii) Expansion of trade with major trading countries;
iv) Diversification of trade into non-traditional markets, particularly developing countries;
v) Strengthening of intra-ASEAN trade through closer economic and trade cooperation; and
vi) Expansion of trade and investment links with the East Asian region.

A few sub-sectors in agriculture are still protected. Rice is one of them, and under livestock there are three sub-sectors accorded protection. They include the poultry industry covering products such as live poultry; fresh, chilled or frozen meat; as well as poultry eggs. Products are bound at rates of 23 per cent to 85 per cent. However, currently the applied rate of duty is zero. Nevertheless, minimum market access of 3 per cent of domestic consumption is now allowed increasing to 5 per cent in 2004. Second is the swine industry, which includes live swine and meat of swine, and the duty bound rates range from 23 to 139 per cent. Third is fresh milk that is bound at a rate of 6 per cent.

### 4.7.1 Monetary and exchange rate policies

The sharp depreciation of the Malaysian Ringgit in 1998 as a result of the Asian financial crisis resulted in higher consumer and producer prices and thus, inflation became a concern of the government. During the 2001 to 2005 period plan, the government is to ensure that the growth of money supply is consistent with price stability and adopt a prudent fiscal policy. Efforts are being made to further strengthen the financial sector and upgrade its risk-management capacity, develop a deeper and broader capital market, and build a more robust corporate sector with high standards of corporate governance. Strong economic fundamentals such as a stable exchange rate (pegged at RM 3.8 to US$ 1), a sufficiently high level of savings, strong external accounts with high external reserves as well as a manageable fiscal deficit and a

sustainable level of debt are needed. Sound economic management and the setting up of an early warning system will be important to reduce the negative impacts of external shocks whenever they occur.

### 4.7.2 State trading enterprise

The Federal Agricultural Marketing Authority (FAMA), was set up under the Ministry of Agriculture to strengthen the marketing and distributive channels for agricultural produce. The produce includes horticultural products, fruits and flowers. FAMA has established 43 Farm Collection Centres and four National Food Terminals that undertake a whole range of post-harvest activities including collection, grading, certification, packaging and downstream distribution. The goal is to ensure stable and fair prices and greater value added for smallholder produce as well as the adequate supply of food to consumers at reasonable prices. The ongoing contract farming and strategic arrangements with major supermarkets will also continue.

### 4.7.3 Policy reforms initiative

Under the Mid-Term Review of the Eighth Malaysia Plan, the overall policy focus will be to reposition Malaysia to be better placed to meet the challenges arising from the changing economic landscape as well as secure the opportunities that arise. Malaysia is to further strengthen its economic fundamentals, enhance its competitiveness and continue to peg its currency without causing distortions.

Malaysia is currently at a turning point of disengaging itself from labour-intensive and low technology products to high technology and knowledge-based economic activities. Although the transition began in the mid-1990s, it was hampered by the Asian financial crisis and the subsequent sluggish growth of the economy. The government has established the policy framework for this transformation under the Third Outline Perspective Plan (OPP3), Knowledge-based Economy Master Plan (KEMP) and IMP2. To enhance the innovative and technological capacity and capability, the Science and Technology Policy II will also be implemented.

# 5. Demand for Feedstuffs and Feed Crops

## 5.1 Consumption structure and characteristics

The consumption of feeding stuffs by non-ruminants is predominantly maize (50 per cent of the import value for animal feeds), and soybean meal (23 per cent). The remainder is rice bran, broken rice, copra cake, groundnut cake, rapeseed cake, cassava flakes and pearls, wheat pollard, fishmeal and other residues. About 95 per cent of the feedstuffs used in non-ruminant feeds are imported. Thus, fluctuations in the world's prices of the feedstuffs have a significant influence on their use.

The consumption of feeding stuffs by ruminants is largely fresh forages (native grasses), concentrates and by-products of oil palm such as PKC, OPF and POME. PKC contains 15-17 per cent crude protein and 16 per cent crude fibre and has been successfully used as a ruminant feed. In 2002, about 1.7 million tons of PKC was produced, of which 90 per cent was exported.

## 5.2 Consumer price behaviour

Consumers of feedstuffs are largely feed millers/integrators and to a smaller extent home mixers. Since most of the feedstuffs are imported, their prices are determined by supply and demand in the world market. Large feed millers or integrators have the financial strength to undertake contract or forward buying of feeding stuffs to avoid wide variations in price increments. At the same time, in the formulation of feeds, the use of sophisticated software to program the least-cost combination of feedstuffs without compromising the nutritional quality of the feeds adds advantage in terms of price and production efficiencies. Small, independent livestock producers and home mixers are subjected to a very tough, competitive environment. They have to be efficient producers, failing which they will be out of the business.

The consumers of poultry products are protected by the ceiling price imposed by the government. The retail price of poultry products fluctuates mildly below the ceiling price. The enforcement officers of the Ministry of Domestic Trade and Consumer Affairs strictly monitor the price of food items and retailers are required to display the prices and use double-faced weighing machines.

## 5.3 Response to government policies and market and non-market forces

The response towards government policies has been good as reflected by the move towards bigger and more efficient poultry and swine producers that are able to compete in the world market. Nevertheless, there are smallholders rearing poultry and swine for the domestic market and the Department of Veterinary Services (DVS) continues to monitor their performance and provide assistance whenever necessary. As the domestic market is almost saturated, increasing demand for poultry products from Brunei Darussalam, Hong Kong and Singapore is an added booster to the poultry industry in terms of market expansion.

## 5.4 Development of products

Deboned meat and special cuts of poultry with attractive packaging and improved marketing strategies have brought much success to processors and retailers. The development of various products from poultry such as ready-to-eat nuggets, burgers, sausages, frankfurters,

bologna, pepperoni and salami encouraged further the development of the small- and medium-scale meat processing factories. The presence of supermarkets and hypermarkets has further boosted the marketing of these poultry products. To those that prefer eating out, retail outlets such as Kentucky Fried Chicken (KFC), Kenny Rogers, Marybrown, A&W, Satay and Chicken Rice have been very successful in promoting their products to capture this segment of the market.

## 5.5 Projections to 2015

The results of the model are presented below:

Maize for domestic food demand

$$\underset{}{\text{LogMfood}_t} = \underset{}{3.5249} - \underset{(-1.0853)}{0.5723}\text{LogPPM}_t - \underset{(-2.2827^*)}{0.7083}\text{LogPMF}_t + \underset{(0.7125)}{1.5026}\text{LogPCI}_t + \underset{(0.9598)}{0.455}\text{LogAR}(2)$$

$R^2 = 0.6751$
DW = 1.9595
t-statistic in parenthesis
* significant at 5 per cent level

Where,

$\text{Mfood}_t$ = Quantity of maize demanded for food in year t (tons)

$\text{PPM}_t$ = Producer price of maize for food in year t (RM/t)

$\text{PMF}_t$ = Price of maize flake in year t (RM/t)

$\text{PCI}_t$ = Per capita income in year t (RM)

$\text{AR}(2)$ = Autoregressive variable lagged 2 periods

The above model uses 15 years of data from 1986 to 2000 and the Ordinary Least Squares (OLS) regression was used to run the model. The quantity of maize demanded for food was regressed against three independent variables as specified in the model formulation i.e. producer price of maize, price of maize flake and per capita income using the linear form and log-linear form. The model is modified by regressing the quantity of maize demanded against the three independent variables above and the autoregressive variable lagged 2 periods using the log-linear form. The results show that 68 per cent of the variation in the quantity of maize demanded for food is explained by the above variables. The negative signs obtained for the producer price of maize and the price of maize flakes follow the a priori expectations. As this model is in log form the coefficients of the independent variables are the elasticities. A one per cent decrease (increase) in the producer price of maize would lead to a 0.57 per cent increase (decrease) in quantity demanded. The own price elasticity of maize for food is inelastic. A one per cent decrease (increase) in the price of maize flakes would lead to a 0.71 per cent increase (decrease) in the quantity demanded. Similarly, it is inelastic for maize for food w.r.t. the price of maize flakes. In terms of income elasticity, it is very elastic, i.e. a one per cent increase (decrease) in income would lead to about a 1.5 per cent increase (decrease) in the quantity of maize for food.

Using the elasticities from the results above, and the growth rates of the three variables, a forecast of the demand of maize for food in terms of value (RM) and quantity (metric tons) was calculated and is given in Table 5.1. The forecast of the demand of maize for food in 2015 is 27,308 tons valued at RM 42 million (US$ 11.05 million).

**Table 5.1 Forecast of the demand for maize as food (2005-2015)**

| Years | Demand for maize as food (RM @ RM 1539/t) | Demand for maize as food (MT) |
|---|---|---|
| 2005 | 23,671,359 | 15,381 |
| 2006 | 25,070,310 | 16,290 |
| 2007 | 26,552,367 | 17,253 |
| 2008 | 28,120,608 | 18,272 |
| 2009 | 29,781,189 | 19,351 |
| 2010 | 31,541,805 | 20,495 |
| 2011 | 33,405,534 | 21,706 |
| 2012 | 35,378,532 | 22,988 |
| 2013 | 37,468,494 | 24,346 |
| 2014 | 39,683,115 | 25,785 |
| 2015 | 42,027,012 | 27,308 |

Source: Author's own calculation.

Maize for domestic feed demand

$$\underset{}{\log Mfeed_t} = \underset{}{16.7563} - \underset{(-0.478)}{0.1972}\log PGM_t - \underset{(-0.2819)}{0.1381}\log PPFeed_t + \underset{(0.7961)}{0.2812}\log AR(1) + \underset{(1.2859)}{0.5076}\log AR(2)$$

$R^2 = 0.7906$
DW = 2.2607
t-statistic in parenthesis

Where,

$Mfeed_t$ = Quantity of maize demanded for feed in year t (tons)

$PGM_t$ = Price of imported grain maize in year t (RM/ton)

$PPFeed_t$ = Price of prepared feed in year t (RM/ton)

$AR(1)$ = Autoregressive variables lagged one period

$AR(2)$ = Autoregressive variables lagged two periods

The above model uses 12 years of data from 1989 to 2000 and the OLS regression was used to run the model. The above model was accepted after several runs using the linear and the log-linear forms. The results show that the log-linear form is better where the quantity of maize demanded for feed is dependent on the price of imported maize, the price of prepared feed, and the autoregressive variables lagged 1 and 2 years. The results show that 79 per cent of the variation in the quantity of maize demanded for feed is explained by the above variables. The sign obtained for the price of imported maize is negative and follows the a priori expectations. As this model is also in log form the coefficients of the independent variables are the elasticities. A one per cent decrease (increase) in the price of imported maize would lead to a 0.19 per cent increase (decrease) in the quantity of maize demanded. As the coefficient is less than one, the demand for maize as feed is inelastic. Similarly, a one per cent decrease (increase) in the price of prepared feeds leads to a 0.14 per cent increase (decrease) in the quantity of maize demanded. Also, the quantity of maize demanded in the previous one and two years has a positive influence on the current quantity of maize demanded.

Using the forecasting method described earlier, the demand for maize as feed from the year 2005 until 2015 was calculated. This is shown in Table 5.2. The results for 2010 indicate that the demand for maize as feed will be 2.69 million tons increasing in 2015 to 2.78 million tons. Based on the current (2004) import price of RM 790 per tons, the import values for maize in 2010 and 2015 will be RM 2.12 billion (US$ 0.56 billion) and RM 2.20 billion (US$ 0.58 billion) respectively.

**Table 5.2 Forecast of the demand for maize as feed (2005-2015)**

| Year | Demand for maize as feed (RM @ RM 790/t) | Demand for maize as feed (MT) |
|---|---|---|
| 2005 | 2,056,102,980 | 2,602,662 |
| 2006 | 2,069,676,760 | 2,619,844 |
| 2007 | 2,083,339,810 | 2,637,139 |
| 2008 | 2,097,092,920 | 2,654,548 |
| 2009 | 2,110,936,880 | 2,672,072 |
| 2010 | 2,124,872,480 | 2,689,712 |
| 2011 | 2,138,899,720 | 2,707,468 |
| 2012 | 2,153,019,390 | 2,725,341 |
| 2013 | 2,167,233,070 | 2,743,333 |
| 2014 | 2,181,539,970 | 2,761,443 |
| 2015 | 2,195,940,880 | 2,779,672 |

Source: Author's own calculation.

Soybean meal for domestic feed demand

$$\underset{}{\text{LogSBM}_t} = \underset{}{-30.3077} \underset{(-1.2847)}{- 0.1499\text{LogPSBM}_t} \underset{(8.8768)}{+ 1.5209\text{LogPGM}_t} \underset{(33.5016)}{+ 2.6526\text{LogPP}_t} \underset{(-0.0441)}{- 0.0042\text{LogPFM}_t} \underset{(-3.8394)}{- 1.3881\text{AR}(1)} \underset{(-2.2682)}{- 0.7978\text{AR}(2)}$$

$R^2 = 0.9876$
DW = 2.6291
t-statistic in parenthesis

Where,

$\text{SBM}_t$ = Quantity of soybean meal demanded for feed in year t (tons)

$\text{PSBM}_t$ = Price of imported soybean meal in year t (RM/t)

$\text{PGM}_t$ = Price of imported grain maize in year t (RM/t)

$\text{PP}_t$ = Poultry production in year t (MT)

$\text{PFM}_t$ = Price of imported fish meal

$\text{AR}(1)$ = Autoregressive variables lagged one period

$\text{AR}(2)$ = Autoregressive variables lagged two periods

The above model uses 12 years of data from 1989 to 2000 and the OLS regression was used to run the model. The model was accepted after several runs using the linear and the log-linear forms. The results in the log-linear form show that the quantity of soybean meal demanded for feed is dependent on the price of imported soybean meal, the price of imported grain maize, poultry production, the price of imported fish meal, and the autoregressive variables lagged 1 and 2 years. The results show that 99 per cent of the variations in the quantity of soybean meal demanded for feed is explained by the above variables. The sign obtained for the price of imported soybean meal is negative and follows the a priori expectations. As this model is also in log form the coefficients of the independent variables are the elasticities. A one per cent decrease (increase) in the price of imported soybean meal would lead to a 0.15 per cent increase (decrease) in the quantity of soybean meal demanded. As the coefficient is less than one, the demand for soybean meal as feed is inelastic. However, a one per cent increase (decrease) in the price of imported grain maize leads to a 1.52 per cent increase (decrease) in the quantity of soybean meal demanded. Also, a one per cent increase (decrease) in poultry production leads to a 2.65 per cent increase (decrease) in the quantity of soybean meal demanded. A one per cent decrease (increase) in the price of imported fish meal leads to a negligible change in the quantity of soybean meal demanded.

The forecasting method described was previously used to forecast the demand of soybean meal for feed. The forecast will be in terms of value (RM) and quantity (metric tons) from 2005 to 2015. In 2005, the demand of soybean meal for feed is valued at RM 485 million (US$ 128 million) and about 603 thousand tons. In 2015, demand is expected to be RM 858 million (US$ 225.8 million) and the quantity 1.07 million metric tons. This is shown in Table 5.3.

**Table 5.3 Forecast of the demand for soybean meal as feed (2005-2015)**

| Year | Demand for soybean meal as feed (RM @ RM 804/t) | Demand for soybean meal as feed (MT) |
|---|---|---|
| 2005 | 485,055,612 | 603,303 |
| 2006 | 513,549,372 | 638,743 |
| 2007 | 543,716,256 | 676,264 |
| 2008 | 575,655,960 | 715,990 |
| 2009 | 609,471,396 | 758,049 |
| 2010 | 645,272,712 | 802,578 |
| 2011 | 683,178,096 | 849,724 |
| 2012 | 723,309,756 | 899,639 |
| 2013 | 765,798,744 | 952,486 |
| 2014 | 810,783,348 | 1,008,437 |
| 2015 | 858,411,504 | 1,067,676 |

Source: Authors' own calculation.

Soybean for domestic food and feed demand

$$\underset{}{\text{LogSB}_t} = \underset{}{-21.2447} - \underset{(-1.4474)}{0.3446\text{LogPSB}_t} + \underset{(2.0332)}{2.6488\text{LogPOP}_t} - \underset{(-1.3338)}{0.9131\text{LogPCI}_t}$$

$R^2 = 0.4366$
DW = 1.9797
t-statistic in parenthesis

Where,

$SB_t$ = Demand of soybean in year t (MT)

$PSB_t$ = Price of imported soybean in year t (RM/t)

$POP_t$ = Population (nos)

$PCI_t$ = Per capita income in year t (RM)

The above model also uses 12 years of data from 1989 to 2000 and the OLS regression to run the model. The results in the log-linear form show that the quantity of soybean demanded for food and feed is dependent on the price of imported soybean, the population and per capita income. The results show that 44 per cent of the variation in the quantity of soybean demanded for food and feed is explained by the above variables. The sign obtained for the price of imported soybean is negative and follows the a priori expectations. As this model is in log form the coefficients of the independent variables are the elasticities. A one per cent decrease (increase) in the price of imported soybean would lead to a 0.34 per cent increase (decrease) in the quantity of soybean demanded. As the coefficient is less than one, the demand for soybean is inelastic. However, a one per cent increase (decrease) in the population leads to a 2.65 per cent increase (decrease) in the quantity of soybean demanded. A one per cent decrease (increase) in per capita income leads to a 0.91 increase (decrease) in the quantity of soybean demanded.

The forecasting method described earlier was used to forecast the demand for soybean as food and feed from 2005 to 2015. The current market price of soybean is about RM 1,330 per

ton and this price was used to forecast the values in the years ahead. In 2015, the demand of soybean for food and feed will be about 761 thousand tons worth about RM 1.01 billion (US$ 0.27 billion). This is shown in Table 5.4.

**Table 5.4 Forecast of the demand for soybean as food and feed (2005-2015)**

| Year | Demand for soybean as food and feed (RM @ RM 1330/t) | Demand for soybean as food and feed (MT) |
|---|---|---|
| 2005 | 911,676,430 | 685,471 |
| 2006 | 921,249,770 | 692,669 |
| 2007 | 930,922,860 | 699,942 |
| 2008 | 940,697,030 | 707,291 |
| 2009 | 950,574,940 | 714,718 |
| 2010 | 960,555,260 | 722,222 |
| 2011 | 970,641,980 | 729,806 |
| 2012 | 980,833,770 | 737,469 |
| 2013 | 991,131,960 | 745,212 |
| 2014 | 1,001,539,210 | 753,037 |
| 2015 | 1,012,055,520 | 760,944 |

Source: Authors' own calculation.

# 6. Supply of Feedstuffs and Feed Crops

## 6.1 Production structure and characteristics

The supply of feeding stuffs to the non-ruminant industry is through importation. The major imported feeding stuffs are maize, soybean and soybean meal. The sources of supply for maize, soybean and soybean meal are open to all countries in the world as long as they offer competitive prices with good and consistent quality. Malaysia's imports of soybean are not only for food but also to produce soybean oil and thereby obtain soybean meal as a by-product.

The supply of feeding stuffs for ruminants is native grasses from idle land or open fields and by-products from the oil palm industry. PKC, POME and OPF are the major products from this sector. PKC and POME are by-products from the oil palm mills, while OPF is obtained from plantations. Guinea grasses are usually planted by government agencies such as the DVS, Department of Agriculture (DOA), MARDI and also universities. Smallholders do not plant grasses but harvest them from the wild, on plantations or from idle land.

## 6.2 Producer price behaviour

### 6.2.1 Feed crop prices

As there are currently no feed crops grown in the country, there is no established market for them. Experience has shown that prices of feed crops such as maize or cassava are usually not as competitive as the imported feedstuffs. As feed costs constitute about 75 per cent of the cost of production, livestock producers are continually trying to minimize feed costs. As a result, domestic feed crop producers continue to face restricted upward price movement for their output against the rising costs of production. Thus, profits from feed crops are very thin and not attractive. Farmers are better off producing food crops where there is ready market, better output prices and better profits are realized.

### 6.2.2 Product prices

There is currently no record of product prices for feed crops. In the past, the production of cassava lead to starch production and the refuse obtained from the process was used as swine feed. The price of cassava refuse is not as competitive as the price of the imported cassava refuse and Thailand still offers the best supply of cassava products at competitive prices.

## 6.3 Response to government policies and market and non-market forces

During 2001-2003, the Ministry of Agriculture received a total of 156 project proposals (113 in aquaculture, 29 for food crops and 14 for livestock). This is due largely to the inclusion of the food sector as a promoted sector in the Promotion of Investments Act 1986. Under the act, investors are given incentives such as pioneer status, investment tax allowances and reinvestment allowances. There are however, no project proposals for feed crops.

## 6.4 Development of farming technologies and production arrangements

The Rice and Industrial Crops Research Centre of MARDI conducts research on food and feed crops such as maize, cassava and groundnut. Although research emphasis is on food crops such as rice, other food and feed crops are also researched. There exist High Yielding Varieties (HYV) of maize and cassava developed by the scientists at MARDI. Among the grain maize are Suwan 1 (4t/ha) and Suwan 3 (4.5t/ha) and among the sweet corn are Thai Supersweet (13t/ha), Manis Madu (13t/ha) and Masmadu (17t/ha) (Zaharah H., 1992). It should be noted that yields quoted for grain maize are in dried form while the yields for sweet corn are in wet form. In the case of cassava, Black Twig is the popular variety for starch production and Medan for food. Lately the Sri Kanji 1 and Sri Kanji 2 have had up to 27 per cent more starch than Black Twig and the edible Sri Pontian outperformed the Medan variety by more than 30 per cent in yield. These varieties can be obtained directly by smallholders from MARDI or through the extension agents under DOA.

## 6.5 Projections to 2015

The results of the model are presented below:

Maize for food domestic supply

$$\underset{}{\text{LogMS}_t} = \underset{}{-4.4033} + \underset{(9.073^{**})}{1.078\text{LogMA}_t} + \underset{(3.187^{*})}{0.3283\text{LogPPM}_t} + \underset{(1.979)}{0.2369\text{LogMA}_{t-1}} - \underset{(-0.824)}{0.4929\text{LogAR}(1)} + \underset{(0.623)}{0.2178\text{LogAR}(2)} + \underset{(0.925)}{0.3120\text{LogAR}(3)}$$

Adjusted $R^2 = 0.9032$
DW = 2.283
t-statistic in parenthesis
* significant at 5 per cent level
** significant at 1 per cent level

Where,

$MS_t$ = Domestic maize production of food in year t (tons)

$PPM_t$ = Producer price of maize for food in year t (RM/t)

$MA_t$ = Domestic maize acreage for food in year t (ha)

$MA_{t-1}$ = Domestic maize acreage for food lagged 1 year (ha)

$AR(1)$ = Autoregressive variables lagged one period

$AR(2)$ = Autoregressive variables lagged two periods

$AR(3)$ = Autoregressive variables lagged three periods

The model uses 15 years of data from 1986 - 2000 to run the model using OLS. Domestic maize production was first regressed against three independent variables i.e. producer price, maize acreage and maize acreage lagged one year using log linear form. Then, several autoregressive variables were included in the model, and the results were better. About 90 per cent of the variation in the production of maize for food was explained by the producer price, maize for food acreage, maize for food acreage lagged one year and the autoregressive variables lagged 1 to 3 periods. The significant variables are maize acreage and the producer price of maize for food. The positive signs obtained for producer price, maize acreage and maize acreage

lagged one year are consistent with the a priori expectations. As this is a log form, the coefficient of the variable is also the elasticity. A one per cent increase (decrease) in the producer price will lead to a 0.33 per cent increase (decrease) in the production of maize for food. The 'own price' is inelastic. For maize acreage, a one per cent increase (decrease) in maize acreage results in a 1.08 per cent increase (decrease) in the production of maize for food.

Using the above model, a forecast of the supply of maize for food from 2005 - 2015 was made and is shown in Table 6.1. The results show that the supply of maize for food in 2010 will be 15,453 tons worth about RM 24 million (US$ 6.32 million) and for 2015 it will be 17,880 tons valued at RM 28 million (US$ 7.37 million).

**Table 6.1 Forecast of the supply of maize for food (2005-2015)**

| Year | Supply of maize for food (RM @ RM 1539/t) | Supply of maize for food (MT) |
|---|---|---|
| 2005 | 20,554,884 | 13,356 |
| 2006 | 21,162,789 | 13,751 |
| 2007 | 21,790,701 | 14,159 |
| 2008 | 22,435,542 | 14,578 |
| 2009 | 23,098,851 | 15,009 |
| 2010 | 23,782,167 | 15,453 |
| 2011 | 24,487,029 | 15,911 |
| 2012 | 25,211,898 | 16,382 |
| 2013 | 25,958,313 | 16,867 |
| 2014 | 26,726,274 | 17,366 |
| 2015 | 27,517,320 | 17,880 |

Source: Authors' own calculation.

# 7. Trading Feedstuffs and Feed Crops

## 7.1 Domestic and international trading

The domestic trading of feedstuffs is based primarily on imported feedstuffs among the livestock producers or feed millers. Feedstuffs are imported from all over the world and in the case of maize and soybean from as far away as Argentina. The produce of prepared animal feed and livestock products is traded domestically as well as internationally. As the domestic market is small, Malaysia must continue to explore new markets. Efforts need to be taken to strengthen international cooperation bilaterally with Malaysia's close neighbours and other countries as well as multilaterally within the framework of ASEAN, Asia-Pacific Economic Cooperation, Asia-Europe meeting, South-South Cooperation, Organization of the Islamic Conference, Commonwealth, Non-Aligned Movement, United Nations as well as other regional and international organizations. The formation of Free Trade Agreements (FTAs) allows Malaysia to pursue trade with selected countries in several areas including agriculture. The FTAs have been used as a trade policy tool to stimulate and accelerate the momentum of growth and specific trade agenda. Currently, the countries involved include China, Japan and ASEAN countries.

### 7.1.1 WTO

Malaysia remains committed to the multilateral trading system under the World Trade Organization (WTO). The agricultural sector have always been a contentious point between developed and developing nations in many previous trade negotiations. This is due to the fact that many developed countries heavily subsidize the sector and impose prohibitively high tariffs on agro-items of interest to developing countries. The WTO Agreement on Agriculture has three 'pillars' i.e. market access, domestic support and export subsidies. Under market access, non-tariff barriers must be converted to tariffs or tariffication, a minimum level of import access has to be allowed and there shall be Special Safeguards (SSG). Domestic support is divided into two parts: first the trade distorting issues such as price subsidies, input subsidies related to production and government purchases at guaranteed prices. Secondly, the non or minimally trade distorting issues such as R&D, advisory and extension services, physical infrastructure, pest control, training, inspection services, marketing and promotional services, direct payments/decouple income support. The two biggest spenders on domestic support are the USA and the European Union. The third pillar is export subsidies that are to be reduced.

In 2001, the WTO's Doha Ministerial meeting adopted a mandate for agricultural negotiations that called for the phasing out of export subsidies, a reduction in domestic subsidies and important reductions on tariffs in the North, with special and differential treatment for the South. Trade negotiations by the group of 20 developing countries demanded that the Doha mandate be preserved at the Fifth WTO Ministerial Conference in Cancun, September 2003. However, this failed because the developed countries brought to the table new issues labeled as the Singapore issues. Post-Cancun talks resumed in February 2004 and consensus was finally reached among WTO members to eliminate all forms of export subsidies by a target date and also to disallow any new subsidies. However, there are still other outstanding issues such as agricultural dumping and market concentration that has more damaging effects from the current trade rules.

Malaysia as a trading nation believes and practices an open trading system and external trade is highly important. Overall, Malaysia is one of the most liberalized countries in the region. Malaysia's offensive interest is in oil palm and cocoa while the defensive interest lies in

tobacco, rice, selected livestock and horticulture. The negotiating position for Malaysia is to emphasize the offensive interest while not sacrificing national concerns in agriculture.

## 7.2 Direction of trade

As a trading nation and an open economy, Malaysia has chosen to pursue bilateral and regional trading arrangements in order to:

- Maximize every opportunity available to enhance its economic growth; and
- Complement its pursuit of market access in the WTO.

In terms of feedstuffs and feed crops, Malaysia will continue to depend on imported maize, soybean and soybean meal for the livestock industry. China is the largest supplier of maize, followed by USA and Argentina. There are other smaller maize suppliers such as Thailand, Myanmar, France, Indonesia, United Arab Emirates, Netherlands, Belgium and Korea (Appendix Tables 24-27). Lately, India has begun offering maize after a long absence.

As for soybean, Argentina remained the top soybean supplier to Malaysia with a 44 per cent market share followed by the USA with 34 per cent. Other suppliers include China, Canada, Brazil and India (Appendix Tables 28-29). The competitively priced soybean and soybean meal from Argentina continue to be its strength compared to the USA

## 7.3 Export and import behaviour and structure

In its efforts to promote exports, Malaysia will continue to enhance its competitiveness, creating a niche in specific products, creating global brand names and venturing into non-traditional markets. The focus will be on a more efficient use of labour and capital as well as improvement in skills, technology and managerial capability, and greater application of information and communications technology (ICT).

### 7.3.1 Price behaviour

The price behavior of feedstuffs is not controlled by the government and thus, depends on market forces. The imported price of maize has always fluctuated and will continue to fluctuate but this will have little effect on the demand as there are few substitutes. The price for protein sources such as soybean meal and other oil cakes have also fluctuated and will continue to fluctuate. However, feed millers have a choice, as they are substitutes. A rise in the price of soybean meal allows the feed millers to switch to other oil cakes if the price and quality are right.

## 7.4 Trade response to market and non-market forces

The trading of feedstuffs and feed crops is thriving due to the strength of the prepared animal feed and livestock industries. As the global market opens up under WTO, sources of imported raw materials for the domestic animal feed industry will widen. Raw material producers will have to be competitive in the world market to survive. This will benefit Malaysia as it can source the raw materials from all over the world as long as the price is competitive, the quality is good and consistent and terms of contracts are adhered to.

## 7.5 Export and import projections to 2015

Malaysia imports substantial amounts of grain maize for local non-ruminant feeds. Import demand is similar to the demand for maize as feed as described previously and is also true for the forecast. Malaysia does not produce or export grain maize and any exports shown in statistics are actually re-exports.

# 8. Measures to Meet Excess Demand

## 8.1 Government and private sector initiatives

In the Eighth Malaysia Plan, a total of RM 7.9 billion or 7.1 per cent of the total development expenditure was allocated for agricultural programmes. During 2001-2003, about 66 per cent of the amount was spent on the expansion of industrial and food crops with particular attention on commercial-scale production, the adoption of new technologies and the provision of related support services. A total of RM 3.2 billion will be allocated to agriculture in the remaining Plan period to further advance the implementation of ongoing development programmes, strengthen support services as well as create a more conducive environment for greater participation by the private sector in commercial agriculture and the search for new sources of growth. The allocation of funds for agriculture in the Ninth Malaysia Plan (2006-2010) and the Tenth Malaysia Plan (2011-2015) will continue and there should be more emphasis on food crops that have by-products from processing, which can be used as animal feed.

### 8.1.1 Production technology

The Ladang Lambor project on grain maize in the early nineties used variety Suwan 1 which at best gives a grain yield of 4 tons per hectare. The cost of production ranged from RM 0.36 to RM 0.60 per kg, making it non-competitive with the price of imported grain maize that ranged between RM 0.33 and RM 0.47 per kg. It was reported that a hybrid variety of grain maize produces 10 tons per hectare. If this type of yield is achievable locally, and under the same input regime and prices, the cost of production could be reduced significantly enabling maize to be sold at competitive prices.

One possible commodity that could substitute maize is cassava. Research has shown that cassava may be incorporated at higher levels or even completely replace maize in the diets of swine and poultry provided it is properly balanced for essential amino acid content, especially methionine (Anon, 1994). Cassava can be grown on most types of soil with a yield ranging between 30-40 tons per hectare. However, to revive this commodity there is an urgent need for cost-effective drying technology because cassava has a high moisture content at harvest and must be dried for storability. Overall, the cost of using cassava including methionine must be comparable or lower than the cost of imported maize for it to be acceptable to the feed millers or livestock owners.

### 8.1.2 Research and development cooperation

Firstly, R&D on grain maize and commodities that can substitute maize in animal feed must continue. Secondly, there must be sufficient resources i.e. human as well as the funds to carry out R&D. The commercialization aspect of this R&D must be given priority, as this will determine its attractiveness to entrepreneurs in local industry.

There must also be cooperation among the R&D institutions around the world working on grain maize. This will facilitate the exchange of ideas and research among the scientists towards solving this supply problem. Genetically modified (GM) maize has stirred some concern among scientists and it calls for discussion and an exchange of ideas or further research so that the public can better understand the mysteries surrounding GM maize.

### 8.1.3 Trade cooperation and liberalization

Local companies need to be encouraged to participate in the Multinational Corporations (MNCs) supply chain management network for online and real-time procurement, production and logistic management. Access to global buyers through the appointment of independent representatives, sales subsidiaries, joint ventures and the establishment of production units all need to be promoted. This is another approach that will be taken to address the excess demand issue.

## 8.2 Farmer participation in feed crop development

### 8.2.1 Feed crop farming

Feed crop farming, unlike food crop farming is currently not a viable enterprise in Malaysia. It is cheaper to import than to produce locally. As 95 per cent of the feedstuffs used for non-ruminant feeds are imported, which leaves only about 5 per cent to be supplied from locally produced sources. Local feedstuffs are generally rice bran, broken rice, copra cake, cassava refuse, fish and bone meal. The crops are grown for food and the by-products or the end products are used as animal feeds. Efforts must be taken to improve the quality of these products so that they can be competitive with imported feedstuffs and thus able to sustain their share in the industry.

In the case of ruminants, the by-products from the oil palm industry can play a significant role in the development of ruminant feeds. PKC is a good source of protein that is readily available in the country. The use of OPF for ruminant feeds is another important breakthrough in the use of domestically available resources. Other by-products from the oil palm industry include oil palm trunks (OPT), palm press fibre (PPF), palm oil mill effluent (POME) and empty fruit bunches (EFB).

### 8.2.2 Response to market development

The market for animal feed, especially for non-ruminants is well established. The raw materials used for the prepared feeds are mostly imported as there is no local production of feed crops. The local raw materials used are mainly by-products or end products from food crop processing such as cassava and rice. The supply of local raw materials is still small, irregular and of poor quality. There is a need for improvements in the quality and consistency of the supply. Only then could there be a greater shift towards using locally produced by-products or end products by the feed millers. There is also a need to introduce certain initiatives to entice entrepreneurs into food crop production with dual roles of food and feed.

The market for ruminant feeds offers opportunities for locally produced raw materials. While PKC, POME, EFB and PPF are obtained from the oil palm mills, OPF and OPT are obtained from the farms or plantations. The large oil palm acreage in Malaysia provides abundant supplies of OPF to be used as ruminant feeds. The production of OPF based feeds mainly utilizes freshly felled or pruned OPF. MARDI's research has shown that OPF is safe for ruminant consumption and it is classified as a roughage feed source. A joint MARDI-Japan International Cooperation Agency (JICA) project has developed the technology for the production of OPF pellets and cubed forms. The product is targeted for the export market in countries such as South Korea, Taiwan and Middle Eastern countries.

### 8.2.3 Response to manufacturing development

The food manufacturing industry that includes the manufacture of animal feed grew at a rate of 2.8 per cent per annum during 2001-2003. The value of sales during the said period was RM 23.8 billion. Exports of processed food amounted to RM 8.72 billion and among the major contributors was animal feed. The industry is being encouraged to consolidate and merge to

achieve economies of scale to meet domestic demand as well as venture into the export market. Most of the companies listed on the Malaysian Stock Exchange that deal with animal feeds or livestock production are integrators.

The huge market for 'halal' food worldwide is estimated at RM 200 billion (US$ 53 billion). To meet the objective of developing Malaysia into a regional 'halal' food hub, various measures have been implemented. Technical issues including streamlining and standardizing certificate procedures and charges, the use of a common logo and conformance to international food safety standards and requirements for 'halal' food were resolved. Coordinating measures and programmes at both the federal and state levels were implemented. Consultations were held with relevant industry groups regarding implementation issues and solutions to enable the development of a holistic and integrated approach to 'halal' food.

### 8.2.4 Measures to mobilize farmers' involvement

The government's agricultural development expenditure will continue to be directed towards greater modernization and commercialization of industrial and food crop production. This will be expedited through increased farm mechanization, modern farming practices, wider adoption of new technologies and upgrading product quality. New growth areas in agriculture will also be identified. The modernization and mechanization of the agricultural sector and improved farm management techniques for large-scale mixed farming enterprises are expected to reduce the demand for workers. The move towards capital-intensive technology requires that farmers adapt to the changing scenario by acquiring new skills that will complement their current knowledge of farming.

#### *8.2.4.1 Equity considerations*

Moving towards a more equitable society, Malaysia adopted a two-pronged strategy of poverty alleviation and a restructuring of society to ensure balanced and equitable participation among and within ethnic groups as well as regions. With regard to employment restructuring, measures will continue to be taken to reflect the ethnic composition of the population in all sectors and occupations. As part of a major long-term income distribution objective, Malaysia will continue to create a greater and more prosperous middle-income group in addition to increasing the income of the lower income group. Overall income distribution among households has improved over the years. The proportion of lower income households, defined as those earning less than RM 1,200 per month, decreased from 33.1 per cent in 1999 to 25.9 per cent in 2002. The share of middle-income households, defined as those earning between RM 1,200 and RM 3,499, increased from 47.7 per cent in 1999 to 47.9 per cent in 2002.

As far as feed crops are concerned, grain maize and soybean are important raw materials for the feed milling industry, which in turn supports the poultry industry. Nevertheless, the development of these crops is left to market forces and there is very little government intervention. Concerning ruminant feeds, the by-products from food crops such as pineapple, sweet corn and banana in localized areas are in continuous use. This, in a way has contributed towards improving the income and standard of living of the smallholders.

#### *8.2.4.2 Poverty alleviation*

Poverty line income in 2002 was RM 529 per month for Peninsular Malaysia. The incidence of rural poverty decreased from 12.4 per cent in 1999 to 11.4 per cent in 2002. It is highest among the agricultural, hunting and forestry workers at 14.5 per cent. The *Skim Pembangunan Kesejahteraan Rakyat* (SPKR) generated projects such as petty trading, cottage industries, livestock and aquaculture projects and the commercial production of food crops. During 2001 to 2003, a total of RM 406.2 million was allocated to the various projects under SPKR. In addition to the SPKR, programmes such as *Amanah Ikhtiar Malaysia* (AIM) provided micro-credit loans to poor families amounting to RM 358 million.

There is no program specifically for feed crops to address the above issue. Nevertheless, lately there has been some interest in kenaf as a feed crop mainly for beef or dairy cattle. Initial findings indicate that it is feasible to grow the crop and feed the animals on farm. R&D on kenaf is still ongoing.

Another potential crop is sweet corn. The crop can be commercially grown for food. The cost of producing sweet corn is about RM 0.26 per cob while the average selling price per cob is RM 0.36. On top of that, after harvest, the stalk and leaves can be used to make silage and sold to livestock producers. The corn stalk and leaves fed to beef and dairy cattle as well as small ruminants such as goats are quite popular with livestock producers.

## 8.3 Potentials and constraints to feed crop expansion

The potential of feed crop farming under the current situation is bleak. However, the potential of food crop expansion looks good. There is however, a linkage between the two. Food crop operations need to be the core business while the by-products or end products are the secondary business. The by-products or end products from food crops can be used as feedstuffs and their prices can be competitive against imported feedstuffs. The quality of the by-products or end products can be improved through R&D so as to be acceptable to feed millers and livestock rearers. Food crops that can provide these dual benefits of food and feed have greater potential for survival. Rice is one possibility and while it can be substituted for maize as poultry feed, other factors such as cost and consumer preference for the whitish colour of poultry meat need to be considered. Sweet corn grown for food and the stalk and leaves used as silage for ruminant feed is another possibility.

Feed crop producers face stiff competition from other suppliers. The cost of producing feed crops is high due to higher labour, fertilizer and chemical costs. As neighbouring countries have lower labour costs, local entrepreneurs are encouraged to tap this advantage and invest in these countries. However, before undertaking such a venture, other considerations such as legal and constitutional matters, the policy on the repatriation of profits etc., must not be overlooked.

As feed costs constitute about 75 per cent of the cost of producing poultry and swine, feed millers are very cost cautious and do not only monitor the prices of maize, soybean and soybean meal from various sources but also the substitutes that give the best value for money on the feeds. Thus, feed crop producers continue to face competition with limited upside potential for the output prices.

Simultaneously, livestock producers face a ceiling price on poultry meat set by the government. As a result, they too face restricted upward movement of output prices. To overcome this issue, they must continue to be efficient and productive in their operation.

### 8.3.1 Results of a SWOT analysis on feed crops

| STRENGTHS | WEAKNESSES |
|---|---|
| Production:<br>• Suitable climate for year-round production of feed crops<br>• Strong institutional support including R&D and extension services<br>• The area for rice production is well established with good production and marketing facilities<br>• There are 18 lines of rice that can yield 9 tons per hectare<br>• Malaysia has abundant OPF from the oil palm plantations that can be exploited and promoted as ruminant feeds domestically and abroad | Production:<br>• Not economical to plant maize and cassava as feed crops<br>• Serious labour constraints i.e. competition with other sectors of the economy<br>• No large tract of contiguous flat land for mechanized farming of feed crops that could lower the cost of production<br>• Yield of feed grains not high enough to lower the cost of production<br>• The unpredictable rain can destroy a good harvest of grain maize due to aflatoxin build up<br>• The grain maize cannot be harvested dry on the plant and needs to be dried but the drying cost is high<br>• There are no large storage facilities |
| Marketing:<br>• There is good infrastructure (roads, railways, ports and airports) and telecommunications in the country<br>• The strong, manufactured feeds industry offers a ready market for domestically grown feed crops | Marketing:<br>• There is an unorganized marketing system for domestically produced feed crops such as grain maize |
| Processing:<br>• Malaysia has experienced and efficient prepared animal feed processors that can source the best raw materials from all over the world<br>• Malaysia has PKC, POME, PPF and EFB; all by-products from the oil palm mills that are good as ruminant feeds | Processing:<br>• Over-dependence on imports of raw materials for non-ruminant feeds often subjected to price instability<br>• Domestically produced feedstuffs such as cassava refuse, rice bran and broken rice are not price competitive with imports |
| **OPPORTUNITIES** | **THREATS** |
| Production:<br>• Reverse investment in favourable neighbouring countries that offers cheaper labour costs can be very profitable<br>• The increasing trend in demand for raw materials such as maize for the animal feed industry is a positive signal to producers | Production:<br>• A shortage in the supply of maize, soybean and soybean meal in the world market will lead to astronomically high prices<br>• The spread of diseases such as the Nipah virus or Avian flu can cripple the livestock industry and subsequently the animal feed industry<br>• An unstable government or changing legal and constitutional matters in the country will affect reverse investment |
| Marketing:<br>• The implementation of WTO and AFTA will facilitate competitive sourcing of raw materials<br>• Marketing of poultry products via the huge 'halal' food market in the world will further increase the demand for feed crops<br>• The increasing retail outlets for ready-to-eat poultry products such as at KFC, A&W, Satay, Chicken rice etc also indirectly increase the demand for feed crops | Marketing:<br>• The domestic market for poultry meat, eggs and pork is saturated and new markets are limited<br>• The growing health-conscious consumers may reduce consumption of poultry products and turn to fish and fish products, thereby reducing the demand for animal feed<br>• The domestic per capita consumption of poultry meat, eggs and pork has reached a plateau and thus may curtail the demand for feed crops |
| Processing:<br>• There is increasing demand for PKC from Europe and Japan as ruminant feeds | Processing:<br>• The entry of many processors of prepared feeds in the world market leads to stiff competition and only the most efficient will survive |

# 9. Conclusions and Recommendations

The potential for feed crops being grown by smallholders and plantations in Malaysia is not bright. Smallholders have many attractive alternative crops such as oil palm, rice, vegetables and fruits to choose from. These crops have ready marketing outlets and the output prices are better than feed crop prices. The plantation owners are sticking with the established crops such as rubber, oil palm and cocoa. Massive switching has occurred but from rubber to oil palm.

The potential lies in the food crops that have dual uses i.e. for food and feed. Although there are grain maize hybrids that can give very high yields, these cannot be realized under a tropical climate. However, sweet corn offers an opportunity as a food crop while the stalks and leaves after harvest can be turned into silage for animal feed. The price of cassava roots for starch production currently is too low to attract farmers. Rice, which is grown for food, can also be used as animal feed. After rice milling, rice bran or broken rice is obtained and these can also be used as animal feed. Nevertheless, these products need to be competitive in the open market in terms of price and quality.

The prepared animal feed industry and the livestock industry (namely the non-ruminants) depend on each other for their continued growth. For as long as there is demand for poultry, eggs and pork, synergy between the two industries will remain. Malaysia is self-sufficient in poultry, egg and swine production but per capita consumption has reached a plateau meaning that Malaysia needs to seek new markets quickly. Under WTO, there can be greater market access for livestock producers as long as they are able to compete.

While poultry meat is among the cheapest and the most widely eaten animal meat protein, the concern about diseases affecting the industry such as Avian flu, antibiotic residues in poultry meat, the incidence of Salmonella in eggs and also E. coli have triggered a demand for healthy and wholesome poultry meat and eggs. The health-conscious consumers (normally associated with the high income group and the urban population) are very choosy about what they consume in order to lower cholesterol or the uric acid level in their bodies. If this trend continues there will be a faster slowdown in the domestic demand for poultry meat and eggs and subsequently the prepared animal feed industry. To cater for this segment of consumers, the production of poultry may have to change to a less intensive, free-range type or more 'natural' systems where the number of birds kept together is smaller to minimize the spread of diseases and where there is restrictive use of antibiotics. This system will result in higher costs of production and subsequently higher prices to the consumers. It remains to be seen whether the health-conscious consumers are willing to pay a premium price for this type of poultry meat.

Malaysia needs to tap the huge 'halal' food market and poultry meat and eggs have the potential to be in this market. Various measures have already been taken pertaining to efforts to promote Malaysia as a regional 'halal' food hub. Implementation issues or problems need to be resolved as quickly as possible.

Experiments on OPF-based feed have shown that it is superior in nutritive value when compared to conventional feeds based on native grasses. There is potential for OPF-based feed if it can be produced competitively against other substitutes. There are about 3.8 million hectares of oil palm in the country and a good supply of OPF is not an issue, although the cost of collection is. The potential for other by-products from the oil palm industry such as PPF, EFB and OPT is good and their use should be aggressively promoted for acceptance as ruminant feeds.

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# Appendices

**Table 1 Exports and imports of groats and meal of maize**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 1,619.66 | 1,128,482.00 | 5,042.72 | 3,047,197.00 |
| 1990 | 380.20 | 298,582.00 | 6,364.91 | 4,687,312.00 |
| 1991 | 389.44 | 302,156.00 | 9,205.91 | 7,353,545.00 |
| 1992 | 184.09 | 135,008.00 | 9,294.17 | 8,530,239.00 |
| 1993 | 12.89 | 15,393.00 | 12,595.32 | 12,434,395.00 |
| 1994 | 27.50 | 7,840.00 | 10,073.24 | 9,772,638.00 |
| 1995 | 75.00 | 79,772.00 | 9,239.00 | 7,130,665.00 |
| 1996 | 1,077.00 | 684,664.00 | 17,258.00 | 16,309,442.00 |
| 1997 | 399.20 | 172,463.00 | 17,448.41 | 18,914,214.00 |
| 1998 | 20.86 | 30,093.00 | 16,885.95 | 22,900,185.00 |
| 1999 | 76.99 | 132,196.00 | 14,851.03 | 16,058,828.00 |
| 2000 | 458.00 | 328,272.00 | 18,544.25 | 19,693,943.00 |
| 2001 | 1,540.99 | 1,228,873.00 | 28,098.00 | 26,299,772.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 2 Exports and imports of rolled or flake grains of maize**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 782.72 | 403,874.00 | 110,749.37 | 44,555,754.00 |
| 1990 | 669.40 | 335,912.00 | 112,101.13 | 43,749,046.00 |
| 1991 | 712.06 | 336,853.00 | 89,290.06 | 34,409,166.00 |
| 1992 | 1,216.15 | 518,548.00 | 149,643.83 | 52,162,060.00 |
| 1993 | 530.47 | 277,488.00 | 97,153.35 | 32,508,765.00 |
| 1994 | 608.35 | 349,013.00 | 137,651.01 | 48,352,434.00 |
| 1995 | 2,394.83 | 1,065,142.00 | 61,879.32 | 24,853,394.00 |
| 1996 | 1,419.38 | 846,989.00 | 117,142 | 59,753,468.00 |
| 1997 | 4.32 | 30,652.00 | 1,133 | 1,294,229.00 |
| 1998 | 1,677.18 | 1,148,708.00 | 165,291 | 75,246,452.00 |
| 1999 | 74.00 | 22,833.00 | 279,758 | 120,305,295.00 |
| 2000 | 65.00 | 38,083.00 | 251,216 | 108,696,945.00 |
| 2001 | 14.00 | 11,280.00 | 242,970 | 108,422,775.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 3 Exports and imports of other maize**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 2,333.41 | 995,494.00 | 463,909.76 | 179,618,065.00 |
| 1990 | 2,869.91 | 1,265,602.00 | 614,931.30 | 234,373,966.00 |
| 1991 | 2,978.03 | 1,363,901.00 | 693,434.58 | 259,639,889.00 |
| 1992 | 2,771.83 | 1,247,739.00 | 755,004.65 | 260,443,144.00 |
| 1993 | 4,124.06 | 1,887,319.00 | 860,236.08 | 277,766,837.00 |
| 1994 | 4,138.62 | 1,881,193.00 | 869,597.79 | 300,556,708.00 |
| 1995 | 5,872.00 | 2,897,057.00 | 895,680.00 | 352,541,845.00 |
| 1996 | 10,041.00 | 5,636,640.00 | 787,405.00 | 380,121,778.00 |
| 1997 | 18,040.39 | 8,899,274.00 | 965,926.76 | 401,298,222.00 |
| 1998 | 14,299.11 | 9,556,862.00 | 798,072.10 | 383,032,101.00 |
| 1999 | 10,980.00 | 9,253,232.00 | 826,030.00 | 354,925,054.00 |
| 2000 | 11,587.00 | 9,593,450.00 | 832,594.00 | 346,852,355.00 |
| 2001 | 12,379.01 | 10,274,578.30 | 777,560.00 | 351,345,940.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

*Appendix*

**Table 4 Exports and imports of maize, seed**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 27.35 | 10,162.00 | 783,521.80 | 312,742,901.00 |
| 1990 | 2.49 | 496.00 | 658,649.52 | 249,462,859.00 |
| 1991 | 239.74 | 51,418.00 | 601,454.20 | 221,227,404.00 |
| 1992 | 123.99 | 42,307.00 | 776,356.10 | 261,116,343.00 |
| 1993 | 143.52 | 56,452.00 | 939,379.00 | 295,265,953.00 |
| 1994 | 910.09 | 266,483.00 | 861,285.70 | 293,127,295.00 |
| 1995 | 424.00 | 185,210.00 | 1,188,740.00 | 479,272,729.00 |
| 1996 | 279.00 | 180,392.00 | 1,176,644.00 | 557,390,807.00 |
| 1997 | 4,070.24 | 1,643,970.00 | 1,467,374.96 | 618,798,866.00 |
| 1998 | 15,567.61 | 9,914,163.00 | 1,045,389.72 | 503,537,057.00 |
| 1999 | 11,927.00 | 6,230,961.00 | 1,376,033.00 | 633,017,472.00 |
| 2000 | 7,115.00 | 4,053,929.00 | 1,416,076.00 | 622,351,652.00 |
| 2001 | 5,429.00 | 3,603,190.00 | 1,291,372.00 | 543,931,513.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 5 Total quantity of imported maize**

| Year | Maize | | | | |
|---|---|---|---|---|---|
| | Groats | Other | Seeds | Roll/flake | Total |
| | | | tons | | |
| 1989 | 50,42.72 | 463,909.76 | 783,521.80 | 110,749.37 | 1,363,223.65 |
| 1990 | 63,64.91 | 614,931.30 | 658,649.52 | 112,101.13 | 1,392,046.86 |
| 1991 | 92,05.91 | 693,434.58 | 601,454.20 | 89,290.06 | 1,393,384.75 |
| 1992 | 92,94.17 | 755,004.65 | 776,356.10 | 149,643.83 | 1,690,298.75 |
| 1993 | 12,595.32 | 860,236.08 | 939,379.00 | 97,153.35 | 1,909,363.75 |
| 1994 | 10,073.24 | 869,597.79 | 861,285.70 | 137,651.01 | 1,878,607.74 |
| 1995 | 9,239.00 | 895,680.00 | 1,188,740.00 | 61,879.32 | 2,155,538.32 |
| 1996 | 17,258.00 | 787,405.00 | 1,176,644.00 | 117,142 | 2,098,448.55 |
| 1997 | 17,448.41 | 965,926.76 | 1,467,374.96 | 1,133 | 2,451,882.96 |
| 1998 | 16,885.95 | 798,072.10 | 1,045,389.72 | 165,291 | 2,025,638.67 |
| 1999 | 14,851.03 | 826,030.00 | 1,376,033.00 | 279,758 | 2,496,672.03 |
| 2000 | 18,544.25 | 832,594.00 | 1,416,076.00 | 251,216 | 2,518,430.25 |
| 2001 | 28,098.00 | 777,560.00 | 1,291,372.00 | 242,970 | 2,340,000.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 6 Total value imported maize**

| Year | Maize | | | | |
|---|---|---|---|---|---|
| | Groats | Other | Seed | Flake | Total Value |
| | | | RM | | |
| 1989 | 3,047,197.00 | 179,618,065.00 | 312,742,901.00 | 44,555,754.00 | 539,963,917.00 |
| 1990 | 4,687,312.00 | 234,373,966.00 | 249,462,859.00 | 43,749,046.00 | 532,273,183.00 |
| 1991 | 7,353,545.00 | 259,639,889.00 | 221,227,404.00 | 34,409,166.00 | 522,630,004.00 |
| 1992 | 8,530,239.00 | 260,443,144.00 | 261,116,343.00 | 52,162,060.00 | 582,251,786.00 |
| 1993 | 12,434,395.00 | 277,766,837.00 | 295,265,953.00 | 32,508,765.00 | 617,975,950.00 |
| 1994 | 9,772,638.00 | 300,556,708.00 | 293,127,295.00 | 48,352,434.00 | 651,809,075.00 |
| 1995 | 7,130,665.00 | 352,541,845.00 | 479,272,729.00 | 24,853,394.00 | 863,798,633.00 |
| 1996 | 16,309,442.00 | 380,121,778.00 | 557,390,807.00 | 59,753,468.00 | 1,013,575,495.00 |
| 1997 | 18,914,214.00 | 401,298,222.00 | 618,798,866.00 | 1,294,229.00 | 1,040,305,531.00 |
| 1998 | 22,900,185.00 | 383,032,101.00 | 503,537,057.00 | 75,246,452.00 | 984,715,795.00 |
| 1999 | 16,058,828.00 | 354,925,054.00 | 633,017,472.00 | 120,305,295.00 | 1,124,306,649.00 |
| 2000 | 19,693,943.00 | 346,852,355.00 | 622,351,652.00 | 108,696,945.00 | 1,097,594,895.00 |
| 2001 | 26,299,772.00 | 351,345,940.00 | 543,931,513.00 | 108,422,775.00 | 1,030,000,000.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 7 The acreage of maize in Peninsular Malaysia**

| Year | Acreage (hectare) |
|---|---|
| 1984 | 4,744 |
| 1985 | 4,750 |
| 1986 | 4,249 |
| 1987 | 5,904 |
| 1988 | 6,063 |
| 1989 | 8,877 |
| 1990 | 7,875 |
| 1991 | 7,942 |
| 1992 | 8,020 |
| 1993 | 7,758 |
| 1994 | 6,475 |
| 1995 | 5,661 |
| 1996 | 3,867 |
| 1997 | 4,266 |
| 1998 | 5,847 |
| 1999 | 6,497 |
| 2000 | 4,795 |

Source: http://agrolink.moa.my/doa/BI/statistics.

**Table 8 Export and import of soybeans, whether or not broken**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 3,373.42 | 3,269,920.00 | 371,828.75 | 302,185,550.00 |
| 1990 | 7,556.29 | 6,458,962.00 | 473,619.73 | 330,102,562.00 |
| 1991 | 13,520.73 | 11,553,983.00 | 551,933.75 | 388,578,366.00 |
| 1992 | 11,516.82 | 10,064,809.00 | 513,781.28 | 334,032,970.00 |
| 1993 | 16,906.60 | 14,531,391.00 | 494,804.48 | 336,935,723.00 |
| 1994 | 10,027.07 | 9,147,712.00 | 484,015.32 | 350,328,630.00 |
| 1995 | 9,297.57 | 8,438,047.00 | 495,177.25 | 331,381,608.00 |
| 1996 | 16,010.00 | 15,878,564.00 | 397,694.00 | 326,460,403.00 |
| 1997 | 6,869.83 | 10,900,284.00 | 337,986.53 | 292,293,034.00 |
| 1998 | 27,750.95 | 32,738,918.00 | 491,221.80 | 515,355,686.00 |
| 1999 | 67,912.29 | 62,215,581.00 | 646,407.78 | 544,684,442.00 |
| 2000 | 38,343.33 | 30,171,800.00 | 582,897.06 | 502,301,609.00 |
| 2001 | 15,954.94 | 14,864,139.00 | 700,841.30 | 573,392,701.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 9 Oil-cake and other solid residues, ground or in the form of pellets, result of extraction of soybean oil**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 3,574.13 | 3,458,520.00 | 143,809.77 | 106,684,342.00 |
| 1990 | 3,587.18 | 3,059,263.00 | 137,261.27 | 79,004,628.00 |
| 1991 | 2,146.81 | 1,989,154.00 | 179,805.75 | 99,765,060.00 |
| 1992 | 2,092.04 | 2,081,057.00 | 321,388.66 | 182,316,971.00 |
| 1993 | 2,976.03 | 2,994,653.00 | 301,620.51 | 171,618,073.00 |
| 1994 | 5,837.58 | 4,602,159.00 | 465,277.21 | 272,013,703.00 |
| 1995 | 7,912.00 | 6,054,961.00 | 469,070.00 | 259,152,115.00 |
| 1996 | 6,640.00 | 5,443,819.00 | 612,660.00 | 442,957,669.00 |
| 1997 | 3,512.48 | 5,666,915.00 | 1,113,217.51 | 531,768,739.00 |
| 1998 | 17,453.98 | 18,065,615.00 | 467,894.24 | 420,356,437.00 |
| 1999 | 34,493.37 | 25,701,035.00 | 616,488.08 | 411,194,878.00 |
| 2000 | 25,144.81 | 21,331,436.00 | 540,243.79 | 416,978,721.00 |
| 2001 | 18,298.61 | 18,071,336.00 | 578,968.42 | 464,791,902.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

*Appendix*

**Table 10 Cassava and substitutes in the form of flakes, grains, pearl siftings or in similar form**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 3,357.28 | 3,027,315.00 | 2,774.80 | 794,392.00 |
| 1990 | 37,577.30 | 3,852,864.00 | 3,180.12 | 776,204.00 |
| 1991 | 1,613.65 | 1,597,017.00 | 114.98 | 221,191.00 |
| 1992 | 240.80 | 830,260.00 | 11.39 | 37,713.00 |
| 1993 | 2,208.47 | 2,692,783.00 | 577.50 | 651,923.00 |
| 1994 | 1,967.36 | 3,272,661.00 | 854.30 | 796,681.00 |
| 1995 | 1,632.62 | 3,158,129.00 | 873.23 | 1,053,153.00 |
| 1996 | 2,027.10 | 3,352,487.00 | 9,354.99 | 4,654,348.00 |
| 1997 | 2,477.05 | 3,778,083.00 | 934.74 | 909,943.00 |
| 1998 | 1,174.23 | 4,023,051.00 | 644.65 | 739,460.00 |
| 1999 | 901.43 | 2,304,825.00 | 1,319.59 | 1,257,085.00 |
| 2000 | 837.23 | 2,237,625.00 | 1,331.08 | 1,187,314.00 |
| 2001 | 802.57 | 2,745,476.00 | 1,590.79 | 1,458,895.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 11 Manioc, other than dried or in the form of pellets**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 155.75 | 171,652.00 | 735.86 | 126,841.00 |
| 1990 | 195.92 | 272,251.00 | 867.62 | 141,152.00 |
| 1991 | 107.79 | 184,361.00 | 7.85 | 8,168.00 |
| 1992 | 19.73 | 29,708.00 | 44.03 | 103,624.00 |
| 1993 | 14.07 | 22,141.00 | 183.29 | 47,222.00 |
| 1994 | 16.79 | 27,330.00 | 422.95 | 15,959.00 |
| 1995 | 32.00 | 58,845.00 | 44.00 | 35,718.00 |
| 1996 | 36.00 | 53,514.00 | 19.00 | 20,074.00 |
| 1997 | 40.11 | 64,522.00 | 238.86 | 70,952.00 |
| 1998 | 60.61 | 128,129.00 | 21.84 | 68,298.00 |
| 1999 | 47.77 | 78,000.00 | 9.38 | 36,493.00 |
| 2000 | 589.44 | 361,906.00 | 40.98 | 88,258.00 |
| 2001 | 935.03 | 573,850.00 | 34.29 | 55,225.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 12 The acreage of cassava in Peninsular Malaysia**

| Year | Acreage (hectare) |
|---|---|
| 1984 | 4,975 |
| 1985 | 5,764 |
| 1986 | 5,376 |
| 1987 | 4,965 |
| 1988 | 2,978 |
| 1989 | 3,649 |
| 1990 | 3,130 |
| 1991 | 2,539 |
| 1992 | 3,398 |
| 1993 | 4,907 |
| 1994 | 3,922 |
| 1995 | 2,335 |
| 1996 | 2,124 |
| 1997 | 1,633 |
| 1998 | 1,982 |
| 1999 | 2,006 |
| 2000 | 1,834 |

Source: http://agrolink.moa.my/doa/BI/statistics.

**Table 13 Oil-cake and other solid residues, ground or in the form of pellets result of extraction of groundnut oil**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 6.7 | 3,082.00 | 47,260.03 | 19,661,132.00 |
| 1990 | 0 | 0 | 46,058.07 | 18,883,863.00 |
| 1991 | 0 | 0 | 40,853.28 | 16,940,062.00 |
| 1992 | 71.5 | 5,88950 | 46,764.03 | 19,218,683.00 |
| 1993 | 253.39 | 114,732.00 | 51,410.34 | 20,323,061.00 |
| 1994 | 25.07 | 22,143.00 | 31,038.08 | 14,487,132.00 |
| 1995 | 16 | 19,075.00 | 16,328.00 | 6,796,850.00 |
| 1996 | 0 | 0 | 11,896.00 | 6,036,763.00 |
| 1997 | 46,650 | 112,496.00 | 10,708.73 | 6,589,675.00 |
| 1998 | 0 | 0 | 8,270.00 | 5,604,430.00 |
| 1999 | 0 | 0 | 1,000.00 | 228,000.00 |
| 2000 | 0 | 0 | 0 | 0.00 |
| 2001 | 0 | 0 | 20.00 | 21,569.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 14 The acreage of groundnut in Peninsular Malaysia**

| Year | Acreage (hectare) |
|---|---|
| 1990 | 1,391 |
| 1991 | 797 |
| 1992 | 943 |
| 1993 | 602 |
| 1994 | 621 |
| 1995 | 505 |
| 1996 | 224 |
| 1997 | 471 |
| 1998 | 357 |
| 1999 | 265 |
| 2000 | 245 |

Source: http://agrolink.moa.my/doa/BI/statistics.

**Table 15 Bran or rice, whether or not in the form of pellets**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 0 | 0 | 33,446.40 | 6,645,038.00 |
| 1990 | 0 | 0 | 15,004.14 | 2,745,562.00 |
| 1991 | 15 | 2,883.00 | 6,158.61 | 1,174,321.00 |
| 1992 | 0 | 0 | 13,996.76 | 2,320,240.00 |
| 1993 | 0 | 0 | 6,221.98 | 914,531.00 |
| 1994 | 0 | 0 | 1,937.05 | 292,785.00 |
| 1995 | 0 | 0 | 2,613.00 | 455,233.00 |
| 1996 | 0 | 0 | 16,294.00 | 4,864,267.00 |
| 1997 | 0 | 0 | 7,473.92 | 2,272,840.00 |
| 1998 | 0 | 0 | 4,250.17 | 1,169,992.00 |
| 1999 | 65,000 | 32,500.00 | 6,015.18 | 1,882,856.00 |
| 2000 | 77,000 | 38,500.00 | 3,902.01 | 924,766.00 |
| 2001 | 0 | 0 | 1,118.89 | 306,626.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

*Appendix*

**Table 16 Oil-cake and other solid residues of coconut or copra**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 9,517.87 | 3,054,751.00 | 5,344.06 | 1,144,738.00 |
| 1990 | 1,987.46 | 574,652.00 | 864.11 | 140,748.00 |
| 1991 | 10.06 | 7,468.00 | 3,054.14 | 530,833.00 |
| 1992 | 3,483.07 | 1,115,983.00 | 1,550.38 | 470,850.00 |
| 1993 | 1,661.50 | 830,955.00 | 19.20 | 29,849.00 |
| 1994 | 1,598.68 | 1,221,484.00 | 18.00 | 14,698.00 |
| 1995 | 772.00 | 268,581.00 | 1,904.00 | 537,533.00 |
| 1996 | 693.00 | 309,622.00 | 1,900.00 | 2,042,694.00 |
| 1997 | 1,539.16 | 839,407.00 | 1,641.00 | 1,751,797.00 |
| 1998 | 1,922.68 | 1,242,069.00 | 222.85 | 78,116.00 |
| 1999 | 2,737.46 | 1,116,196.00 | 3,158.28 | 4,134,839.00 |
| 2000 | 3,479.84 | 1,287,217.00 | 103.15 | 42,918.00 |
| 2001 | 2,840.13 | 993,005.00 | 524.04 | 262,020.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 17 Flours, meals and pellets of fish, unfit for human consumption**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 8,117.99 | 9,898,644.00 | 44,947.07 | 55,079,962.00 |
| 1990 | 8,323.42 | 10,160,806.00 | 23,646.06 | 27,626,396.00 |
| 1991 | 8,562.86 | 10,035,807.00 | 15,536.40 | 17,752,492.00 |
| 1992 | 6,203.84 | 7,731,132.00 | 10,785.29 | 12,366,932.00 |
| 1993 | 6,854.05 | 7,450,706.00 | 19,198.59 | 24,814,315.00 |
| 1994 | 4,262.88 | 4,431,532.00 | 25,185.03 | 33,860,608.00 |
| 1995 | 3,894.59 | 3,982,946.00 | 23,642.77 | 33,617,331.00 |
| 1996 | 2,341.72 | 2,246,754.00 | 14,340.15 | 27,022,703.00 |
| 1997 | 27.65 | 16,379.00 | 1,075.03 | 1,171,634.00 |
| 1998 | 20,642.72 | 35,790,379.00 | 6,620.63 | 18,850,083.00 |
| 1999 | 10,359.31 | 13,995,303.00 | 9,045.50 | 16,891,614.00 |
| 2000 | 12,373.22 | 17,025,959.00 | 7,042.08 | 13,545,010.00 |
| 2001 | 22,779.95 | 34,313,655.00 | 5,569.81 | 12,022,520.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 18 Bran and pollard of wheat, whether or not in the form of pellets**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 3,451.24 | 1,159,139.00 | 115,343.11 | 31,998,083.00 |
| 1990 | 6,583.94 | 1,857,512.00 | 102,237.57 | 29,378,631.00 |
| 1991 | 3,063.27 | 657,968.00 | 89,834.45 | 22,481,559.00 |
| 1992 | 1,009.79 | 251,426.00 | 100,628.91 | 26,967,799.00 |
| 1993 | 482.59 | 154,783.00 | 114,210.32 | 30,004,371.00 |
| 1994 | 735.48 | 202,871.00 | 94,202.73 | 24,319,080.00 |
| 1995 | 620.00 | 293,772.00 | 69,238.00 | 19,368,712.00 |
| 1996 | 2,993.00 | 1,198,475.00 | 77,684.00 | 25,840,982.00 |
| 1997 | 980.28 | 408,273.00 | 73,236.79 | 23,211,923.00 |
| 1998 | 2,379.45 | 1,157,384.00 | 62,068.75 | 24,280,013.00 |
| 1999 | 10,886.61 | 3,959,180.00 | 43,747.66 | 19,240,442.00 |
| 2000 | 10,680.11 | 6,230,162.00 | 33,127.85 | 15,475,388.00 |
| 2001 | 8,755.58 | 2,939,551.00 | 35,185.01 | 15,344,401.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 19 Oil cake and other solid residues of rapeseed cake or meal**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1989 | 0 | 0 | 10,181.11 | 3,418,579.00 |
| 1990 | 0 | 0 | 9,992.15 | 3,182,409.00 |
| 1991 | 58.37 | 11674 | 14,887.02 | 3,708,895.00 |
| 1992 | 47.42 | 10987 | 10,435.34 | 2,265,257.00 |
| 1993 | 0 | 0 | 4,783.05 | 1,430,376.00 |
| 1994 | 30 | 21091 | 4,994.87 | 1,514,659.00 |
| 1995 | 110 | 78,641.00 | 4,302.00 | 1,220,709.00 |
| 1996 | 111 | 87,008.00 | 36,867.00 | 15,874,636.00 |
| 1997 | 0 | 0 | 20,218.82 | 11,284,145.00 |
| 1998 | 0 | 0 | 9,494.20 | 4,690,205.00 |
| 1999 | 200,510 | 49,130.00 | 4,347.70 | 1,516,878.00 |
| 2000 | 862,100 | 401,016.00 | 16,281.95 | 8,246,983.00 |
| 2001 | 195,000 | 117,648.00 | 1,696.64 | 951,201.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 20 Flours, meals and pellets of meat or meat offals, greaves**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1996 | 0 | 0 | 5,379,000 | 5,643,452.00 |
| 1997 | 600 | 7,074.00 | 31,235,814 | 38,636,011.00 |
| 1998 | 10,710 | 10,710.00 | 30,033,479 | 36,842,373.00 |
| 1999 | 36,200 | 15,920.00 | 50,082,247 | 45,579,808.00 |
| 2000 | 600,393 | 901,273.00 | 54,939,363 | 54,270,351.00 |
| 2001 | 2,200,000 | 3,737,428.00 | 41,598,606 | 43,343,617.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 21 Residues of starch manufacture and similar residues**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1996 | 0 | 0 | 5,956,000 | 7,686,372.00 |
| 1997 | 29,210 | 72,859.00 | 33,373,204 | 45,757,204.00 |
| 1998 | 0 | 0 | 23,882,621 | 35,837,575.00 |
| 1999 | 0 | 0 | 25,804,957 | 28,150,592.00 |
| 2000 | 6,250 | 32,063.00 | 25,644,134 | 31,116,967.00 |
| 2001 | 2,303 | 7,696.00 | 21,813,611 | 27,928,580.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 22 Other preparations of a kind used in animal feeding**

| Year | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| 1996 | 5,562,000 | 9,249,382.00 | 29,686,000 | 52,645,428.00 |
| 1997 | 22,737,198 | 52,333,451.00 | 74,204,500 | 242,248,196.00 |
| 1998 | 29,370,005 | 67,525,779.00 | 78,640,980 | 261,702,384.00 |
| 1999 | 33,317,067 | 58,423,020.00 | 98,983,327 | 243,721,431.00 |
| 2000 | 43,481,253 | 71,513,036.00 | 118,532,309 | 286,740,451.00 |
| 2001 | 67,911,467 | 100,056,138.00 | 136,662,881 | 356,813,845.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

*Appendix*

**Table 23 Imports and exports of manufactured feeds - Malaysia**

| Year | Import | | Export | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM '000) | Quantity (tons) | Value (RM '000) |
| 1987 | 444,408 | 86,757.00 | 729,918 | 67,778.00 |
| 1988 | 465,110 | 95,668.00 | 753,568 | 83,558.00 |
| 1989 | 553,632 | 117,275.00 | 992,914 | 102,696.00 |
| 1990 | 481,918 | 100,909.00 | 1,078,128 | 100,187.00 |
| 1991 | 475,611 | 111,957.00 | 979,174 | 94,410.00 |
| 1992 | 647,612 | 169,025.00 | 1,016,285 | 111,326.00 |
| 1993 | 637,633 | 165,723.00 | 1,181,826 | 108,434.00 |
| 1994 | 736,535 | 193,167.00 | 1,333,514 | 121,640.00 |
| 1995 | 837,418 | 218,681.00 | 1,324,374 | 128,894.00 |
| 1996 | 1,128,066 | 327,237.00 | 1,418,482 | 163,922.00 |
| 1997 | 983,878 | 289,649.00 | 1,154,552 | 102,178.00 |
| 1998 | 762,330 | 231,276.00 | 1,439,831 | 89,882.00 |
| 1999 | 918,371 | 227,110.00 | 1,563,082 | 99,280.00 |
| 2000 | 871,989 | 198,437.00 | 1,794,025 | 75,607.00 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, various issues.

**Table 24 Malaysia's exports and imports of maize (corn) seeds, to and from countries of destinations in 2002**

| Countries | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| Argentina | - | - | 17,039.00 | 6,708,323 |
| Australia | - | - | 5.20 | 5,315 |
| Bangladesh | 0.52 | 1,005 | - | - |
| Brunei Darussalam | 1,863.20 | 1,064,143 | - | - |
| China | - | - | 1,555,688.17 | 638,302,053 |
| France | - | - | 735.00 | 571,200 |
| Indonesia | 2,020.52 | 944,496 | 271.13 | 122,122 |
| Republic of Korea | - | - | 37.10 | 27,941 |
| Myanmar | - | - | 518.35 | 192,374 |
| Saudi Arabia | 4.80 | 35,366 | - | - |
| Singapore | 89.65 | 161,648 | - | - |
| Taiwan | 41.34 | 51,321 | 12.13 | 8,208 |
| Thailand | - | - | 12,322.57 | 5,390,960 |
| USA | - | - | 998.00 | 1,364,798 |
| Grand total | 4,020.03 | 2,257,979 | 1,587,626.65 | 652,693,294 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, 2003.

**Table 25 Malaysia's exports and imports of other maize (corn) to and from countries of destinations in 2002**

| Countries | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| Argentina | - | - | 563.00 | 313,486 |
| Australia | - | - | 129.20 | 119,100 |
| Bangladesh | 20.00 | 23,940 | - | - |
| Belgium | - | 84.00 | 80,635 | |
| Brunei Darussalam | 3,175.10 | 1,625,732 | - | - |
| China | - | - | 758,334.66 | 318,393,074 |
| Hong Kong | 1.60 | 2,300 | - | - |
| Indonesia | 64.15 | 79,138 | 6,887.79 | 3,016,733 |
| Japan | 1.05 | 1,475 | - | - |
| Myanmar | - | - | 15,454.28 | 6,811,018 |
| Philippines | - | - | 57.00 | 62,010 |
| Saudi Arabia | 19.20 | 67,392 | - | - |
| Singapore | 10,613.22 | 9,499,483 | - | - |
| Thailand | - | - | 29,238.50 | 12,970,322 |
| United Arab Emirates | 27.66 | 116,433 | - | - |
| USA | - | - | 9,335.87 | 4,285,944 |
| Grand total | 13,921.98 | 11,415,893 | 820,084.30 | 346,052,322 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, 2003.

**Table 26 Malaysia's exports and imports of groats and meals of maize (corn) to and from countries of destinations in 2002**

| Countries | Export | | Import | |
|---|---|---|---|---|
| | Quantity (kg) | Value (RM) | Quantity (kg) | Value (RM) |
| Belgium | - | - | 294,000.00 | 243,407 |
| Brunei Darussalam | 12,000.00 | 19,282 | - | - |
| Cambodia | 540,000.00 | 416,556 | - | - |
| Cameroon | 100,000.00 | 77,140 | - | - |
| China | - | - | 105,400.00 | 75,628 |
| France | - | - | 3,092,336.60 | 2,504,667 |
| Germany | - | - | 168,021.00 | 171,095 |
| Indonesia | 20,000.00 | 12,084 | - | - |
| Italy | - | - | 165,000.00 | 146,268 |
| Republic of Korea | - | - | 235,000.00 | 196,895 |
| Maldives | 1,800.00 | 7,603 | - | - |
| Netherlands | - | - | 331,000.00 | 277,851 |
| Philippines | 100,000.00 | 77,140 | - | - |
| Singapore | 137,200.00 | 61,529 | - | - |
| Thailand | 60,000.00 | 55,860 | 101,000.00 | 96,468 |
| United Arab Emirates | - | - | 865,000.00 | 683,814 |
| United Kingdom | - | - | 3,000.00 | 6,768 |
| USA | - | - | 14,422,737.00 | 16,604,451 |
| Grand total | 971,000.00 | 727,194 | 19,782,494.60 | 21,007,312 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, 2003.

**Table 27 Malaysia's exports and imports of rolled and flaked grains of maize (corn) to and from countries of destinations in 2002**

| Countries | Export | | Import | |
|---|---|---|---|---|
| | Quantity (tons) | Value (RM) | Quantity (tons) | Value (RM) |
| Brunei Darussalam | 14.40 | 8,416 | - | - |
| China | - | - | 133,858.07 | 75,441,877 |
| France | - | - | 21.00 | 20,908 |
| Germany | - | - | 0.01 | 33 |
| Myanmar | - | - | 5,257.93 | 2,169,100 |
| Philippines | - | - | 0.25 | 250 |
| Thailand | - | - | 5,300.00 | 2,267,059 |
| USA | - | - | 120.32 | 71,126 |
| Grand total | 14.40 | 8,416 | 144,557.58 | 79,970,353 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, 2003.

*Appendix*

**Table 28 Malaysia's exports and imports of soybean meal to and from countries of destinations in 2002**

| Countries | Export | | Import | |
|---|---|---|---|---|
| | Quantity (kg) | Value (RM) | Quantity (kg) | Value (RM) |
| Argentina | - | - | 367,601,035.00 | 280,843,189 |
| Australia | 60,773.00 | 52,467 | - | - |
| Bangladesh | 1,000,000.00 | 1,027,425 | - | - |
| Brazil | - | - | 34,049,736.00 | 28,914,095 |
| Brunei Darussalam | 1,726,440.11 | 1,357,307 | - | - |
| China | - | - | 100,296,509.00 | 87,512,998 |
| Denmark | - | - | 213,750.00 | 513,971 |
| Germany | - | - | 309,250.00 | 721,497 |
| India | 156,390.00 | 70,800 | 11,007,172.00 | 8,032,959 |
| Indonesia | 11,961,570.00 | 10,416,130 | 78,234.00 | 77,535 |
| Japan | 20,000.00 | 30,172 | - | - |
| Republic of Korea | 4,099,317.00 | 1,280,123 | - | - |
| Netherlands | - | - | 168,225.00 | 474,514 |
| Papua New Guinea | 97,020.00 | 74,542 | - | - |
| Philippines | 20,000.00 | 45,600 | - | - |
| Singapore | 16,601,884.17 | 14,690,487 | 6,929,879.20 | 5,597,058 |
| Taiwan | 920,000.00 | 259,303 | 55,010.00 | 61,302 |
| Thailand | 1,130,000.00 | 899,660 | - | - |
| USA | 1,951.00 | 6,890 | 59,846.54 | 203,007 |
| Viet Nam | 15,313,220.00 | 12,834,678 | - | - |
| Grand total | 53,108,565.28 | 43,045,584 | 520,768,646.74 | 412,952,125 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, 2003.

**Table 29 Malaysia's exports and imports of soybeans to and from countries of destinations in 2002**

| Countries | Export | | Import | |
|---|---|---|---|---|
| | Quantity (kg) | Value (RM) | Quantity (kg) | Value (RM) |
| Argentina | - | - | 331,247,732.00 | 264,473,387 |
| Australia | 204,400.00 | 197,084 | 147,370.00 | 232,362 |
| Brazil | - | - | 16,422,910.00 | 13,052,143 |
| Canada | 5,400.00 | 5,400 | 113,763,223.25 | 104,466,616 |
| China | - | - | 29,825,351.23 | 28,341,497 |
| Hong Kong | 5,000.00 | 12,318 | - | - |
| India | - | - | 108,042.00 | 76,817 |
| Indonesia | 27,214,837.00 | 20,692,630 | - | - |
| Myanmar | - | - | 43,500.00 | 26,671 |
| Singapore | 3,985,370.00 | 4,181,307 | - | - |
| Taiwan | - | - | 5,892.00 | 13,680 |
| Thailand | 191,500.00 | 229,000 | 2,377,000.00 | 1,891,787 |
| United Kingdom | - | - | 38,700.00 | 49,086 |
| USA | 4,320.00 | 9,000 | 247,328,873.00 | 222,852,550 |
| Viet Nam | 101,570.00 | 93,313 | - | - |
| Grand total | 31,712,397 | 25,420,052 | 741,308,593.48 | 635,476,596 |

Source: Ministry of Agriculture, Malaysia. Import and Export Trade in Food and Agricultural Products, Kuala Lumpur, 2003.

*Appendix*

# Attendance List
# Workshop on FEEDSEA Project:
# "The Prospects of Feed Crops in Malaysia"
# 26 April 2004
# Palm Garden Hotel, IOI, Putrajaya

## Malaysian Agricultural Research and Development Institute (MARDI)

| Bil. | Name | Centre |
|---|---|---|
| 1. | En. Tajaruddin bin Jasi | Economic and Technology Management |
| 2. | En. Zahari bin Radi | Economic and Technology Management |
| 3. | Dr. A. Wahab Abdul Hamid | Rice and Industrial Crops |
| 4. | Dr. Tan Swee Lian | Rice and Industrial Crops |
| 5. | Dr. Mohamed Khusahry bin Mohamed Yusuf | Livestock |
| 6. | Dr. Hj. Engku Azahan bin Engku Ahmad | Livestock |
| 7. | Dr. Mohd Jaafar bin Daud | Livestock |
| 8. | Dr. Wan Zahari Mohamed | Livestock |

## Private sector

| | | |
|---|---|---|
| 1. | En. Mohd Shariff bin Salleh | Sin Heng Chan |
| 2. | En. Abdul Razak | KFC Integrated Poultry Industry Sdn Bhd |

## Government agencies

| | | |
|---|---|---|
| 1. | En. Samsuddin Che Mamat | Economic Planning Unit, Agriculture Section |
| 2. | Pn. Hanisah Hussin | Ministry of Agriculture |
| 3. | Tuan HJ. Ramli Burhanuddin | Department of Agriculture |
| 4. | En. Mat Riduan Zakaria | Federal Agricultural Marketing Authority |
| 5. | Tuan Hj. Sharifudin Jamaludin | Farmers Organization Authority |
| 6. | Tuan Hj. Yusuf Sudin | Department of Veterinary Services |