ANALYSIS OF MALAYSIAN PEPPER MARKET MODEL

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ANALYSIS OF MALAYSIAN PEPPER MARKET MODEL

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Malaysia Sarawak. It is original and is the result of my work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted at Universiti Malaysia Sarawak or to any other academic institution or non-academic institution for any other degree or qualification.

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ABSTRACT

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By

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Malaysia is the fifth largest pepper exporter in the world. About 60% of the pepper produced in Malaysia is meant for export market. Malaysia exports both black pepper and white pepper in the international market. Sarawak Pepper is the trade name for pepper exported from Malaysia. The Malaysian pepper market model was developed to examine the interrelationship between the economic variables of supply, demand and price. The findings indicate that the important determinants of pepper prices are the stock levels and consumptions. The results also suggest that both Malaysian industrial production index and domestic price of pepper are key determinants of domestic demand for pepper in Malaysia. Finally, the domestic price of pepper is highly sensitive to its domestic consumption and its world price.

ABSTRAK

ANALISIS MODEL PASARAN LADA MALAYSIA

Oleh

Nelson Fu Yee Kium

Malaysia adalah pengeksport lada yang kelima terbesar di dunia. 60% daripada pengeluaran lada Malaysia adalah untuk di eksport. Malaysia mengeksport lada hitam dan putih di pasaran antarabangsa. Lada Sarawak sinonim dengan kualiti di dalam perdagangan rempah dan dikenali di pasaran antarabangsa sebagai lada yang berkualiti tinggi. Satu model pasaran lada Malaysia telah dibina untuk menganalisis hubungkait antara pembolehubah ekonomi seperti penawaran, permintaan dan harga. Hasil kajian menunjukkan penentu penting bagi harga lada adalah paras stok dan penggunaan. Keputusan yang diperolehi juga menunjukkan bahawa indeks pengeluaran perindustrian Malaysia dan harga lada tempatan akan menentukan permintaan lada tempatan di Malaysia. Secara keseluruhannya, harga lada tempatan adalah sensitif kepada penggunaan lada dalam negeri dan harga lada antarabangsa.

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CHAPTER ONE

INTRODUCTION

1.0 Background of the Study

The agricultural sector has played a crucial role and contributed significantly to the growth and development of the Malaysian economy since the country's independence in 1957. However, the rapid industrialization during the last two decades caused a decline in the agricultural sector's relative contribution to national income, export earnings, employment and investments (Department of Statistics Malaysia, 2011). The agricultural sector's contribution to the national income showed a declining trend.

Table 1 illustrates the Malaysian economy from 1970 to 2010. In 1970, the percentage of the agricultural sector's (including forestry, livestock and fishing) contribution to the total Gross Domestic Product (GDP) was 29.0%. However, it had later declined to about 16.2% in 1990, 8.4% in 2000 and 7.1% in 2010. However, in terms of absolute value, its contribution to GDP in Malaysia has increased from RM14,054 million in 1970 to about RM18,662 million in 2000 and then increased sharply to RM40,916 million in 2010 (all value are at 2000 prices). In terms of employment opportunities, agricultural sector continues to be the major source of employment although the trend is declining. The overall employment situation has been relatively stable, with a marginal decline in the rate of unemployment from 3.8% in 1970 to 3.6% in 1980, 5.1% in 1990,

3.4% in 2000 and 3.7% in 2010. In 1970, employment in the primary sector (agricultural and mining) formed 56.0% of total employment. In 1980 and 1990 the contribution of agriculture and mining to employment had declined to 44.0% and 26.6% respectively. In the years 2000 and 2010 employment further declined to 15.6% and 12.2% respectively. On the other hand, the secondary (manufacturing and construction) sector absorbed about 34.3% of labour force in 2010 and 35.8% in 2000. Previously, the sector absorbed 26.2% in 1990 compared to 19.0% in 1980 and 12.0% in 1970. The tertiary (services) sector absorbed about 53.6% in 2010 compared to 48.0% in 2000, 47.2% in 1990, 37.0% in 1980 and 32.0% in 1970.

Table 1: Malaysian Economy

Year	Agricultural Sector Contribution to GDP		Unemployment rate (%)	Employment rate (%)		
	RM Million	%		Agricultural sector	Secondary sector	Tertiary sector
1970	14,054	29.0	3.8	56.0	12.0	32.0
1980	16,185	19.7	3.6	44.0	19.0	37.0
1990	17,308	16.2	5.1	26.6	26.2	47.0
2000	18,662	8.4	3.4	15.6	35.8	48.0
2010	40,916	7.1	3.7	12.2	34.3	53.6

Source: Department of Statistic, Malaysia (2011). Various issues.

The total contribution of the commodities sector toward GDP in Malaysia was only 3.92% in 2011 (Department of Statistics Malaysia, 2012). The palm oil sector contributed 2.92% was the highest in the commodity sectors followed by forestry and timber sector contributed 1.17%, while rubber sector contributed 0.35% of total GDP in Malaysia. For pepper sector contributed 0.07% to the GDP Malaysia compared with tobacco sector and cocoa sector absorbed only 0.01% and 0.00% respectively.

The total area of 6.73 million hectares cultivated for plantation crops (Department of Statistics Malaysia, 2011), 4.85 million hectares are oil palm, 1.03 million hectares are rubber and 20,070 hectares are cocoa. Paddy plantation occupies about 672,304 hectares of the total land. However, pepper cultivation, majority of which are smallholder farms, covers only 14,174 hectares.

However, since 2011, pepper commodity has been gaining a lot of popularity in Malaysia (Malaysian Pepper Board). One of the reasons is one hectare of pepper can be planted 2,000 vines as compared with others commodities. In addition, pepper price fetches the highest among the commodities in Malaysia. The stocks of pepper can be stored more than five year. Furthermore, wide domestic markets where pepper can be sell at any time to the exporters, retailer, traders and government agency. The boosts of demanding for pepper in the domestic due to the growth of food manufacturing industries. The Malaysia government agency (Malaysian Pepper Board) involved to expanding the pepper industry by provides free planting materials (such as fertilizer, pepper cutting, pepper posts, dolomite, herbicides, pesticides and others), free farm machinery (namely thresher, blower and spiral separator) and free courses of planting pepper. In term of marketing, the government agency provides marketing option to farmers such as Pepper Ownership Scheme (POS) and Physical Forward Pepper Market. There are also many researches of up-stream and down-stream for pepper is still on-going by the private and government sector.

Black Pepper (*Piper nigrum L.*), popularly known as “Black Gold” is a native of Western Ghats of India and found its way to other Southeast Asian countries, besides

South America and Africa. The global production of black pepper increased from 259,270 tonnes during 2000 to 324,709 tonnes in 2010 and is estimated to be 298,400 tonnes in 2011. The annual production of pepper is subject to large variations, mainly due to climatic conditions. The pepper vines are very sensitive to excessive rainfall during critical stage of their growth. The susceptibility of pepper vines to various diseases and pests is another cause of large variations in suppliers.

Pepper, the fruit of the climbing vine Piper nigrum, is produced almost exclusively in the developing countries. The six largest producers are namely Brazil, India, Indonesia, Malaysia, Sri Lanka and Vietnam, all whom are members of the International Pepper Community (IPC) account for some 90% of the pepper entering into international trade. Other producing countries are China, Cambodia, Thailand, Ecuador, Madagascar and Mexico. Total export earnings from pepper represented around US$1,079.27 million in 2010 according to International Pepper Community (IPC). Pepper is largely grown in the state of Sarawak, although it can also be grown anywhere in the other states of Malaysia. Malaysia is now the sixth largest pepper producer in the world, after Vietnam, India, Indonesia, Brazil and China and is fifth in terms of export volume. In all producing countries, pepper is mostly grown in small plots of land, often in home-stead, except in Brazil and Vietnam, where a significant portion of the farmers cultivate large plots. It provides an important source of income and employment to rural areas. Pepper is in fact, the most important cash crop in Sarawak, providing employment to some 67,247 families in Sarawak according to Malaysian Pepper Board.

While the supply of pepper is thus subject to fluctuations, the demand for pepper is relatively steady and rather insensitive to changes in prices and incomes. The main use of pepper is as a flavouring agent in food, but even in that use it is applied in very small quantities. Also pepper does not have a close substitute. With such inelastic demand, small changes in supplies are sufficient to cause large change in prices according to Ng and Kanbur (1993). Lack of ability to interpret and predict changes in the market that are constantly taking place is a serious handicap to exporters, as it prevents them from reacting correctly to such changes. Although market uncertainties would always continue to exist, exporters believe that better knowledge of the factors affecting supply and demand and a degree of competence in predicting them, would improve their trading efficiency (Malaysian Pepper Board).

The National Commodities Industries Policy under the fourth National Agricultural Policy (NAP4) from 2011-2020 marks a milestone to revitalize commodities (namely oil palm, rubber, timber, cocoa, pepper, tobacco, kenaf and sago) as an important sector in the development of the Malaysian economy. Various strategic directions had been devised under National Commodity Industry Policy to increase productivity and competitiveness of the pepper industry in Malaysia. There is also need to increase efficiency and productivity of pepper through planting high yielding and pest and disease resistant varieties using live supports and adopting good agronomic practices. Farmers are encouraged to undertake farm level processing to produce high value-added and better quality pepper. Concurrently, strategies are also advocated to strengthen the competitiveness of the Malaysian pepper industry, through widening of product ranges and improving market capability. Thus, to increase the competitiveness of the Malaysian pepper industry, it must go further

downstream and produce high value end products (such as Creamy White Pepper) for the food and non-food sectors (such as Perfumery and Cosmetic) according to the Malaysian Pepper Board.

1.1 Problem Statement

The extension of econometric modelling to the primary commodity markets has come at a time when there is increasing need for a forecasting and simulation tool. The quantitative, frequently econometric, analysis of the behaviour of commodity markets model is an essential ingredient in formulating the commodity stabilization agreements which will be a cornerstone in north-south relations. A market model is concerned with the determination of prices and with the behaviour of the participants in the market. It focuses on the reconciliation of demand and supply. Furthermore, over the last decade the introduction of policy instruments which have a complex impact on production and trade decisions of commodity (for example, changes in imports quotas, tariffs and partially decoupled subsidies). Various economic (such as exchange rates) and non-economic factors (such as weather extreme) may also influence the performance of the commodity sector. These have led to the need to increase the accuracy of policy analyses and market forecasts, an objective that can be easily achieved with the potential of present-day quantitative economic models according to Shamsudin (2008). However, as far as this research is concerned, there is no study about the Malaysian pepper market model except for Ng and Kanbur (1993) were the only researchers who studied about the pepper market model in Malaysia.

Pepper is mainly grown in the remote areas of Sarawak, mostly by the rural poor smallholders. These pepper farmers in the interiors of Sarawak, exclusively carry out pepper cultivation. The relative lack of market access for other agricultural produce makes pepper the most suitable crop for these areas, and an important source of income for these poor farmers. Therefore, pepper is considered as an important cash crop for about 67,247 families in Sarawak, with the farm size ranging from 0.1 to 0.4 hectare (200 to 800 vines) according to Malaysian Pepper Board. The main pepper producing areas in Sarawak are located further in the interior, as the lands near towns are taken up by other competing uses. Improved employment opportunities for those with education and rural-urban migration have dampened interests in pepper production. In addition, the scattered pepper farms in the hilly terrain to introduce new technologies to improve the quality of pepper output. Besides that, pepper cultivation is not only highly labour intensive according to Paulus (2011a) which requiring about 550 man-days required for the initial establishment of one hectare (2,000) of pepper (for the first year) including putting up the support. When pepper reaches full production, about 726 man-days required per hectare per year, including 500 man-days required for harvesting and processing into black pepper, it is also capital intensive requiring about RM75,000 per hectare (using Belian as hard wood support) for establishment and an average of about RM20,000 per hectare for annual maintenance.

At present there is a decline in production at global level according to Bade and Smit (1994) and one of the main reasons attributed for this is severe crop loss due to pests and disease which has become major issue in all pepper growing countries. Apart from several insect pests damaging the crop, Phytopthtora foot rot and slow decline diseases of

black pepper are the most devastating and have become a nightmare to pepper farmers in making pepper cultivation a non-profitable proposition. These two are important soil borne diseases which are eluding solution for a long time.

Pepper prices have fluctuated substantially, principally due to the instability of supply in the major producing countries according to International Pepper Community (IPC). It should be noted that generally Malaysian prices followed the trend in prices prevailing in overseas markets such as New York, London and Singapore. Price is the most important factor that contributed to the reduction in pepper area and pepper production, thus creating a situation for farmers to switch to other lucrative cash crop such as palm oil and rubber.

Nevertheless, it is undeniable that the standard of living for a number of the rural population, particular those in the state of Sarawak, had improved substantially due to the good prices of pepper since 2011. However, pepper farmers should be inculcated with the entrepreneurship mind set, if the pepper industry in Malaysia is to be driven to a more successful prospect. Farmers must be more knowledgeable about the product itself and the market needs. They should be able to make use of all of the information technology available in order to stay competitive in the global market. This is because most of the pepper farmers have not received any schooling or just attended primary school and have no formal training to plant pepper except learnt the way to plant pepper from their parents according to Tiong (2000).

As the Malaysian economy faced substantial structural changes over the last few decades, pepper industry together with other agricultural commodity sectors, have to encounter problems of acute labour shortages, limited availability of suitable lands and increasing costs of production, arising from inter-sector competition for resources, as well as intense competition in the global market resulting from trade liberalization according to Ng and Kanbur (1993). Future growth of the pepper industry, specifically and agricultural sector, generally requires the nation to address the challenges of efficient and optimal utilization of existing resources in order to further improve competitiveness of this sector. Resource constraints and rapid changes in the global trading and investment environment necessitate the development of a resilient agricultural sector generally, and pepper industry specifically, for the enhancement of their global competitiveness.

Challenges to the pepper industry come from different angles, internationally and domestically. From the international front, the industry faces issues such as tariff and non-tariff barriers according to Malaysian Pepper Board. High tariff have been imposed by importing countries, such as Turkey, Taiwan, Republic of China and Saudi Arabia. Non-tariff barriers in the form of tedious documentation are imposed by Middle East countries which require tedious import formalities, such as export documentations from Malaysia that must be endorsed by their Embassies. Other forms of non-tariff barriers are the strict import regulations and procedures imposed by importing countries, such as on issues pertaining to public health security and bio-terrorism preparedness and response. From the domestic front, challenges come from the upstream, midstream and downstream activities.

1.2 Objectives of the Study

The general objective of this study is to investigate the Malaysian Pepper market. A simultaneous equation model consisting of behavioural equations of supply, demand and price will be developed and estimated using annual time series data from 1980 to 2011. In this study, pepper is classified into two components (black pepper and white pepper) in order to understand which type of pepper has a causal relationship with the supply, demand and price.

1.2.1 The Specific Objectives are:

i. To formulate a model of the Malaysian pepper market; and
ii. To examine factor effects the supply, demand and price of the Malaysian pepper market.

1.3 Significance of Study

With the Malaysia government's policy revival in the agricultural sector, it would be interesting to see how this pepper sector will perform under the industrialization of the country's economy as well as the globalisation development that is affecting the trade and domestic market. An understanding of the pepper sector's progress and development would provide the guiding rationales as well as strategies for its future growth. Despite the three National Agricultural Policies (NAP I, II and III), and currently under the Fourth

National Agricultural Policy (2011-2020), the support and an incentive that have been provided, the sector has not generated the growth and development of the downstream activities.

The industrialization process affected the agricultural sector through a tighter competition for the same pool of resources, namely land, labour and capital. The globalisation process also affected pepper industry through a more liberal trade environment such as lesser protection and stiffer competition from cheaper imports and more efficient producers.

The relevant questions from the above scenario are as follows:

i. How has the pepper sector performed under the Fourth National Agricultural Policy?
ii. What is the impact of globalization and trade liberalization on the pepper sector?
iii. What are the policy issues facing by the Malaysian pepper sector?
iv. Can we forecast the supply, demand and prices of pepper commodity?

Black pepper production is gaining significance over the white pepper over the years. It will be interesting to investigate is there a market linkage between the two markets. However, if black and white pepper price do not have the relationship. Then, researchers should study the Malaysian pepper market independently.

Besides, marketing should as well be promulgated, whereby the decision to sell and buy pepper should not solely dependent on price, but rather on the mutual understanding between the two parties involved. As the industry penetrates into the niche market,

branding of our pepper products is important, so that the product is recognizable world-wide. In fact, there is ample room for the development of our pepper industry as big industries, such as hotels and restaurants are looking for exciting cuisine flavours. The industrial sector in food processing such as meat and instant noodle processing will also make use of large amounts of pepper.

The domestic buffer stock for price stabilization implies that a buffer stock manager buys and sells the commodity in such amounts as necessary to keep the market price within a certain band. Obviously, it may also possible to defend the upper price of the range of pepper if the stock is depleted. Thus, it is possible for us to apply the price stabilization policy for the Malaysian pepper in the farm and export level.

While short-term forecasts are needed for better trading, longer term forecasts of the growth of supply and demand are needed by policy makers to guide them in deciding whether to encourage new planting or replanting of pepper. In most of the pepper exporting countries, programmes exists for encouraging sometimes by way of subsidizing the uprooting of aged vine areas, as a monoculture or in combination with other crops. Since an over-supply of pepper could cause a precipitous decline of prices, it is important for governments to know what the projected supply and demand are over the next ten to fifteen years, so that they could accelerate or decelerate their replanting and new planting programmes appropriately.

1.4 Scope of the Study

In this study, the factors that influence supply, demand and prices of pepper in Malaysia by using annual observation obtained from the online databases of Information of Malaysian Pepper Industry provided by the Malaysian Pepper Board, Annual Bulletin of Statistics (various issues) from the Department of Statistics, Malaysia and also from the online databases of International Financial Statistic provided by the International Monetary Fund (IMF). We also are sorting out the pepper into two components (black pepper and white pepper) in order to understand which type of pepper has a causal relationship with the simulation analysis.

The rest of the study is organized as follows: Chapter Two discusses the Malaysian Pepper Market. This is followed by Chapter Three which discusses literature review. Methodology is provided by in Chapter Four. Chapter Five and Chapter Six provide the empirical results and conclusion respectively.

CHAPTER TWO

MALAYSIAN PEPPER MARKET

2.0 Introduction

This section provides the information for us to understand about the Malaysian pepper market. It discusses the cultivation area, production, yield, domestic consumption, farm gate and free on board (FOB) pepper price from 1970 to 2011. Whereas the export and import of pepper were separated into two categories period are described as 2000-2005 and 2006-2011 for comparison. The study also includes the grading of pepper and tariff lines for pepper products in Malaysia.

2.1 Cultivation Area, Production and Yield of Pepper in Malaysia from 1970 to 2011

Nowadays pepper production in Malaysia almost entirely takes place in Sarawak (99%). Both black and white pepper are produced in Sarawak. The other producing areas are Johor and Sabah about 1% of pepper production. Pepper is mainly grown intensively as a smallholder monoculture crop on holdings from 0.1 to 0.4 hectare (200 to 800 vines). It is important to note that although a gradual slow yield decline could be a characteristic of

the cultivar used, under present farm conditions in Malaysia disease attacks and decline in fertility of soil are the main causes of rapid deterioration of productivity or even death.

Table 2 illustrates the Cultivation Area, Production and Yield of Pepper in Malaysia from 1970 to 2011. The total cultivation area of pepper in Malaysia had shown an up and downward trend from year 1970 to 2011. But the yield of pepper had shown a down and upward trend. In 1970 to 1985, yield of pepper decreased sharply from 4.0493 to 1.7145 tonnes per hectare or decreased about 58%. However, in 1990 the yield increased to 2.7174 tonnes per hectare then decreased until year 2011 to 1.7537 tonnes per hectare.

The pepper crop in Malaysia especially in Sarawak is harvested between May and July each year which coincides with the dry season. Upon harvest the green berries may be dried in the sun and turned into black pepper or soaked in water for a few days to dislodge the pericarp and then cleaned and dried to be turned into white pepper. The processing of green berries into white pepper rather than black pepper takes more time and removal of the rotted pericarp is an unpleasant operation. Furthermore, the conversion rates of pepper into black and white pepper also a dilemma for the pepper productions which are depending on type of variety pepper planted by the farmers. Generally, the conversion rate for black pepper is about 33% of the green berries, but it can vary from 29 to 36% depending upon the variety and maturity at time of harvest. The rate of recovery for white pepper is about 20-25% of the weight of mature berries[1]. Therefore, farmers are normally disinclined to prepare white pepper unless the price premium for white pepper makes it worthwhile.

[1] Interested reader could refer to Paulus (2011b, pp. 261-262) for further understanding about harvesting and processing of pepper.

In Malaysia, most of the farmers are highly responsive to changes in prices. When prices are low then the production is brought down quickly by reduction of fertilizer and maintenance or even total neglect of holdings. This is a short term phenomena, but the lack of replanting and new planting of pepper in those low price periods also affects medium term and long term production. The most attractive competing crops in Malaysia are oil palm and rubber.

Moreover, the production of black pepper as well as white pepper one has to take into account whether pepper is cultivated as a mixed crop or as a monocrop. Even more difficult it is when there are only a few vines in a homestead garden. Production of pepper is only determined by productive vines. That mean either the number of immature (example planted in the last two to three years) and senile vines should be subtracted.

A similar story applied to pepper yields. Average yield per hectare can be calculated from total production and area. Yields depend heavily on the cultivation system and the age of vines. Rough knowledge of the number of productive pepper vines, age distribution and normal production, which can be regarded as production at normal prices. But in reality circumstances are never normal. Actually production depends on price of pepper, the price of fertilizer, the instance of diseases and weather conditions.

Table 2: Cultivation Area, Production and Yield of Pepper in Malaysia from 1970 to 2011

Year	Sarawak			Sabah			Johor			Total Cultivation Area (Hectare)	Production (Tonne)	Yield (Tonne/ Hectare)
	Cultivation Area (Hectare)	Production (Tonne)	Production's share (%)	Cultivation Area (Hectare)	Production (Tonne)	Production's share (%)	Cultivation Area (Hectare)	Production (Tonne)	Production's share (%)			
1970	6,000	24,296	94%	56	227	1%	330	1,336	5%	6,386	25,859	4.0493
1975	8,230	28,275	90%	72	247	1%	828	2,845	9%	9,130	31,367	3.4356
1980	12,698	28,845	92%	241	547	2%	910	2,067	7%	13,849	31,460	2.2716
1985	9,124	15,643	98%	173	297	2%	35	60	0%	9,332	16,000	1.7145
1990	11,207	30,454	98%	155	421	1%	46	125	0%	11,408	31,000	2.7174
1995	9,690	15,268	99%	102	161	1%	45	71	0%	9,837	15,500	1.5757
2000	13,327	23,887	100%	18	32	0%	45	81	0%	13,390	24,000	1.7924
2005	12,674	18,928	100%	16	24	0%	32	48	0%	12,722	19,000	1.4935
2010	14,056	24,073	99%	10	17	0%	80	137	1%	14,146	24,227	1.7126
2011	14,453	25,346	99%	4	7	0%	182	319	1%	14,639	25,672	1.7537

Source: Department of Agricultural Sarawak and Malaysian Pepper Board.

2.2 World Production of Pepper and Malaysia's Share

Table 3 and Figure 1 show the World Production of Pepper and Malaysia's Share from 1970 to 2011. Malaysia production of pepper depends very much on agro climatic factors, pest and diseases occurrence as well as price mechanism. High price couple with good agricultural practices, favourable weather situation and less incidence of pests and diseases often led to higher production level. Reversing the situation by any one of the factors would normally lead to lower production level.

The Malaysian pepper production's share in the world had shown a sharply decreased trend from 1975 to 2011. In 1975, the Malaysia's share of pepper production was 30% compared to 2011 was only 9% which is decreased about 21%.

One of the major reasons for low production of pepper is because of not all pepper harvested by farmers is sold during the harvesting season. It is usual for farmers to store part of their pepper in anticipation of higher price later, and also as a form of saving, since pepper can be quickly converted to cash when need arises. Consequently pepper in Malaysia, especially in Sarawak is marketed throughout the year. Generally during the harvest season farmers sell about two-thirds of their pepper to meet their requirements for cash and supplies and to repay debt obligations. Even with the pepper delivered to the premises of dealers for sale, not all is sold on the date of delivery. A farmer may sell part and leave the rest in storage with the dealer to be sold later when the farmer chooses to sell.

The rain in certain crucial periods is also a major determining factor of the pepper production. Pepper is a plant of humid tropics and requires 2000-3000 mm rainfall. Rainfall has to be well distributed for proper vine growth and development. Excess rainfall will result in more vegetative growth which will result in a decline in production. As pepper is usually planted on the land with the high slopes of 10° to 25°, the excess rainfall will also cause the fertilizers washed away. As the result, will affect the productions of pepper and farmers also need to pay more for their fertilizers. Similarly if the rainfall during the flowering period is inadequate, the extent of pollination will be less which in turn adversely affects the production. Regular rains during the flowering season help for pollination of flowers. The plant cannot withstand prolonged drought. Hot humid conditions are good for growth but continuing humidity over long periods of time favours the incidence of fungal disease such as Phytophthora foot rot. Relative humidity of over 90% during flowering season and about 70-80% during other parts of the year is considered good for the pepper production.[2] Hence, for the forecast of production the rainfall in the crucial periods in the production phase will have to be monitored carefully.

[22] See Paulus (2011a, pp. 71) for further understanding about climate requirements for pepper.

Table 3: World Production of Pepper and Malaysia's Share

Year	World Production (Tonne)	Malaysia's share (Tonne)	Malaysia's share (%)
1970	96,345	25,859	27%
1975	105,401	31,367	30%
1980	140,097	31,460	22%
1985	150,355	16,000	11%
1990	204,386	31,000	15%
1995	195,194	15,500	8%
2000	259,270	24,000	9%
2005	334,270	19,000	6%
2010	324,709	24,227	7%
2011	298,400	25,600	9%

Source: International Pepper Community and Malaysian Pepper Board.

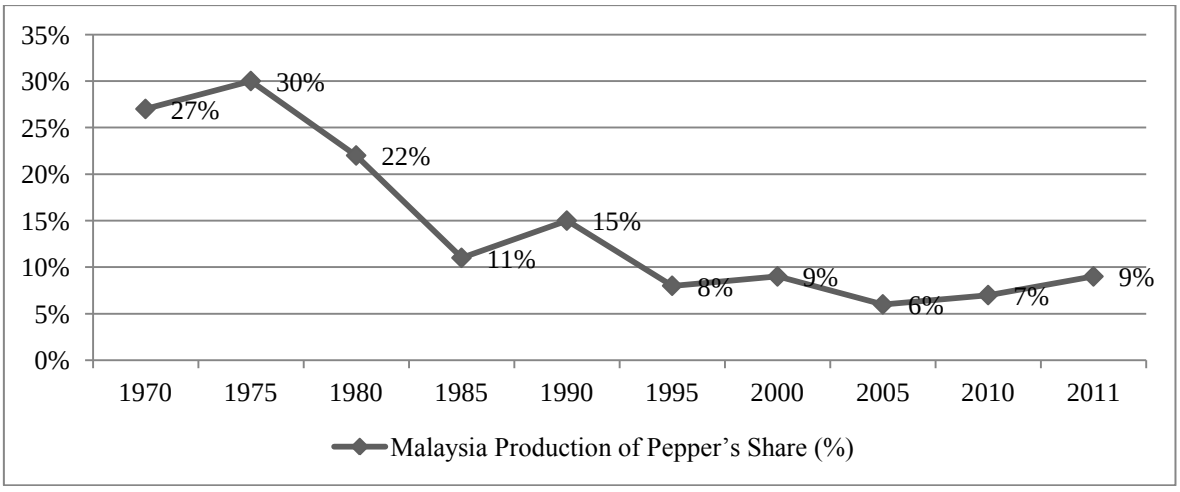


Figure 1: Malaysia Production of Pepper's Share from 1970 to 2011

2.3 Demand and Supply of Pepper in Malaysia from 1970 to 2011

Table 4 and Figure 2 illustrate the Demand and Supply of Pepper in Malaysia from 1970 to 2011. The domestic consumption's share of pepper had increased sharply from 1% to 30% from 1970 to 2011 respectively.

One of the major reasons is because pepper is an essential ingredient in food preparations in Malaysia because of its taste and flavour. Pepper and pepper product are extensively used as food/ meat preservatives, perfumes, cosmetics, medicines and others. Pepper cannot be substituted by other spices/ products because of its consumer pull/ preferences and it versatile usage. Whereas, coconut oil can be substituted by oil palm, corn oil, soya bean oil and others but not the spices.

The demand for pepper is always increasing in every year and consumption per capita in Malaysia is also increasing year after year. Consumption of pepper is influenced by size and rate of growth in population, food habits and per capita income. In Malaysia, where pepper is not a traditional flavouring agent, adoption of "Western" food may lead to rapid increase in per capita consumption.

When looking at demand for various types of pepper in Malaysia, the major distinction that has to be made is between black and white. White pepper is mainly used for household consumption, while black pepper is also used industrially. The reason is because most people think that white pepper is of better quality than the black pepper. On this point it is interesting to note that in the U.S.A major demand for household

consumption is for black pepper, whereas in Europe white pepper is preferred for this purpose.[3] As this is only consumed by households, demand will probably be almost totally price inelastic.

However, it seems that Malaysia still has a journey to hit its target to achieve 40% for the domestic consumption's share from the pepper production. So that, it will not rely on the export market only because it had strengthened its domestic market. As the result, the fluctuation of pepper price in the international market will not affect much on the Malaysia's pepper market.

[3] Interested reader could refer to Tiong (2000) about marketing of Sarawak pepper.

Table 4: Demand and Supply of Pepper in Malaysia from 1970 to 2011

Year	Production (Tonne)	Domestic Consumption (Tonne)	Domestic Consumption Per Capita (Gram)	Domestic Consumption's Share (%)
1970	25,859	380	34.92	1%
1975	31,367	440	35.77	1%
1980	31,460	500	36.03	2%
1985	16,000	600	37.78	4%
1990	31,000	700	38.67	2%
1995	15,500	900	43.52	6%
2000	24,000	1,350	57.46	6%
2005	19,000	2,900	109.53	15%
2010	24,227	7,069	249.49	29%
2011	25,672	7,828	271.49	30%

Source: Department of Agricultural Sarawak and Malaysian Pepper Board.

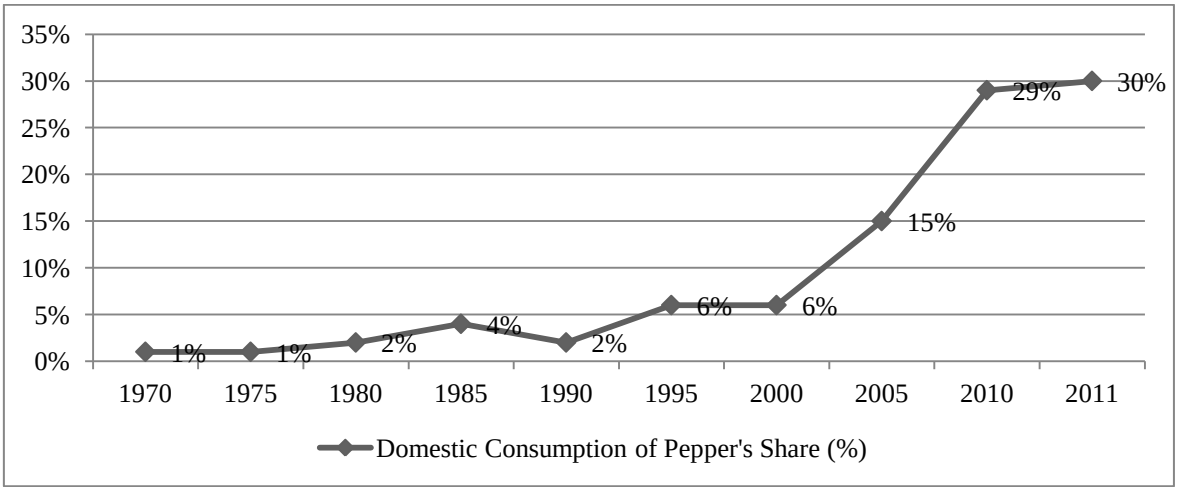


Figure 2: Malaysia Domestic Consumption of Pepper's Share from 1970 to 2011

2.4 Malaysia's Export of Pepper by Country

As Shown in Table 5 and Figure 3 indicate that the Malaysia total export of pepper in 2000-2005 was 127,838.27 tonnes valued at RM1,052.29 million. However, in 2006-2011, the total export of pepper dropped to 86,030.83 tonnes but in term of export earnings was increased to RM1,138.99 million due to the high price offered by the market. In 2000-2005, Malaysia exported about 84% of the whole black pepper but decreased to 70% in 2006-2011. However, overturn scenarios of the whole black pepper were ground black pepper from 3% to 6% followed by the whole white pepper from 12% to 21% and ground white pepper from 2% to 4%.

Malaysian pepper is exported direct to some 20 countries. However, about 24% of pepper from Malaysia is still sold to Singapore where it is re-packed for re-export in 2000-2005. Various reasons such as geographical proximity, attractive storage and credit facilities offered by Singapore traders, ease of communication and shipping, long established trading ties and other account for the overwhelming trade with Singapore which functions as a re-exporting centre in the marketing of Malaysian pepper to the world markets. In 2006-2011, Malaysia export of pepper dropped to 14%. This is because Singapore is no longer as a transit market for Malaysia and many facilities have been created by the Malaysian government to promote the pepper commodity and sell directly to the end-users and importers.

Export of Malaysia's pepper in 2000-2005 to 2006-2011 shown rises in term of percentages were China 1% to 9%, Hong Kong 1% to 2%, Indonesia 0% to 2%, Japan 22%

to 28%, Korea 7% to 10%, Philippines 1% to 2%, Taiwan 8% to 12% and Vietnam 0% to 5%.

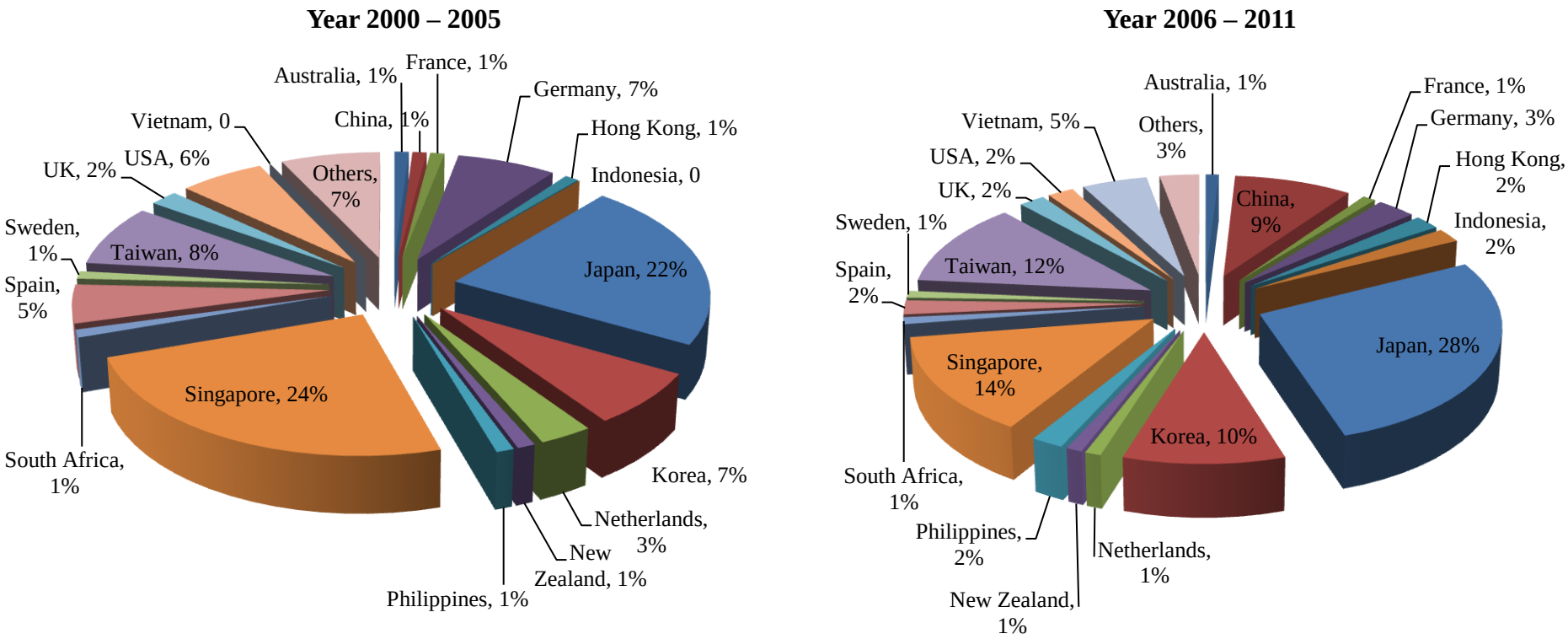
However, about six countries decreased in the percentages of export of Malaysia's pepper in 2000-2005 to 2006-2011 which were Germany 7% to 3%, Netherlands 3% to 1%, Singapore 24% to 14%, Spain 5% to 2%, USA 6% to 2% and others 7% to 3%.

Malaysia exported pepper to the six countries which remained stable in term of percentages from 2000 to 2011. Only 1% exported for each of the five countries namely Australia, France, New Zealand, South Africa and Sweden. The UK remained stable at 2% of Malaysia export of pepper.

Table 5: Malaysia's Export of Pepper by Country

No.	Country	2000 – 2005						2006 – 2011					
		Black Pepper		White Pepper		Total Export by Country (Tonne)	Country Export's Share (%)	Black Pepper		White Pepper		Total Export by Country (Tonne)	Country Export's Share (%)
		Whole (Tonne)	Ground (Tonne)	Whole (Tonne)	Ground (Tonne)			Whole (Tonne)	Ground (Tonne)	Whole (Tonne)	Ground (Tonne)		
1.	Australia	946.02	191.65	298.19	138.14	1,574.00	1%	251.43	97.73	90.79	70.96	510.91	1%
2.	China	1,043.43	139.43	222.11	10.43	1,415.40	1%	5,915.68	67.43	1,683.18	27.20	7,693.49	9%
3.	France	742.70	136.08	120.31	113.53	1,112.62	1%	205.52	171.90	86.01	164.39	627.82	1%
4.	Germany	8,039.26	0.08	1,057.97	-	9,097.31	7%	1,324.32	-	973.71	-	2,298.03	3%
5.	Hong Kong	841.41	39.96	276.78	194.49	1,352.64	1%	1,000.05	55.32	372.56	233.79	1,661.72	2%
6.	Indonesia	425.00	-	0.24	21.20	446.44	0%	1,531.51	-	0.66	0.29	1,532.46	2%
7.	Japan	18,846.50	2,912.98	5,258.75	1,070.03	28,088.26	22%	13,378.99	3,686.88	4,866.20	1,810.78	23,742.85	28%
8.	Korea	8,241.33	113.00	833.59	24.80	9,212.72	7%	7,567.65	408.50	974.56	57.71	9,008.42	10%
9.	Netherlands	3,098.18	-	945.00	1.53	4,044.71	3%	971.15	-	291.48	-	1,262.63	1%
10.	New Zealand	485.58	57.55	237.74	15.44	796.31	1%	229.79	93.70	117.44	78.72	519.65	1%
11.	Philippines	641.85	2.85	68.02	0.98	713.70	1%	1,373.99	122.59	356.35	9.16	1,862.09	2%
12.	Singapore	28,290.92	96.53	1,849.54	189.74	30,426.73	24%	9,275.35	199.56	1,804.29	763.00	12,042.20	14%
13.	South Africa	1,324.70	16.50	312.00	0.34	1,653.54	1%	472.20	-	119.85	0.74	592.79	1%
14.	Spain	6,092.85	-	660.71	-	6,753.56	5%	1,361.50	-	254.00	-	1,615.50	2%
15.	Sweden	804.20	0.50	491.55	-	1,296.25	1%	523.62	-	411.00	-	934.62	1%
16.	Taiwan	10,047.23	31.27	540.83	18.46	10,637.79	8%	8,715.89	21.53	1,318.07	15.69	10,071.18	12%
17.	UK	2,467.35	45.86	469.90	53.04	3,036.15	2%	441.93	8.15	994.05	18.30	1,462.43	2%
18.	USA	6,818.61	14.96	659.99	154.71	7,648.27	6%	92.98	11.31	1,886.03	0.23	1,990.55	2%
19.	Vietnam	20.00	-	2.00	-	22.00	0%	3,074.22	76.12	727.20	8.07	3,885.61	5%
20.	Others	7,692.41	48.63	706.52	62.31	8,509.87	7%	2,087.87	140.08	380.33	107.60	2,715.88	3%
Total Export of Pepper (Tonne)		106,909.53	3,847.83	15,011.74	2,069.97	**127,838.27**	**100%**	59,795.64	5,160.80	17,707.76	3,366.63	**86,030.83**	**100%**
Pepper Export's Share (%)		84%	3%	12%	2%	**100%**		70%	6%	21%	4%	**100%**	

Source: Department of Statistics Malaysia and Malaysian Pepper Board.



127,838.27 tonnes
RM1,052.29 million

86,030.83 tonnes
RM1,138.99 million

Figure 3: Malaysia's Export of Pepper by Country

Source: Department of Statistics Malaysia and Malaysian Pepper Board.

2.5 World Export of Pepper and Malaysia's Share

Table 6 and Figure 4 provide the World Export of Pepper and Malaysia's Share from 1970 to 2011. The Malaysia export of pepper's share in the world had decreased sharply from 40% in 1970 to 6% in 2011.

Previously as domestic consumption in Malaysia is negligible all pepper produced will sooner or later be exported. Traditionally the bulk of pepper exports were shipped to Singapore. Nowadays, there are modern facilities for grading and cleaning in all major ports and pepper exports now have to be graded first and then have to be subjected to inspection and certification by the Malaysian Pepper Board (MPB). Furthermore the MPB stimulated direct trade (for example not with Singapore and Hong Kong as an intermediated market) by imposing a certain percentage of direct trade on exporters, depending on their expertise and this percentage set every year.

The major reasons for the drop of Malaysia export of pepper's share is because of unable to sustain the pepper production to meet the demand of the consuming countries and also price competition from other producing countries. Besides, high tariff have been imposed by importing countries and non-tariff barriers in the form of tedious documentation are imposed which require tedious import formalities, such as export documentations from Malaysia that must be endorsed by their Embassies. Other forms of non-tariff barriers are the strict import regulations and procedures imposed by importing countries, such as on issues pertaining to public health security and bio-terrorism preparedness and response.

Table 6: World Export of Pepper and Malaysia's Share

Year	World Export (Tonne)	Malaysia's share (Tonne)	Malaysia's share (%)
1970	65,032	26,272	40%
1975	94,428	32,352	34%
1980	122,775	31,460	26%
1985	96,317	18,906	20%
1990	151,667	29,210	19%
1995	140,413	15,203	11%
2000	174,354	23,847	14%
2005	212,479	18,233	9%
2010	260,653	14,076	5%
2011	242,250	15,500	6%

Source: International Pepper Community and Malaysian Pepper Board.

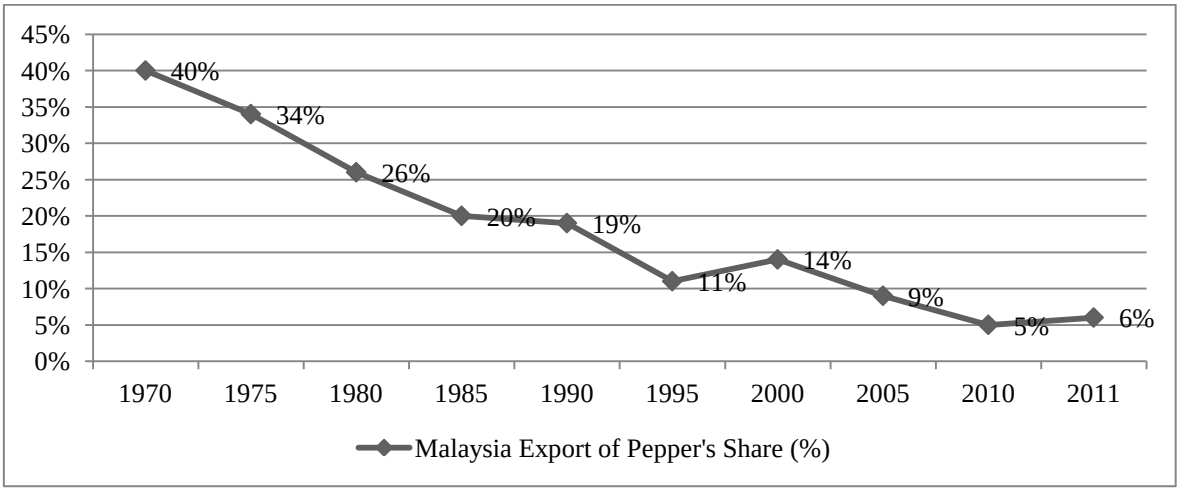


Figure 4: Malaysia Export of Pepper's Share from 1970 to 2011

2.6 Malaysia's Import of Pepper by Country

Table 7 and Figure 5 reveal the Malaysia's Import of Pepper by Country from 2000 to 2011. Malaysia also imported pepper from other producing countries namely China, India, Indonesia, Vietnam and others.

As shown in the table, most of the pepper imported by Malaysia was the whole black and white pepper. In 2000-2005, Malaysia imported about 58% of the whole black pepper but decreased to 48% in 2006-2011. However, the quantity of imported pepper for whole white pepper, ground black and white pepper shows a reverse scenario of the whole black pepper. In 2000-2005, import for whole white pepper was 25%, whereas for ground black and white peppers were 10% and 7% respectively. However, imported pepper had increased to 30% for whole white pepper and each of the ground black and white peppers jumped to 11% in 2006-2011.

According to the Figure 5, in 2000-2005, Malaysia imported most of the pepper from Indonesia 62%, followed by Vietnam 22% then India 6%, China 5% and others 4%. Nevertheless, the quantity of imported pepper from Indonesia and India dropped to 34% and 4% but the boosts of imported pepper were from Vietnam 35%, China 21%, and others 5% in 2006-2011. The total imported of pepper from Malaysia in 2000-2005 was 18,560.40 tonnes value at RM134.05 million and increased to 27,931.09 tonnes value at RM319.51 million in 2006-2011.

Table 7: Malaysia's Import of Pepper by Country

No.	Country	2000 – 2005						2006 – 2011					
		Black Pepper		White Pepper		Total Import by country (Tonne)	Country Import's Share (%)	Black Pepper		White Pepper		Total Import by country (Tonne)	Country Import's Share (%)
		Whole (Tonne)	Ground (Tonne)	Whole (Tonne)	Ground (Tonne)			Whole (Tonne)	Ground (Tonne)	Whole (Tonne)	Ground (Tonne)		
1.	China	28.50	110.26	802.06	69.92	1,010.74	5%	172.36	54.25	5,462.10	281.44	5,970.15	21%
2.	India	673.54	429.85	32.33	4.27	1,139.99	6%	378.76	676.97	35.43	12.37	1,103.53	4%
3.	Indonesia	7,696.28	576.48	2,558.48	694.07	11,525.31	62%	6,311.50	76.30	1,339.58	1,874.36	9,601.74	34%
4.	Vietnam	2,338.98	472.55	1,063.08	202.55	4,077.16	22%	6,581.27	1,536.65	1,350.73	379.13	9,847.78	35%
5.	Others	109.64	279.66	129.18	288.72	807.20	4%	84.93	628.73	86.52	607.71	1,407.89	5%
Total Import of Pepper (Tonne)		10,846.94	1,868.80	4,585.13	1,259.53	**18,560.40**	**100%**	13,528.82	2,972.90	8,274.36	3,155.01	**27,931.09**	**100%**
Pepper Import's Share (%)		58%	10%	25%	7%	**100%**		48%	11%	30%	11%	**100%**	

Source: Department of Statistics Malaysia and Malaysian Pepper Board.

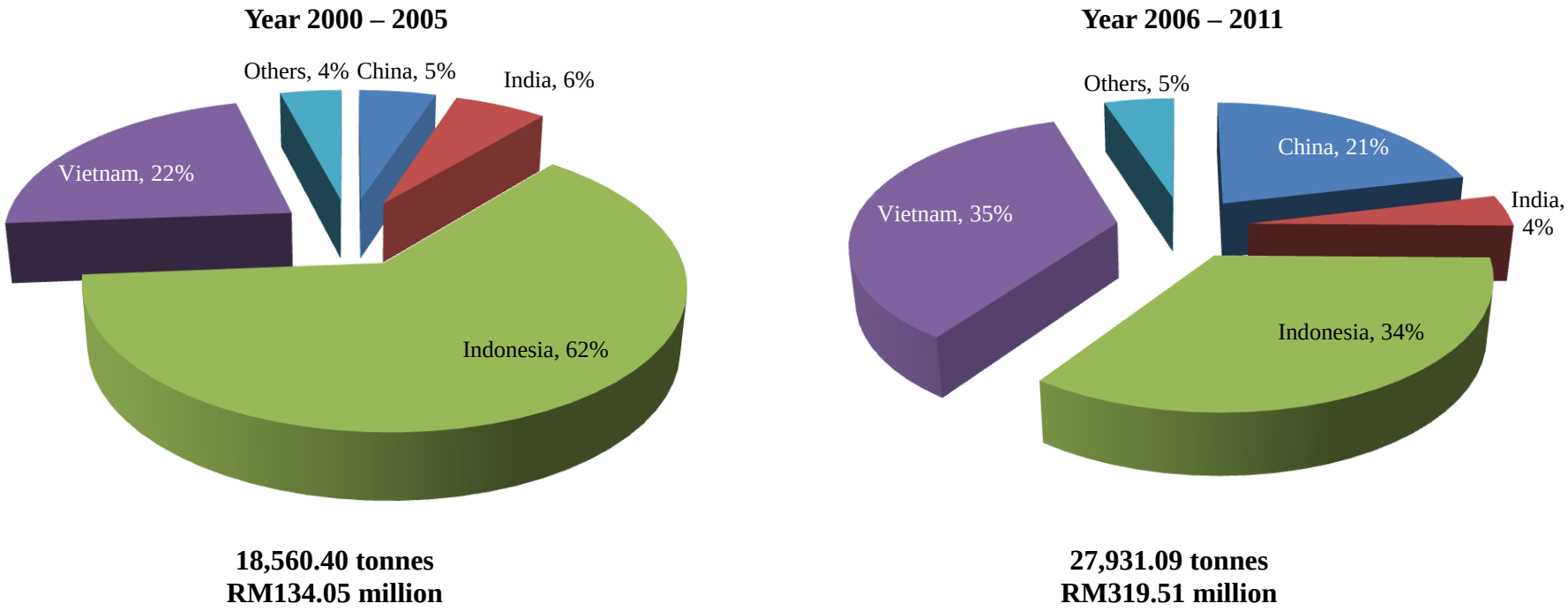


Figure 5: Malaysia's Import of Pepper by Country

Source: Department of Statistics Malaysia and Malaysian Pepper Board.

2.7 Yearly Average Farm-Gate and Free On Board (FOB) Price for Black and White Pepper in Malaysia from 1970 to 2011

Figure 6 illustrates the Yearly Average Farm-Gate and Free On Board (FOB) Price for Black and White Pepper in Malaysia from 1970 to 2011. The black and white pepper prices generally track similar pattern over time in both farm and exports levels.

The pepper prices had shown a marginal increased trend in 1970 to 1978. On the other hand, the prices of pepper in 1979 to 1982 were rather gloomy. Demand remained flat, the prices were continuously decreased. Exporters caught selling short in the past have remained very cautions. Similarly, delivery offers were difficult to obtain as importers were cautious about further short sales.

Pepper prices oscillated upwards in the period 1983 to 1987, but the price persistently fluctuate downwards in 1988 to 1992. The pepper prices fluctuated upwards from 1993 to 1997 and oscillated at a high level in 1998 to 1999. However, the prices dropped in 2000 to 2004 but from 2005 until 2011 the pepper prices shown an upwards trend in the market.

Pepper prices fluctuate on day to day basis because of various variable factors. At times, no relationship between demand and supply would be existed and speculators play an important role in determining the pepper prices, which will have a direct or indirect impact on demand and supply position.

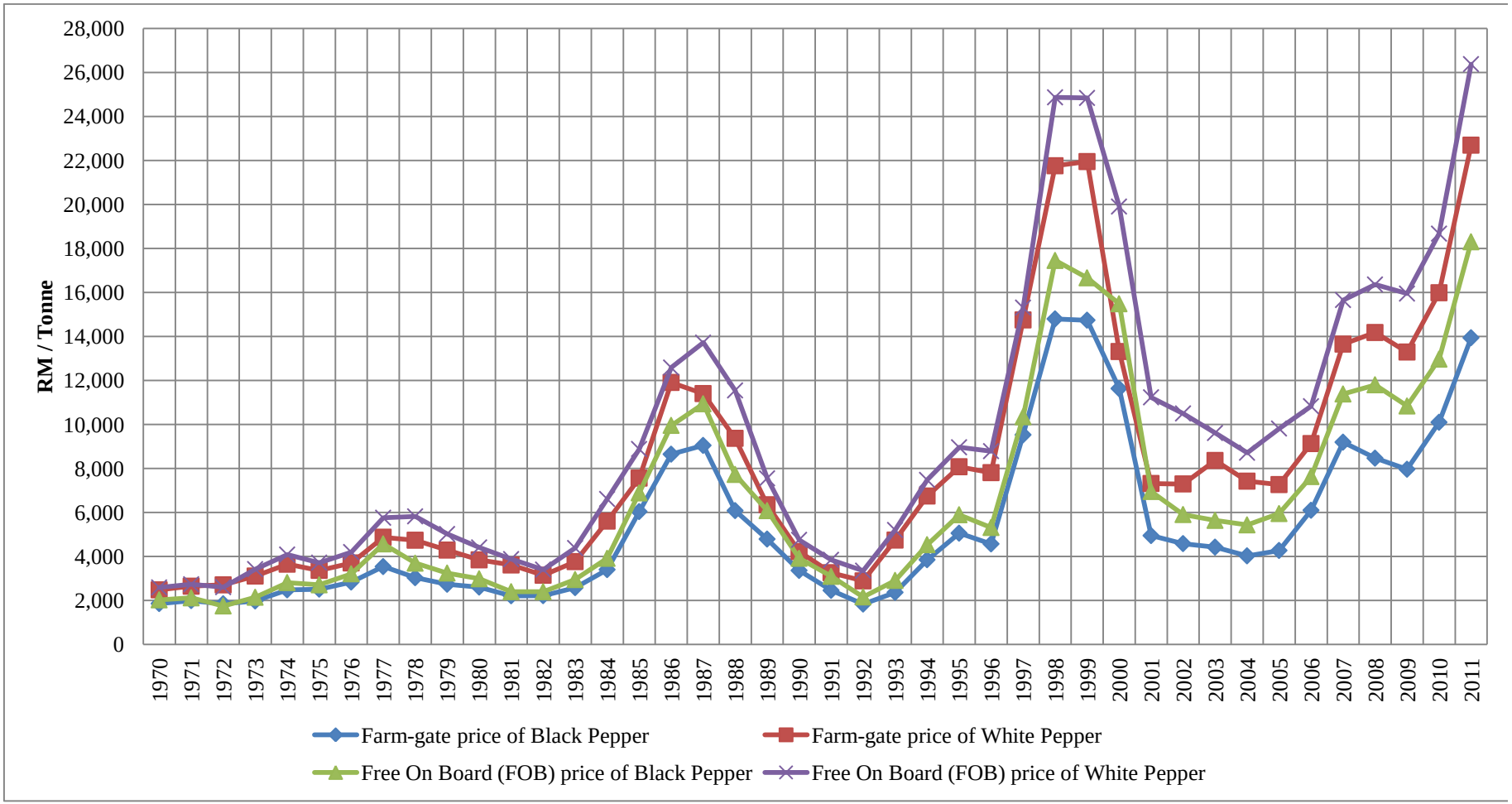
Pepper prices tend to move in cyclical way and price fluctuation can be very different from one year to another. In general, price varies substantially, largely because of fluctuations in supplies by the major producing countries and these price swings were also accentuated by speculative trading.

Price instability of pepper is very high and arises mainly due to fluctuations of supply, as demand in the short-term is quite price inelastic and stable. The cyclical movement of the prices with on average five years up and five years down already indicates that supply reactions on prices are the main causes of price instability.

The prices of black and white pepper tumbled down due to there was grossly oversupply of pepper particularly white pepper. Major reason is because of the exporters competed with each other to sell pepper hurriedly and buy so doing tried to undercut each other. Whereas the importers tried to withhold buying and adopted a wait and see strategy to see who can offer the least price. Besides, all most the pepper was exported in the raw form as bulk whole pepper and not as processed pepper or pepper product.

However, farmers are not influenced entirely by price considerations in preparing black and white pepper. There are two important factors when the farmer harvests pepper in Malaysia. The first and final harvest generally produce black pepper as the berries are small and irregular and not ripe. Water supplies can vary and important for the production of white pepper. However, few areas have to produce black pepper due to local water shortage.

Therefore, market analysis is helpful to people involved in the trading of primary commodities including pepper in preventing unnecessary big losses. However, not all are acquainted or have appropriate knowledge on utilizing such information to eliminate price risk. It is well known that prices of most primary commodities in the international market are volatile. Thus, dealing with the trading of primary commodities including pepper that mean consciously or unconsciously dealing with speculative activities. In the producing countries, the attitude and the sales policy of the exporters/ shippers will always give influence to the other local markets participants, that is, the intermediary traders and also the farmers in selling their products or in price discovery. Ironically, some exporters especially those who belong to small firms or are new in the business do not have the means to get updated market information from international sources either through the telephone or facsimile telecommunication and have limited ability in making interpretations and conclusions of the available market analyses to void erroneous decisions in their sales policy. In other words, these exporters are highly exposed to price risk. There is a danger that their attitude and sales policy might be followed by other local market participants. Consequently, these exporter and other local market participants might face the same problem of adverse price changes in the international market.



Source: Malaysian Pepper Board.

Figure 6: Yearly Average Farm-Gate and Free On Board (FOB) Price for Black and White Pepper in Malaysia from 1970 to 2011

2.8 Grading of Malaysian Pepper

The pepper industry in Malaysia is export-oriented. Practically all the pepper produced in the country is for export as domestic consumption is negligible. At the export level, since 1975 the Malaysian Pepper Board (formerly known as Pepper Marketing Board), a federal government agency has introduced a grading scheme to standardize the quality of pepper exports. Under the grading scheme presently, all pepper consignment for export from the major ports of shipment in Malaysia are subjected to compulsory inspection and certification of quality by the Malaysian Pepper Board in accordance with its standard grade specifications.

In the world spice trade, Malaysian pepper was famous as Sarawak Pepper due recognition by the world pepper market. It is not just because of the Geographical Indication (GI) of Region received by Malaysia but because of Sarawak as the largest state in Malaysia was an established producer of "King of Spice" (Pepper). Thus, the name of Sarawak is just a brand for Malaysian pepper. As a result, most of the name for black and white pepper will normally started with Sarawak and followed by its grade.

At present, there are five grades each for black and white pepper, namely Standard No. 1, Special, FAQ (Fair Average Quality), Field, Coarse Field. The specifications for physical properties of these grades are given in the Table 8.

The grading procedure of the Malaysian Pepper Board requires every consignment of pepper for export to be kept in bonded store for the purposes of sampling and laboratory

testing of samples. Samples randomly drawn to be representative of a whole consignment are tested for characteristics such as moisture, extraneous matter and light berries, and grades are ascertained according to the prescribed specifications. The Board then issues a certificate attesting the grade of the consignment as well as labels and seals all the bags of pepper which are only released from the bonded store at the time of shipment. To facilitate easier identification, the labels have different colours for different grades.

Most of the exporters in Malaysia especially in Sarawak possess simple processing facilities which enable them to clean and upgrade their pepper to FAQ grade. For preparation of higher grades for example Special and Standard No. 1 they can make use of the Malaysian Pepper Board's three pepper cleaning plants at Kuching, Sarikei and Sibu. These are modern plants capable of cleaning farm pepper to the quality requirements of major pepper markets in the world, including the American Spice Trade Association (ASTA) quality imported by the United States. The processing facilities (namely Dry & Wet Plant, Steam Treatment Plant, Colour Sorting Plant and Grinding Plant) are available to the private sector at a charge. So that, the industry players can meets their customers' product expectation and demand. The graded and certified Malaysian pepper is now recognized by end users and traders all over the world as being of high consistent quality. Furthermore, the inspection and grading service provided by the Board is regarded as the most advanced and effective system in the spice trade.

Table 8: Specifications of Black and White Pepper

A. Sarawak Black Pepper

Characteristics	Grade				
	Standard Malaysian Black Pepper No.1 (Brown Label)	**Sarawak Special Black (Yellow Label)**	**Sarawak FAQ Black (Black Label)**	**Sarawak Field Black (Purple Label)**	**Sarawak Coarse Field Black (Grey Label)**
I. Moisture, per cent by weight, maximum	% 12.0	% 14.5	% 15.0	% 16.0	% 16.0
II. Light berries, per cent by weight, maximum	2.0	4.0	8.0	10.0	-
III. Extraneous matter, per cent by weight, maximum	1.0	1.5	3.0	4.0	8.0

B. Sarawak White Pepper

Characteristics	Grade				
	Standard Malaysian White Pepper No. 1 (Cream Label)	**Sarawak Special White (Green Label)**	**Sarawak FAQ White (Blue Label)**	**Sarawak Field White (Orange Label)**	**Sarawak Coarse Field White (Grey Label)**
I. Moisture, per cent by weight, maximum	% 12.0	% 15.0	% 16.0	% 16.0	% 16.0
II. Light berries, per cent by weight, maximum	0.2	0.5	1.0	1.5	-
III. Extraneous matter, per cent by weight, maximum	0.25	0.25	0.5	1.0	3.0
IV. Amount of black/ dark grey berries in white pepper, per cent by weight maximum	1.0	1.0	2.0	3.0	5.0

Note:

i. *Standard Malaysian White Pepper and Special White Pepper shall have a generally pale creamy or dull brownish ivory appearance and shall not contain a substantial amount of dark or mainly brown berries, the determination of which shall be based on a standard sample.*

ii. *The mouldy pepper in Standard Malaysian pepper shall not exceed 1% by weight.*

iii. *For light pepper, pericarps and pin-head shall not be considered as extraneous matter in grading.*

Source: Malaysian Pepper Board.

2.9 Malaysia Tariff Lines for Pepper Products

There is none tariff and quota required for import and export of pepper in Malaysia. This is because Malaysia wanted to promote its pepper and also the aspiration is to make Malaysia as the "Regional Halal Food Hub" which can contribute positively to the demand in the spice.

However, there are about seven type of documentation compulsory for import and export of peppers in Malaysia namely Certificate of Phytosanitary, Certificate of Origin (CO), Grade Certificate, Bill of Lading, Packing List, Commercial Invoice and Certificate of Analysis (inclusive the test of Physical, Chemical and Microbiological).

Trade liberalisation, open market economy, globalisation of trade, which are being liberalised further with the implementation of Free Trade Agreement (FTA), will significantly affect the pepper market in Malaysia due to price battle with other producing countries. Production quota, stock retention schemes, minimum export price and protection policy will not effective with the open market economy and globalization of trade. Thus, establishing linkage between producers and consumers, exporters and importers are very important for effective co-ordination and strengthening of the Malaysian pepper trade.

2.10 Conclusion

In this summary, the Malaysian pepper with particular reference to Sarawak, the state which accounts for over 99% of pepper production in Malaysia. Other pepper producing states are Johor and Sabah. Pepper is cultivated in small farm holdings in Malaysia. It is harvested generally in the months of May to July in Sarawak and between Decembers to February in Johor. After harvest the green berries are processed into black or white pepper. The decision to produce black or white pepper depends on various factors such as the customary practice of the farmer, the premium in price for white pepper, the availability of water for processing white pepper, size of the berries harvested and security of the farm against theft.

Not all pepper harvested is offered for immediate sale. It is normal practice to store a part of the crop after each harvest for subsequent sale generally in the offseason when prices are expected to be higher. Pepper may store, by some farmers and dealers, for several years for sale during times of boom. This is an inherent feature of the pepper trade.

Pepper has a unique status/position in international trade. Pepper is grown in the developing countries but consumed more in the developed countries. Demand for pepper is continuously increasing and there is no substitute for pepper product. Pepper is a unique product used for its taste and flavour in the food industry. Although pepper does not have very close natural substitutes, there are products to flavour food and make it “hot” which may influence the consumer’s preference. The most important one are chillies but not a big

threat at the moment as long as the supply of pepper is adequate in the market. But the thinking of substitution possibilities has to be considered in the long term period.

The economies of the traditional pepper producing countries are changing from agriculture to industrialization and within agricultural sector the priorities are being shifted from high labour intensive crops to a less labour intensive crop. It is hard for pepper to compete with other crops such as oil palm, rubber and others on economic reasons, where the returns are higher. Consequently, the production of pepper is declining by leaving a big gap between demand and supply.

The price of pepper fluctuates on day to day basis and it is at times very high. The Malaysian pepper farmers need to have other resources of income by produce high value-end products of pepper at the time when pepper price is falling down. On the other hand, concerns about food quality, contamination on food and safety standards are increasing, as well as concerns on natural resources degradation and environment friendly factors. Biotechnological methods and biological farming have offered increasing opportunities to Malaysian pepper industry and efforts should be made to focus on these issues.

It is time to revitalize the Malaysian pepper farming by introducing and implementing the most cost effective and efficient pepper farming as a mixed/ multi-crop which helps poverty alleviation of the poor pepper farmers and ensures sustained supply of pepper to the consuming countries.

CHAPTER THREE

LITERATURE REVIEW

3.0 Introduction

Commodity market models are employed widely in the preparation of commodity quantity and price forecasting. The question of commodity models is still an interesting issue which had become the critical argument since the 19th century. Here, the common reviews for the study are more focus on various types of commodity models. It is interesting to discover that many researchers are increasingly being combined with other methodologies to produce more sophisticated model structures.

In this chapter, the review of previous literature will be divided into three sections: the first section in this chapter reviews the commodity models. The second section focuses on the types of commodity models in Malaysia. The last section will be the types of commodity models in other countries.

3.1 Commodity Models

Previous models for primary commodities have different specifications which depend on the market structure, statistics, and the objective of the study as well as on other

factors. The commodity market structure includes aspects of production, consumption, and demand for inventory and government policies. Many of the traditional commodity models can be described as flow in nature (although some are ambiguous in the sense that it is not clear whether they are flow, stock or stock-flow). Different types of models can be found in Adams (1981). In flow models, inventories are determined by the difference between supply and demand. When there is excess supply, inventories build up and prices fall and vice versa. In a stock model, inventories and expectations are explicitly specified; therefore, they play as significant role in determining prices as shown by Adams (1981). The stock-flow model is an amalgam of the other two. As indicated in Adams (1981) the flow adjustment is present to the extent that it describes the pressure due to consumption and production. However, the pressure mechanism is formulated in such a way that it reflects the pressure of consumption or production on available inventories; this situation results in the following price equation specification:

$$P = f\,(H/C,\ H/Q,\ \text{and } Z)$$

In this equation, P, H, C, Q is respectively price, inventory stock, consumption and production respectively. Z represents all exogenous variables which affect price. When the dynamic nature of the models is considered, the paths of the endogenous variables can be observed. This can be seen in models constructed by Just *et al*. (1977), in which the continuous adjustment system provide the means for an analysis to explore price determination outside equilibrium.

On the other hand, the modelling commodity production, it is very crucial to integrate geological, technical, biological factors and parameters into appropriate economic relationships. Current and lagged response should be clearly specified to indicate whether the analysis is short, medium or long run. The first person to formulate supply relations, which are dynamically based on partial adjustment mechanism, was Nerlove (1956 and 1958). This gives rise to a single distributed lag model that could explain much of the supply response to output price changes (long run). Muth (1961) criticized Nerlove's model and suggested a rational expectation's model.

Behrman (1968) shows a modified supply response mechanism that includes expectations on yield as well as on price levels. Just (1974) expand on the adaptive expectations model to include quadratic lag terms indicative of risk. Critical reviews of the traditional response model in the light of developments in economic time series modelling, for example Muth (1961), Newberry and Stiglitz (1979) have emphasized the notion of risk in agricultural economic models.

The consumption analysis is similar to production in the sense that all possible factors affecting consumption should be included. Such factors include income, price of a commodity, price of substitute or complementary commodities, consumer tastes and preferences as well as the size of the population. Models in Adams (1981) and Hwa (1981) contains some of the above mentioned demand factors. In addition to dynamic relationships, Houthakker (1967) extend the specification of commodity demand to include a dynamic differential formulation.

The inventory demands are an important market component in the short run since their accumulation or depletion wills immediately affect the prices. There are several motives for holding inventories such as transaction, precautionary and speculative which can be found in different inventory theories including flexible accelerator, buffer stocks and supply of storage. The accelerator theory contends that there is a direct relationship between inventory and the level of output (or their rates of change). In Hwa (1981) earlier contributors to this theory can be seen. This theory is based on the transaction motive where more goods are produced to meet an expected increase in consumption (which is assumed to depend on present consumption). One disadvantage of this theory is that there might be a time lag between inventory build-up and sales of output.

Empirical application of inventory behaviour to price adjustments is limited due to inadequacy and scarcity of inventory data. The study on stock models can be seen in Mc Callum (1974). The latest studies include Hwa (1981) on six of the UNCTAD core commodities who presented a theoretical model on inventory and the price dynamics of primary commodities under different expectations.

On the national level, such policies include duties, subsidies and price supports or acreage allotments. On the international level, there are international, there are international agreements such as quotas, buffer stocks and bilateral contracts. Through these agreements, international policies can be implemented. In Schmitz and Bawden (1973), application of such policies on the wheat economy (long term forecasts in the spatial equilibrium trade model) can be found. Government policies that have continued

for a long time can be included analytically in the models because they exhibit a pattern of regularity.

Inclusion of weather and unforeseen events as variables is very essential since these variables have a great influence on the market, for example frosts in Brazil affect the coffee output. The effects of weather can be included in production models. Maunder (1972) has shown how weighting methods can integrate rainfall and temperature sources to aid in the production of butterfat in New Zealand. Similarly, Akiyama and Varangis (1990) calculated the duration of rainfall from the "long term average". In many cases, dummy variables are used to represent extraordinary weather conditions.

The production, consumption, inventory demand, international agreements and government policies, weather and unforeseen events have to be put together in a commodity market structure. The magnitude of the elasticities as well as agricultural concentration of the commodities will indicate whether the market is competitive or non-competitive. The analysis of the market can be static or dynamic as in Wymer (1975), who has investigated the dynamic paths of the endogenous variables that correspond to some short-run equilibrium position.

Table 9 summarized the literature review from the previous researches scrutinizing the Commodity Models, according to specific methodological tests that are being adopted which results to specific finding.

Table 9: Summary of Literature Review on the Commodity Models

No.	Titles	Author	Source	Methodology	Findings
1.	Estimates of Elasticities of Supply of Selected Agricultural Commodities	Nerlove, M. (1956)	Journal of Farm Economics, Vol. 38, No. 2 (May, 1956), pp. 496-509.	Regression Analysis	Estimated the elasticity of supply response to price can be obtained only from comprehensive supply functions. This means that at least the expected prices of alternative output and the expected price of variable inputs must be taken into account. In addition, the responsive of yields to various prices must be investigated and the role of technological change must be examined.
2.	The Dynamic of Supply: Estimation of Farmer's Response to Price	Nerlove, M. (1958)	Johon Hopkin's University Press, Baltimore, 1958.	Nerlove-Koyck Adjustment Model	The pioneering work of Nerlove (1958) on supply response enables one to determine short run and long run elasticities and also it gives the flexibility to introduce non-price shift variable in the model.
3.	Rational Expectation and Theory of Price Movements	Muth, J. F. (1961)	Econometrica, Vol. 29, No. 3 (Jul., 1961), pp. 315-335.	Cobweb Models	Farmers are assumed to hold rational expectation which Muth (1961) defines as those which would be predicted by the relevant economic theory by given the information currently available.
4.	Economic Policy for The Farm Sector	Houthakker, H. S. (1967)	American Enterprise Institute for Public Policy Research, Washington, DC.	Cobweb Models	Private traders could store the commodity and sell contracts at a distant point in time as a hedge. This would result in rising spot prices and redistribution of stocks through time.
5.	Monopolistic Cocoa Pricing	Behraman, J. R. (1968)	American Journal of Agricultural Economics, Vol. 50, pp. 702-719.	OLS Analysis	The leading cocoa producing countries' command over external resources but stock accumulation or surplus disposal problems might have been troublesome and long run supplies would have increased substantially unless producers were effectively isolated from the world market.

Table 9: Summary of Literature Review on the Commodity Models

No.	Titles	Author	Source	Methodology	Findings
6.	National Econoclimatic Models: Problems and Applications	Maunder, W. J. (1972)	New Zealand Meteorological Service, Technical Note No. 208, Wellington.	Weighting Methods	It is believed that national econoclimatic studies are significant to decision-making at various national levels, the alternative being omission of meteorological conditions from decision-making, an omission which can lead to incorrect decision with unfavourable results for the economy.
7.	The World Wheat Economy: An Empirical Analysis	Schmitz, A. and Bawden, D. L. (1973)	Giannini Foundation Monograph, No. 32 (Mar. 1973), Berkeley, California: University of California.	A Spatial Equilibrium Model of Interregional Trade	The long run price and trade effects for the world wheat industry from major changes in both technology and governmental policy. Both a theoretical and an empirical model are constructed for the world wheat industry. The data used are wheat demand and supply relationships for consuming and producing regions and wheat shipping costs.
8.	Competitive Price Adjustments: An Empirical Study	Mc Callum, B. T. (1974)	American Economic Review, Vol. 64, No. 1 (Mar. 1974), pp. 56-65.	OLS Analysis	Their results indicated superiority of the inventory models do not contradict the view that the supply-demand law is a useful approximation where one represents in a simplified way complex dynamic behaviour.
9.	An Investigation of the Importance of Risk in Farmer's Decisions	Just, R. E. (1974)	American Journal of Agricultural Economics, Vol. 56, pp. 14-25.	Nerlovian Model	The adaptive expectations geometric lag model is generalized by geometrically including quadratic lag terms indicative of risk. The computation of consistent estimators is described and model is applied in the analysis of California field supply response. Results indicate that the effects of stabilization might have seriously offset the acreage reducing effects of voluntary acreage restrictions.

Table 9: Summary of Literature Review on the Commodity Models

No.	Titles	Author	Source	Methodology	Findings
10.	Estimation of Continuous Time Models with an Application to the World Sugar Market	Wymer, C. R. (1975)	In: Labys, W. C. (Eds), Quantitative Models of Commodity Markets, Cambridge, Massachusetts: Ballinger.	Regression Analysis	The production, consumption, inventory demand, international agreements and government policies, weather and unforeseen events have to be put together in a commodity market structure.
11.	The Distribution of Welfare Gains from International Price Stabilization under Distortions	Just, R. E., Lutz, E., Schmitz, A. and Turnovsky, S. (1977)	American Journal of Agricultural Economics, No. 59 (Nov., 1977), pp. 652-661.	Massell Model	With a high degree of nonlinearity, producers in both countries as well as the exporting country as a whole lose from stabilization, whereas consumers and the importing country gain.
12.	The Theory of Commodity Price Stabilisation Rules: Welfare Impacts and Supply Responses	Newbery, D. M. G. and Stiglitz, J. E. (1979)	The Economic Journal, Vol. 89, No. 356 (Dec., 1979), pp. 799-817.	Waugh-Oi-Massel Models	A mean preserving price stabilization scheme through the use of stochastic dominance rules and developed a theory of the mean quantity preserving changes in price.
13.	Modelling the World Commodity Markets: Perspectives on the Use of Commodity Market Models for Forecasting and Simulation	Adams, F. G. (1981)	World Bank Commodity Models, Vol. 1, No. 6, June.	OLS Analysis	It is a relatively straightforward matter to build a model of a commodity producing sector and to integrate it into the model of a producing country. It turns out to be considerably more difficult to show the relationships between growth in the producing country and the development of the commodity sector, particularly with respect to its fluctuations. It is well known that foreign exchange earnings and tax receipts have important effects on domestic development and inflation. It is not generally appreciated, however, how much influence a producer country's policies may have on accentuating or attenuating the impact of commodity market fluctuations.

Table 9: Summary of Literature Review on the Commodity Models

No.	Titles	Author	Source	Methodology	Findings
14.	Price Determination in Several International Primary Commodity Markets: A structural Analysis	Hwa, E. C. (1981)	IMF Staff Papers, Vol. 29, No. 1, pp. 157-192.	OLS Analysis	The changes in primary commodity prices are determined by stock disequilibria rather than by either flow or mixed stock-flow disequilibria. The estimates of the speed of price adjustment toward short-run equilibrium are found to be generally larger for agricultural commodities than metals. The estimates further indicate that one year may be sufficient for the agricultural commodity markets to reach equilibrium, while it may not be sufficient for the metal markets.

3.2 Types of Commodity Models In Malaysia

A simultaneous equations model of the Malaysian natural rubber market has the ability to trace, at least, the directions of the movements of certain selected endogenous variables. The model was developed by Yusoff (1988) to forecast the effect of a change in an endogenous variable such as export duty, exchange rates or recession on endogenous variables.

On the other hand, a model of the Malaysian palm-oil industry was formulated, estimated and simulated by Yusoff (1988). The effects on production and price received are substantial, while the effects on acreage and export are minimal. A reduction in export tax also causes a large reduction on local utilization, but has a minimal effect on world price. However, Taib and Darawi (2002) have indentified the important factors affecting the Malaysian palm oil industry. Their model is estimated by taking into account total palm oil area, oil palm yield, domestic consumption, exports and imports from 1970 to 1999. Their results show the importance of the Malaysian economic activity, the exchange rate and world population affecting the palm oil industry. Other factors are palm oil stock level, price of palm oil, technological advancement in production technique and price of soya bean oil.

A study by Shri Dewi *et al*. (2011) have discovered the important factors affecting Malaysian palm oil industry especially biodiesel demand. Their market model representing palm oil production, import, world excess demand, domestic consumption, export demand, rest of the world excess supply and palm oil prices is formulated. A system of equations of

eight structural equations and four identities is estimated by Two Stage Least squares method using annual data for the period 1976-2008. The domestic price equation is formed to investigate the link between biodiesel demand and the Malaysian palm oil market. The domestic price is significantly affected by Malaysian ending stock, world palm oil price, biodiesel demand and lagged domestic price. The elasticity of Malaysian palm oil domestic price with respect to biodiesel demand is then obtained. Results suggest that biodiesel demand has a positive impact on the Malaysian palm oil domestic price. Thus, significant growth in biodiesel demand is important in explaining Malaysian palm oil price determination.

Shamsudin *et al.* (1992), Hameed *et al.* (2009) and Shri Dewi *et al.* (2009) have discovered the world cocoa price is determined by the consumption and stock levels. The world cocoa consumption is primarily influenced by the economies of the consuming countries. The price elasticities of supply and demand are low, indicating that the impact of shifts in both supply and demand on cocoa are substantial. This shows that price fluctuation is mainly due to fluctuation in stock levels caused by changes in both supply and demand. On the other hand, Shamsudin (1998) investigate the economic implications of an export levy on the Malaysian cocoa industry. The results indicated that the imposition of an export levy would lower producer prices and raise export prices. Hence production and export would decline. As for the domestic utilization and import have a positive relationship.

Lin and Shamsudin (1992) found that when income drops, the beef-cattle subsector would lose more consumers' dollars. The pork-hog subsector has greater ability than the

beef-cattle subsector to compete for financial resources to purchase feeder animals in both the short and long run as the disposable income increases. However, the pork-hog subsector would lose more financial resources as income drops. However, Baharumshah and Mohamed (1993) discovered that the significant own-price effect of pricing policy can be an important domestic policy instrument. They found that the meats groups have acquired an important position in the Malaysian diet as indicated by their high expenditure elasticities (elastic) and low own price elasticities. On the other hand, Tey *et al.* (2010) estimated income elasticities on the current food consumption patterns are showing signs of convergence toward a Western diet, exhibiting a tendency for preference toward red meats (mutton and beef) that are expected to increase faster than white meats (poultry and pork) in response to income growth. However, the elastic own-price elasticities in their research indicated that Malaysian consumers are sensitive to the change in prices of meat products. Though the Malaysian government imposes ceiling and floor prices for the meat products, the meat products are still highly associated with high-price volatility.

In addition, Shamsudin and Othman (1995) have developed a market model of sawntimber consisting of supply, export demand and domestic equations and excess supply and price as identities was developed. Their model can be used to analyse the effect of changes in exogenous variables such as export duty, substitute product prices, forest opening and economic growth on the supply, demand and price of sawntimber.

Ng and Kanbur (1993) worked on a modelling of the Malaysian pepper industry using three major components of supply, demand and price. Although Ng's model was a

simple model with nine equations, it did manage to capture the main aspects of the pepper industry. These aspects were:

i. The relative instability of the supply of pepper;
ii. The relative stability of the demand for pepper;
iii. The frequent fluctuation of pepper.

It may be noted that the volatility in pepper supply is attributed mainly to the high susceptibility of the pepper vines to disease and pests. These and other natural factors play an important role in determining yield of pepper. Apart from being volatile, the supply of pepper according to Ng and Kanbur's study is price inelastic in the short run. Price inelasticity is however a common feature of most primary commodities due to long gestation period. On the supply side research in exploring ways and means to control diseases and pests must be intensified and encouraged so that a more stable supply base is achieved. Existing support policies must constantly be reviewed and improved upon so that maximum benefits can be derived from these policies.

Yusoff (1993) in his study has analysed the performance of Malaysian pepper export. The supply equation was regressed upon the production of pepper, the trend variable (which captured the effect of the preferences of the producers for pepper growing) and the demand for Malaysian pepper export, while the demand function was regressed on price of pepper, real world income which was represented by the industrial production index and the production of pepper in Malaysia. The results of the study suggested that price of pepper was not an important determinant of the supply and export demand for

pepper in Malaysia. The supply of pepper was determined by the demand while the export demand was dependent on the capacity to supply which was proxied by the quantity of production. Both of these variables had a positive relationship with their respective independent variables.

Besides, Wong, Rahim and Shamsudin (2010) discovered that the positive relationship between the international pepper price and the export supply of both black and white pepper in the long run is in conformity with economic theory. However, the negative elasticity of white pepper export supply with respect to black pepper price in the long run can be explained by the inherent nature of black pepper as a competing product for white pepper. When international price of black pepper increases, more black pepper will be supplied and exported in the market, causing the export supply of white pepper to reduce and vice versa. They also found that the stock coefficient of 0.10 in the long-run black pepper export supply model implies that the export supply elasticity of black pepper with respect to black pepper stock is very inelastic. The stock of black pepper stored would positively and significantly affect the black pepper export supply in the international market in the long run. The reason is that pepper stock is normally kept for the long-term use in the export supply of black pepper. The export supply of black pepper will increase in the long run particularly when pepper price starts rocketing up.

According to its researches, based on methodologies adopted and also its types of commodity models in Malaysia that is used for these various studies, the results are being summarized in Table 10.

Table 10: Summary of Literature Review on the Types of Commodity Models In Malaysia

No.	Titles	Author	Source	Methodology	Findings
1.	Malaysian Natural Rubber Market Model	Yusoff, M. B. (1988)	Pertanika Journal of Social Sciences & Humanities, 11(3), pp. 441-449.	Two Stage Least Squares Model	The model developed could be used to forecast the effect of a change in an endogenous variable such as export duty, exchange rates or recession on endogenous variables.
2.	Production and Trade Model for the Malaysian Palm Oil Industry	Yusoff, M. B. (1988)	ASEAN Economic Bulletin, pp. 169-177.	Two Stage Least Squares Model	The simulation results suggested that a reduction in palm oil export tax could increase production, price received by the producers, exports and acreage; and reduce world price and local consumption. The effects on production, price received and local consumption are quite substantial, while the effects on acreage, export and world price are small.
3.	An Economic Analysis of Cocoa Prices: A Structural Approach	Shamsudin, M. N., Chew, T. A. and Rosdi, M. L. (1992)	Jurnal Ekonomi Malaysia, No. 25 (Jun., 1992) pp. 3-17.	Two Stage Least Squares Model	The world market model for cocoa was developed to analyse the interrelationship between the economic variables of supply, demand, price and stocks. The important determinants of cocoa prices are the stock levels and consumption.
4.	The Dynamic Characteristics of Pork-Hog, Beef-Cattle, and Corn Subsectors and the Competition Between Pork-Hog and Beef-Cattle Industries in the United States	Lin, Y. N. and Shamsudin, M. N. (1992)	Journal of Economics and Finance, Vol. 16:1, pp. 81-102.	Two Stage Least Squares Model	Analyzed the competitive relationships between pork and beef in the retail market for consumer's dollars and between the beef-cattle and pork-hog industries in input markets for production factors by means of estimated expenditure elasticities. Besides, it is found that beef has greater capability than pork to compete for consumers' dollars while the pork-hog industry has greater ability than the beef-cattle subsector to compete for production inputs in both the short and long run as per-capita disposable income is raised.

Table 10: Summary of Literature Review on the Types of Commodity Models In Malaysia

No.	Titles	Author	Source	Methodology	Findings
5.	Demand for Meat in Malaysia: An Application of the Almost Ideal Demand System Analysis	Baharumshah, A. Z. and Mohamed, Z. (1993)	Pertanika Journal of Social Sciences & Humanities, 1(1), pp. 91-99.	Almost Ideal Demand System (AIDS) Model	Their result showed that own-price elasticities were negative, statistically significant and except for chicken in the inelastic range. However, the cross-price elasticities were positive. The demand for pork, chicken, mutton and fish were all found to be elastic with respect to expenditure.
6.	The Pepper Industry of Malaysia: An Econometeric Analysis of Demand and Supply	Ng, J. and Kanbur, M. G. (1993)	In: Ibrahim, M. Y., Bong, C. F. J. and Ipor, I. B. (Eds), The Pepper Industry: Problems and Prospects. Bintulu: Universiti Pertanian Malaysia, pp. 253-266.	Two Stage Least Squares Model	The supply and demand of pepper is found to be inelastic with respect to price with absolute values of 0.23 and 0.16 respectively. On the other hand, demand is found to be income-elastic with a value of 1.2. Forecasted the model using the demand and production functions showed that both demand and production responded asymmetrically to a sustained change in the price of pepper.
7.	The Performance of Malaysian Pepper Export	Yusoff, M. B. (1993)	In: Ibrahim, M. Y., Bong, C. F. J. and Ipor, I. B. (Eds), The Pepper Industry: Problems and Prospects. Bintulu: Universiti Pertanian Malaysia, pp. 267-282.	Two Stage Least Squares Model	The result suggested that price of pepper is not an important determinant of the supply and export demand for pepper. The supply of pepper is determined by the demand while the export demand depends on the capacity to supply. The results of simulation exercise suggested that an increase in the world industrial production index would increase the export demand more than the supply and therefore the price will rise. Depreciation in ringgit exchange rate would significantly decrease the price of pepper in terms of the U.S. dollar but it has insignificant effect on the demand and supply of Malaysian pepper.

Table 10: Summary of Literature Review on the Types of Commodity Models In Malaysia

No.	Titles	Author	Source	Methodology	Findings
8.	A Market Model of Peninsular Malaysian Sawntimber Industry	Shamsudin, M. N. and Othman, M. S. (1995)	Pertanika Journal of Social Sciences & Humanities, 3(1), pp. 47-53.	Two Stage Least Squares Model	A market model of sawntimber consisting of supply, export demand and domestic demand equations, and excess supply and price as identities was developed. The model can be used to analyse the effect of changes in exogenous variables such as export duty, substitute product prices, forest opening and economic growth on the supply, demand and price of sawntimber.
9.	The Effect of an Export Levy on the Malaysian Cocoa Industry	Shamsudin, M. N. (1998)	Pertanika Journal of Social Sciences & Humanities, 6(1), pp. 23-29.	Two Stage Least Squares Model	The results indicated that the imposition of an export levy would lower producer prices and raise export prices. Hence production and exports would decline. Domestic utilization and imports, on the other hand, would increase.
10.	An Economic Analysis of the Malaysian Palm Oil Market	Talib, B. A. and Darawi, Z. (2002)	Oil Palm Industry Economic Journal, Vol. 2 (1)/ 2002.	Two Stage Least Squares Model	The model is estimated by taking into account total oil palm area, oil palm yield, domestic consumption, exports and imports over the period of study between 1970 and 1999. Their result showed the importance of the Malaysian economic activity, the exchange rate and world population in affecting the palm oil industry. Other factors are palm oil stock level, price of palm oil, technological advancement in production technique and the price of soya bean oil.

Table 10: Summary of Literature Review on the Types of Commodity Models In Malaysia

No.	Titles	Author	Source	Methodology	Findings
11.	Supply and Demand Model for the Malaysian Cocoa Market	Hameed, A. A. A., Hasanov, A., Idris, N., Abdullah, A. M., Arshad, F. M. and Shamsudin, M. N. (2009)	MPRA Paper No. 19568.	Seemingly Unrelated Regression (SUR) Model	They investigated that the Malaysian cocoa production is mainly affected by the previous year production, price of cocoa beans at lag two as well as the harvested area. In the export demand equation, the real effective exchange rates is statistically significant determinant while the index of industrial production of advanced economies and the world price of cocoa are found to be insignificant. They also discovered that both Malaysian industrial production index and domestic price of cocoa beans are key determinants of domestic demand for cocoa beans in Malaysia. The domestic price of cocoa beans is highly sensitive to its domestic consumption, lagged domestic price and its world price.
12.	Malaysian Cocoa Market Modeling: A Combination of Econometric and System Dynamics Approach	Shri Dewi, A., Arshad, F. M., Hameed, A. A. A., Hasanov, A., Idris, N., Abdullah, A. M. and Shamsudin, M. N. (2009)	MPRA Paper No. 19569.	System Dynamics Model Two Stage Least Squares Model	Their research combined the econometric and system dynamics approach in modelling the Malaysian cocoa market. They have also developed the first order system to capture the interdependencies of the major structural elements of the markets such as production, local and export demands, inventory and imports.

Table 10: Summary of Literature Review on the Types of Commodity Models In Malaysia

No.	Titles	Author	Source	Methodology	Findings
13.	Demand Analysis of Meat in Malaysia	Tey, Y. S., Shamsudin, M. N., Mohamed, Z., Abdullah, A. M. and Radam, A. (2010)	Journal of Food Products Marketing, Vol. 16:2, pp. 199-211.	Quadratic Almost Ideal Demand System (QUAIDS) Model	They estimated income elasticities show that current food consumption patterns are showing signs of convergence toward a Western diet, exhibiting tendency for preference toward red meats (mutton and beef) over white meats (poultry and pork). The estimated elastic own-price elasticities indicate that Malaysian consumers are sensitive to the change in prices of the meat products, with other things remain constant.
14.	Long-run Determinants of Export Supply of Sarawak Black and White Pepper: An ARDL Approach	Wong, S. K., Rahim, K. A. and Shamsudin, M. N. (2010)	Global Economy and Finance Journal, Vol. 3, No. 1 (Mar., 2010), pp. 78-87.	Autoregressive Distributed Lag (ARDL) Model	They discovered that both black and white pepper of export supply in Malaysia is primarily affected by international price, production, stock, changes in taste and preference of consumers in the pepper importing countries.
15.	An Econometric Analysis of the Link between Biodiesel Demand and Malaysian Palm Oil Market	Shri Dewi, A., Arshad, F. M., Shamsudin, M. N. and Hameed, A. A. A. (2011)	International Journal of Business and management, Vol. 6, No. 2 (Feb., 2011), pp. 35-45.	Two Stage Least Squares Model	The domestic price is significantly affected by Malaysian ending stock, world palm oil price, biodiesel demand and lagged domestic price. The elasticity of Malaysian palm oil domestic price with respect to biodiesel demand is then obtained. Their results suggested that biodiesel demand has a positive impact on the Malaysian palm oil domestic price. Thus, significant growth in biodiesel demand is important in explaining Malaysian palm oil price determination.

3.3 Types of Commodity Models In Other Countries

French and Bressler's (1962) for the lemon cycle study was based on the hypothesis that the lemon industry in California followed a cobweb condition in which producers made decisions based on recent past and current prices. They approximated an equation in linear form and posited that net response (acreage changes) was a difference between acreage planted and removed. Once the acreage changes were estimated, total output changes could be found by multiplying it with average yield. The proportion of acreage planted was a function of expected long-run profitability from growing lemons, proportion of age distribution of the tree, expected profitability of the alternative crops and minor combined effects. French and Bressler used one period lag between new planting and profit and replacements to indicate that one year was the time required once a decision was made to obtain seedlings and plant. The proportion of acreage removed was a function of the proportion of bearing acreage over 25 years of age, expected current short run profit and the proportion of acreage removed to urban expansion. The equations were then estimated with least square methods for the period 1974-1960. French and Bressler found that the variable proportion of bearing acreage over 25 years and expected current profits were not significant.

Bateman (1965) studied an aggregate and regional supply of Ghanaian cocoa for the period from 1946-1962. The farmer's objective was assumed to maximize the present discounted value of the future stream of net returns from investment in the cocoa. Bateman specified the relationship of plantings and prices such that the number of acres planted was a function of mean value of discounted future price of cocoa and the mean value of

discounted future prices of coffee. The rate of discount was based on the farmer's subjective rate of discount. Price expectation was based on the Nerlovian form that the mean value of expected price this year minus the average of last year's average price is related to the difference between actual producer prices this year and the mean value of last year's expectation. The relationship between planting and output was based on the nature of cocoa production, which Bateman divided into two periods with different rate of output growth. The supply response model was formulated such that the change in cocoa harvested was explained by producers' price, rainfall and humidity and lag changes in output. Lag producer prices were divided into two periods regarding the difference in the output growth for both cocoa and coffee. The equation was estimated with ordinary least square multiple regression (Bateman argued that this method may be applied as long as autocorrelation was not present). Seven regions were estimated separately two times each. The first estimate included all the variables in the model, after that variables were not significant was dropped from the equation. For all regions, cocoa prices and rainfall were found to be significant and have positive coefficients. Coffee prices and humidity had negative coefficients, although they were not significant factors in most of the regions.

French and Matthews (1971) applied their model to estimate asparagus. Although they had a complete framework for the supply response model, admitted that because lack of data, modifications of their models had to be made. Their results indicated consistent estimates and provided a meaningful supply response model for asparagus. The coefficients of estimates for prices of asparagus were the positive and negative coefficient of the estimate for average harvested acreage during the last period. Coefficient estimates to explain the government programme (Bracero) were found not significant.

Alston, Freebairn and Quilkey (1980) estimated a model for the Australian oranges industry. Annual data from 1961/62 to 1975/76 were used to estimate the model. Their study indicated that most of the variation in planting could be explained by the expected profitability of growing oranges, the current stocks of bearing and non-bearing trees and removals of trees in previous year. Their model was based on French and Matthews (1971), but they treated investment in trees in a framework of input demand that emphasized the influence of age composition on the perennial planting decision.

Another study on coffees by Akiyama and Varangis (1990) for Kenya, India and Sri Lanka modified the Nerlovian approach to incorporate a more detailed investment process. Three sets of equations were estimated: new planting, removal and replanting and supply decisions. Akiyama and Varangis indicated that careful attention must be exercised in modelling supply response models. They mentioned that there are four features in the production process in perennial crops; the existence of a biologically determined gestation lag between planting and production; the dependence of current production on current and previous levels of output; the existence of significant cost of adjustment with respect to planting and removal of trees; and the constraints on planting and removal resulting from past decisions and current non-negativity constraints of adjustment process. The implications of their notions were that investment behaviour is not myopic and that relevant supply theory is intrinsically dynamic.

Pompelli and Castaneda (1994) developed an oranges response model for the western United States. They used data from 1962 to 1991 and incorporated Brazilian orange production for their estimates. Growers were assumed to make acreage decisions

based on five factors: their expectations about returns, bearing acreage, non-bearing acreage, international factors and climatic factors. Their estimation results indicated that growers' expected returns, Brazilian orange production and land value expectations had positive influences on bearing acreage changes.

Table 11 summarized the literature review from the previous researches scrutinizing the types of commodity models in other countries, according to specific methodological tests that are being adopted which results to specific finding.

Table 11: Summary of Literature Review on the Types of Commodity Models In Other Countries

No.	Titles	Author	Source	Methodology	Findings
1.	The Lemon Cycle	French, B. C. and Bressler, R. G. (1962)	Journal of Farm Economics, Vol. 44, No.4 (Nov., 1962), pp. 1021-1036.	OLS Analysis	French and Bressler used one period lag between new planting and profit and replacements to indicate that one year was the time required once a decision was made to obtain seedlings and plant.
2.	Aggregate and Regional Supply Functions for Ghanaian Cocoa	Bateman, M. J. (1965)	Journal of Farm Economics, Vol. 47, No. 2 (May, 1965), pp. 384-401.	OLS Analysis	The supply response model was formulated such that the change in cocoa harvested was explained by producers' price, rainfall and humidity and lag changes in output. The cocoa prices and rainfall were found to be significant and have positive coefficients.
3.	A Supply Response Model for Perennial Crops	French, B. C. and Matthews, J. (1971)	American Journal of Agricultural Economics, Vol. 53, pp. 478-490.	Regression Analysis	A model is developed to provide a structural base for estimating response relationships that encompass these dimensions. The model rests on assumptions of rational producer behaviour which takes account of possible actions of other producers and of the aggregate effect of these actions on total production and profits. The model is illustrated by an application to asparagus as perennial vegetable crop.

Table 11: Summary of Literature Review on the Types of Commodity Models In Other Countries

No.	Titles	Author	Source	Methodology	Findings
4.	A Model of Supply Response In The Australian Orange Growing Industry	Alston, J. M., Freebairn, J. W. and Quilkey, J. J. (1980)	Australian Journal of Agricultural Economics, No. 24 (Dec., 1980), pp. 248-267.	OLS Analysis	Discovered a model of Australian orange growing industry to explain changes in plantings, removals, the number and age composition of trees and orange production is developed and estimated. Most of the variation in plantings is explained by the expected profitability of growing oranges, the current stocks of bearing and non-bearing trees and removals of tree last year. They estimated of the elasticities of response of plantings and productions to price changes are low and there are long time lags. An illustrative application of the model projects future developments in the industry for alternative assumptions about the profitability of growing oranges.
5.	The Impact of the International Coffee Agreement on Producing Countries	Akiyama, T. and Varangis, P. N. (1990)	The World Bank Economic Review, Vol. 4, No. 2 (May, 1990), pp. 157-173.	Nerlovian Model	Simulations of a global coffee model incorporating a vintage capital approach to production are run. Over the recent period of operation of the International Coffee Agreement's export quota system, the quota system had a stabilizing effect on world coffee prices. The quotas reduced real export revenues for most small exporting countries, but large producers gained. Most small countries gained, however, in terms of risk reduction. If a brief suspension of the quota occurs from time to time caused, for example, by adverse weather which results in a shortfall in the world supply, the quota system works like a buffer stock scheme; on average, producing countries as a whole lose transfer benefits but gain risk benefits.

Table 11: Summary of Literature Review on the Types of Commodity Models In Other Countries

No.	Titles	Author	Source	Methodology	Findings
6.	Changes in Western U.S. Orange Acreage and Influence of Brazilian Orange Production	Pompelli, G. and Castaneda, H. (1994)	Journal of International Food and Agribusiness Marketing, Vol. 6 (2), pp. 1-16.	OLS Analysis	Their estimation results indicated that growers' expected returns, Brazilian orange production and land value expectations had positive influences on bearing acreage changes.

3.4 Summary of Literature Reviews

There are thirty-five (35) literature reviews have been collected about the commodity model in this study. At the moment there is very limited study about the pepper market model as compared to the rest of commodity. Ng and Kanbur (1993) were the only researchers who studies about the pepper market model in Malaysia and it were eleven years ago.

From literature reviews on the commodity models, it is difficult to justify or evaluate the best commodity models since many researchers are increasingly being combined with other methodologies to produce more sophisticated model structures. There are many commodity researchers using econometric methods which integrated the behaviour of supply, demand, price, inventories and consumption were formulated. Among other things, the inventory demand is regarded to be a function of expected price and consumption. Production is a function of price and other exogenous variables such as weather conditions. Income and price are regarded as the main variables affecting consumption of the commodity. Consumption is negatively related to price and positively related to income.

On the other hand, the literature reviews on the type of commodity models in Malaysia are more focused on palm oil, rubber, timber and cocoa. The interesting part was the methodology that used by most of the researchers in Malaysia was Two Stage Least Squares (2SLS). In general, the variables that used for their model were production, price,

import, export and stock. The studies of commodity models in Malaysia mainly involved Shamsudin, M. N.

The literature reviews on the types of commodity models in other countries were orange and coffee. Most of the methodology that used by the researchers were Ordinary Least Squares (OLS). The researcher's estimation model included weather conditions such as rainfall and temperature.

CHAPTER FOUR

METHODOLOGY

4.0 Introduction

This chapter emphasize on the discussion of methodology and theoretical framework that adapted in this study.

Annual data used in this study were obtained from the Malaysian Pepper Board (MPB) (2011), Department of Statistics Malaysia and International Monetary Fund (IMF). Basically, the data used in this study are from 1980 to 2011.

Firstly, all the area, yield, domestic consumption, exports, imports and price equations were estimated using Ordinary Least Squares (OLS). The equations were estimated with the assumption of independence among the exogenous variables and error terms with zero mean and constant variance. However, since the equations contain lagged dependent variables, OLS yields biased estimates since the residuals are autocorrelated. Therefore, the incidence of autocorrelation was applied in these equations. OLS can continue to be used even in equations containing lagged dependent variables, provided that the disturbance term is serially independent (Johnston, 1984). However, due to the fact that some of the equations were also determined by endogenous variables, the Two Stage Least Squares (2SLS) technique is more suitable than OLS. Thus, 2SLS with the principal

component technique with only selected predetermined variables was used in the first stage of the 2SLS procedure. R^2, F-statistic, t-statistic, Durbin-Watson (DW) and Durbin-h tests were used to evaluate the estimated model. The Durbin-h statistic was used to test for first order autocorrelation when a lagged dependent variable was included as an explanatory variable in the regression. However, sometimes Durbin-h cannot be calculated since the number in the square root formula was negative. Therefore, Lagrange multiplier (LM) statistic was used as an alternative to test for the presence of first-order autocorrelation. The LM test statistic is usually taken to have a χ^2 (1) distribution under this null hypothesis of no autocorrelation, and can be calculated as nR^2 from the test regression (Stewart and Gill, 1998). All the estimated results are discussed together with elasticities calculated at the sample means. The equations using 2SLS are also selected for further analysis because they produced better estimation results than OLS. All equations are in linear forms.

The reason is because OLS estimates are biased and inconsistent when current period endogenous variables appear as regressors in other equations in the system. The errors of a set of related regression equations are often correlated.

However, 2SLS allows for estimation of the reduced form and provides for unbiased and consistent estimators for the system. The basic idea of 2SLS is to ensure that the dependent variables are the only endogenous variables in the system, such function solely of the error term and truly exogenous variables. 2SLS accomplishes this by locating proxies (via an instrumental variables procedure) for the endogenous variables that are not correlated with the error term, such that they are purified of any influence of the stochastic error. More particularly, in the first stage of 2SLS the reduced form is estimated as each

endogenous variable is regressed on all exogenous variables in the system. The predicted values are saved from these regressions, which become instrumental variables for the endogenous variables in those equations. When the second stage is estimated utilizing the instrumental values for the endogenous variables are not correlated with the error term.

4.1 Sources of Data

In this study, the yearly times series data that covers the period begins in 1980 and ends in 2011 (31 observations) were adopted. To identify the important factor affecting the Malaysia pepper market, we divided the pepper into black and white. The purpose is to show that our results are not sensitive to the variable selected. The baselines of these data are from the year 2005.

Data on the area planted of pepper; yield of pepper; fertilizer usage; domestic consumption of black and white pepper; ending stock of black and white pepper; export of black and white pepper; import of black and white pepper; farm gate price of black and white pepper; FOB price of black and white pepper in Malaysia; retail price of black and white pepper as well as the world price of black and white pepper in New York are obtained from the Malaysian Pepper Board website.

The Department of Statistics, Malaysia provided the data on interest rate (FD 3 months); Government Agricultural Expenditure; Gross National Income per Capital; and Malaysia Index of Industrial Production. The data on real effective exchange rate and

world GDP are available at the International Financial Statistics of the International Monetary Fund. In Table 12 summarized the variables for the Pepper Market Model.

Table 12: Variables for the Pepper Market Model

Acronym	Variables Name	Sources of Data
PM	• Pepper Production of Malaysia (Tonne)	Malaysian Pepper Board
AP	• Area Planted of Pepper (Hectare)	Malaysian Pepper Board
YD	• Yield of Pepper (Tonne/Hectare)	Malaysian Pepper Board
CBP	• Domestic Consumption of Black Pepper (Tonne)	Malaysian Pepper Board
CWP	• Domestic Consumption of White Pepper (Tonne)	Malaysian Pepper Board
STBP	• Ending Stock of Black Pepper (Tonne)	Malaysian Pepper Board
STWP	• Ending Stock of White Pepper (Tonne)	Malaysian Pepper Board
XB	• Export of Black Pepper (Tonne)	Malaysian Pepper Board
XW	• Export of White Pepper (Tonne)	Malaysian Pepper Board
MB	• Import of Black Pepper (Tonne)	Malaysian Pepper Board
MW	• Import of White Pepper (Tonne)	Malaysian Pepper Board
FBP	• Farm Gate Price of Black Pepper (RM/Tonne)	Malaysian Pepper Board
FWP	• Farm Gate Price of White Pepper (RM/Tonne)	Malaysian Pepper Board
FOBB	• FOB Price of Black Pepper in Malaysia (RM/Tonne)	Malaysian Pepper Board
FOBW	• FOB Price of White Pepper in Malaysia (RM/Tonne)	Malaysian Pepper Board
RPB	• Retail Price of Black Pepper (RM/Tonne)	Malaysian Pepper Board
RPW	• Retail Price of White Pepper (RM/Tonne)	Malaysian Pepper Board
WPB	• World Price of Malaysian Black Pepper quoted at New York (US$/Tonne)	Malaysian Pepper Board
WPW	• World Price of Malaysian White Pepper quoted at New York (US$/Tonne)	Malaysian Pepper Board
FERT	• Fertilizer usage (RM/Tonne)	Malaysian Pepper Board
IR	• Interest Rate, FD 3 Months (%)	Department of Statistics, Malaysia
GOVDE	• Government Agricultural Expenditure (RM Million)	Department of Statistics, Malaysia
GNI	• Gross National Income per Capital (RM)	Department of Statistics, Malaysia
MIIP	• Malaysia Index of Industrial Production (%, 2005 = 100)	Department of Statistics, Malaysia
REER	• Real Effective Exchange Rate (%)	International Monetary Fund
GDPW	• World GDP (US$)	International Monetary Fund

4.2 Theoretical Framework

The basic market model which was proposed by Labys (1973) was used to develop the framework in commodity. The construction of the market model can be summarized into four equations which consists supply (Q_t), demand (D_t), price (P_t) and stock or inventory (I_t) as an identity equation.

$$Q_t = q\,(Q_{t-i}, P_{t-i}, N_t, Z_t) \quad (1)$$

$$D_t = d\,(D_{t-1}, P_t, P_t^c, A_t, T_t) \quad (2)$$

$$P_t = p\,(P_{t-1}, I_t) \quad (3)$$

$$I_t = I_{t-1} + Q_t - D_t \quad (4)$$

Where

Q_t	=	Commodity supply
D_t	=	Commodity demand
P_t	=	Commodity price
I_t	=	Inventory or stock
P_{t-i}	=	Prices with lag distribution
N_t	=	Natural factors
Z_t	=	Policy variables influencing supply
P_t^c	=	Prices of substitute commodities
A_t	=	Economic activity level or income
T_t	=	Technical factors
i	=	1, 2, 3,…

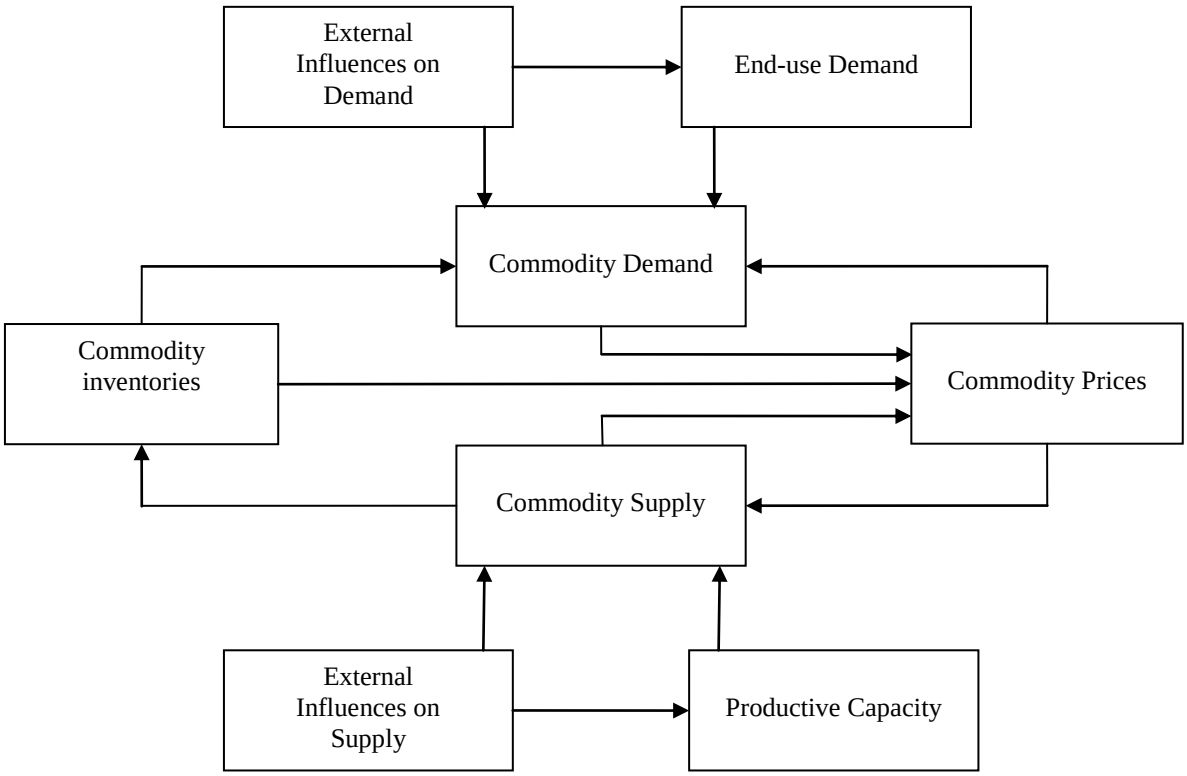
According to Labys and Pollak (1984), it is assumed that in the system equation, prices adjust to clear the market. Supply of the commodity depends on the lagged supply, lagged price, natural factors and policy variables. Demand is being dependent on lagged demand, own price, prices of one or more substitute commodities, level of economic activity and technical factors. Lagged price and changes in inventory can be used to explain the price. Since the supply process normally uses the general class of distributed lag functions so the lagged price variables are included. The market model is closed using an identity which equates inventories with lagged inventories plus quantity supplied minus quantity demanded.

The relatively simple generalized theoretical model widely has been applied to most of the agricultural commodities (such as palm oil, soybean oil, rubber and cocoa). In Malaysia, it also been applied to analyse and model the palm oil, rubber and cocoa market.

4.3 Commodity Model

From a theoretical view point, a commodity model is a quantitative representation of a commodity market or industry; the behavioural relationships included reflect demand and supply aspects of price determination as well as other related economic, political and social phenomena. Hence most commodity models are composed of a number of components which reflect various aspects of demand, supply and price determination (Figure 7). Modelling of a commodity markets entails integrating all of the above components into the overall market or industry. Implicit in the assumption is that producers

are maximising their profits, and consumers are maximising their utility under given constraints.



Source: Adopted from Shamsudin, M. N. (2008, pp. 5).

Figure 7: Schematic representation of a commodity model

As shown in Figure 7, demand for a commodity depends on its own and other commodity prices as well as external influences such as income or economic activity. Commodity supply depends on prices as well as external influences such as cost of production, weather or agronomic factors. Prices are simultaneously determined by demand and supply. Inventories normally exist on the demand and supply sides of the market and these are held for precautionary, transaction or speculative motives.

Depending on the elasticity of demand and supply, inventories play a role in price adjustments. The approach that is taken to construct an econometric commodity market model resembles that of other economic models: (1) Determination of modelling purposes; (2) Selection of model structure; (3) Specification of relationships; (4) Estimation of parameters; (5) Validation; and (6) Model solution or simulation.

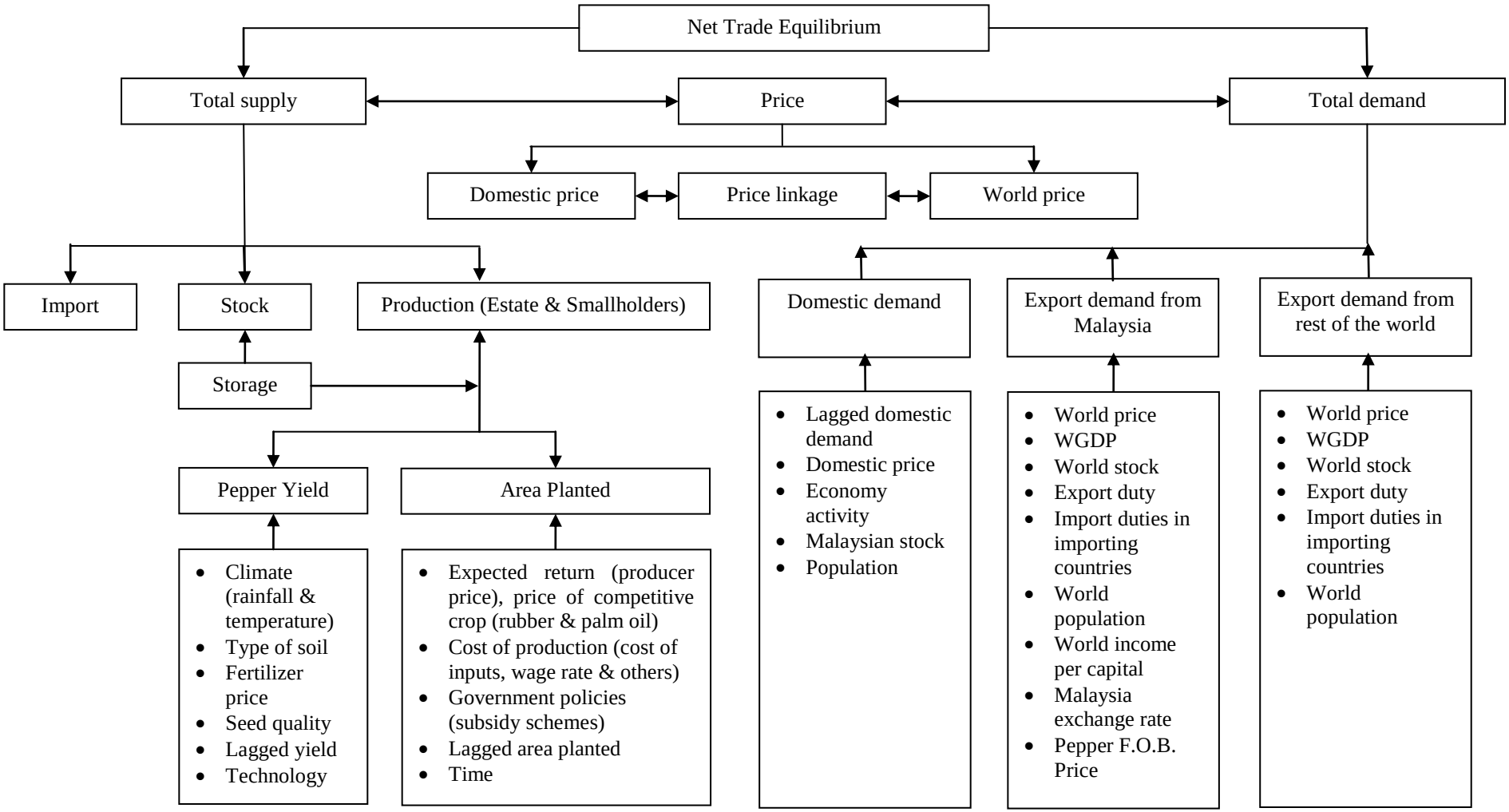
The selection of the structure of a commodity model reflects not only the formal methodology employed including model specification, estimation and simulation, but also the attributes of the commodity market or a particular commodity problem to be analysed. Examples of such attributes include the non-competitive nature market, the presence of international stockpiles, or a range of tariff or non-tariff trade barriers. Also relevant in this context is the empirical scope of a model. While almost all econometric commodity models are temporal, some of these also embody important spatial characteristics. The degree of disaggregation is also significant particularly with respect to commodity end-uses.

4.4 Conceptual Framework of Pepper Market Model

The basic structure of models proposed in the analysis of agricultural commodity markets are formed from the components of the market model approach developed by Labys (1973) which suggests that for a particular commodity, four equations supply, demand, price and stock (commonly used as an identity to reveal the market clearing condition) are used simultaneously. To elucidate more complex structures of the market

behaviour, these basic market models can be tailored and reformulated. Incorporation of more variables enables the market model to be extended.

Therefore, a pepper commodity model is determined by its theoretical framework which is later translated into empirical or statistical analysis. Theoretically, a pepper commodity model is composed of a number of components which reflect various aspects of demand, supply and price determination. Modelling of pepper commodity markets entails integrating all these components into the overall market or industry structure. Figure 8 presents a Framework of Pepper Market Model in Malaysia. Pepper Market model, however, has its own particular structure somewhat at variance with the general.



Source: Adapted from Labys (1976, pp. 38) with modification.

Figure 8: Framework of Pepper Market Model in Malaysia

The structure of pepper commodity models can be summarized in the following equations, although much more complex structures are used in practice:

$$Q_t = q\,(Q_{t-1}, P_{t-1}, P_t^c, N_t, Z_t) \quad (1)$$

$$D_t = d\,(D_{t-1}, P_t, A_t, X_t) \quad (2)$$

$$P_t = p\,(P_{t-1}, I_t) \quad (3)$$

$$I_t = I_{t-1} + Q_t - D_t \quad (4)$$

Where

	Q	=	Pepper supply
	P_{t-1}	=	Price with lag distribution
	P^c	=	Price of competing commodities
	N	=	Agronomic factors
	Z	=	Policy variables influencing supply
	D	=	Pepper demand
	P	=	Pepper prices
	A	=	Income or activity level
	X	=	Policy variables influencing demand
	I	=	Pepper inventories

Supply of pepper is explained as being dependent on its own prices and prices of competing commodities as well as underlying productivity factors such as agronomic influence and a possible policy variable. A lagged pepper price variable is included since the supply process is normally described using some form of the general class of

distributed lag functions. Other possible influencing factors and the customary stochastic disturbance term are omitted here to simplify presentation. In the case of industrial crop such as pepper, the supply equation may be broken into two equations explaining smallholder and estate supplies.

Demand of pepper would depend on price, economic activity, prices of one or more alternative commodities and relevant policy variables. For export of pepper, a modification of this equation is necessary since domestic demand and exports do not depend on the same set of explanatory variables. Thus, the demand of pepper equation may be broken into two equations explaining domestic and export demand.

Prices of pepper are explained by inventories of pepper. This equation is sometimes inverted to explain inventory demand. Although the price relationship is a function of inventories, any final specification adopted would depend on whether the underlying price structure reflects a flow adjustment, a stock adjustment, or a stock-flow adjustment process.

The model is closed using an identity which equates inventories with lagged inventories plus supply minus demand. Where the price equation is inverted to represent inventory demand, the identity can be recognized as the equivalent supply of inventories equation. The above model requires its variable to be classified as endogenous variables: Q, D, P and I; and exogenous variables: P^c, A, N, X and Z. X and Z are also known as instrument or policy controllable variables.

4.5 Model Specification

The Malaysian pepper market model was formulated. The model consists of eleven (11) behavioural equations and an identity. The behavioural equations describe the supply, demand and price of pepper. The model is closed by an identity which defines the stock of pepper.

4.5.1. Area Planted

The area planted function is modelled as:

$AP_t = f(FBP_t, FWP_t, IR, GOVDE, AP_{t-1})$

Where:

AP_t	=	Area planted of pepper at time t (ha)
FBP_t	=	Farm price of black pepper at time t (RM/ tonne)
FWP_t	=	Farm price of white pepper at time t (RM/ tonne)
IR	=	Interest rate (FD 3 months)
GOVDE	=	Government agricultural expenditure

4.5.2. Yield

The yield of pepper can be estimated as follows:

$YD_t = f(FERT_t)$

Where:

YD_t	=	Pepper yield at time t (tonne/ha)
$FERT_t$	=	Fertilizer usage (RM/Tonne)

4.5.3. Export Demand

The export function for pepper is taken to depend on the world price of pepper, the use of world GDP as a proxy for the world economic activity instead of the Malaysian Industrial Production. Thus, export demand is modelled as a function of world GDP, real effective exchange rate, world price of pepper and Free on board (FOB) of pepper price as follows:

4.5.3.1. Black Pepper

$$XB_t = f(WPB_t, REER_t, GDPW_t, FOBB_t, XB_{t-1})$$

Where:

XB_t	=	Export of black pepper at time t (tonne)
WPB_t	=	World price of black pepper quoted in New York at time t (US$/tonne)
$REER_t$	=	Real effective exchange rate at time t
$GDPW_t$	=	World GDP at time t (US$)
$FOBB_t$	=	FOB price of black pepper in Malaysia t (US$)

4.5.3.2. White Pepper

$$XW_t = f(WPW_t, REER_t, GDPW_t, FOBW_t, XW_{t-1})$$

Where:

XW_t	=	Export of white pepper at time t (tonne)
WPW_t	=	World price of white pepper quoted in New York at time t (US$/tonne)
$REER_t$	=	Real effective exchange rate at time t
$GDPW_t$	=	World GDP at time t (US$)
$FOBW_t$	=	FOB price of white pepper in Malaysia t (US$)

4.5.4. Import Demand

The specification of the import demand of pepper is similar to the domestic demand but with the use of Malaysian Index of Industrial production instead of world GDP. Thus, the import demand function can be specified as follows:

4.5.4.1. Black Pepper

$MB_t = f(WPB_t, MIIP_t, STBP_{t-1})$

Where:

MB_t	=	Import of black pepper at time t (tonne)
WPB_t	=	World price of black pepper quoted in New York at time t (US$/tonne)
$MIIP_t$	=	Malaysian index of industrial production
STBP	=	Ending stock of black pepper (tonne)

4.5.4.2. White Pepper

$MW_t = f(WPW_t, MIIP_t, STWP_{t-1})$

Where:

MW_t	=	Import of white pepper at time t (tonne)
WPW_t	=	World price of white pepper quoted in New York at time t (US$/tonne)
$MIIP_t$	=	Malaysian index of industrial production
STWP	=	Ending stock of white pepper (tonne)

4.5.5. Domestic Demand

The domestic demand is assumed to depend on the domestic price of pepper and domestic economy activity as follows:

4.5.5.1. Black Pepper

$CBP_t = f(RPB_t, GNI_t, MIIP_t)$

Where:

CBP_t	=	Domestic consumption of black pepper at time t (tonne)
RPB_t	=	Retail price of black pepper at time t (RM/tonne)
GNI_t	=	Gross National Income per capital (RM)
$MIIP_t$	=	Malaysian index of industrial production

4.5.5.2. White Pepper

$CWP_t = f(RPW_t, GNI_t, MIIP_t)$

Where:

CWP_t	=	Domestic consumption of white pepper at time t (tonne)
RPW_t	=	Retail price of white pepper at time t (RM/tonne)
GNI_t	=	Gross National Income per capital (RM)
$MIIP_t$	=	Malaysian index of industrial production

4.5.6. Price

Since the farm price of pepper is determined by the world price of pepper, the domestic price equation is considered as a function of the spot price of pepper in New York (the main trading centre) where this price is the representative of the world market price for pepper. It is expected that this relationship will be a positive one.

4.5.6.1. Black Pepper

$FBP_t = f(WPB_t, CBP_t, STBP_{t-1})$

Where:

FBP_t	=	Farm price of black pepper at time t (RM/ tonne)
WPB_t	=	World price of black pepper quoted in New York at time t (US$/tonne)
CBP_t	=	Domestic consumption of black pepper at time t (tonne)
STBP	=	Ending stock of black pepper (tonne)

4.5.6.2. White Pepper

$FWP_t = f(WPW_t, CWP_t, STWP_{t-1})$

Where:

FWP_t	=	Farm price of white pepper at time t (RM/ tonne)
WPW_t	=	World price of white pepper quoted in New York at time t (US$/tonne)
CWP_t	=	Domestic consumption of white pepper at time t (tonne)
STWP	=	Ending stock of white pepper (tonne)

4.5.7. Identity

The model is closed by an identity to ensure completeness of the model. The following identity defined the market clearing condition.

$$ST = PM + (STBP + STWP) + (MB_t + MW_t) - (CBP_t + CWP_t) - (XB_t + XW_t)$$

Where:

ST	=	Malaysian Pepper Ending Stock (tonne)
PM	=	Pepper Production of Malaysia (Tonne)
CBP_t	=	Domestic consumption of black pepper at time t (tonne)
CWP_t	=	Domestic consumption of white pepper at time t (tonne)
STBP	=	Ending stock of black pepper (tonne)
STWP	=	Ending stock of white pepper (tonne)
MB_t	=	Import of black pepper at time t (tonne)
MW_t	=	Import of white pepper at time t (tonne)
XB_t	=	Export of black pepper at time t (tonne)
XW_t	=	Export of white pepper at time t (tonne)

CHAPTER FIVE

EMPIRICAL RESULTS

5.0 Background of Analysis

In this chapter, the empirical results will be presented using the statistical analysis of Two Stage Least Squares (2SLS). All the tests were carried out using E-Views version 4.1 (2002) program. Annual data from 1980 to 2011 were used in this study for both the dependent (area planted, yield, export, import, domestic consumption and farm price of pepper) and independent (interest rate, government agricultural expenditure, fertilizer usage, world price of pepper quoted in New York, real effective exchange rate, world GDP, FOB price, Malaysian index of industrial production, ending stock, retail price of pepper and Gross National Income per capital) variables. The empirical results for the various analyses are summarized in the tabulate form.

Two Stage Least Squares (2SLS) has been a widely used method of estimating the parameters of a single structural equation in a system of linear simultaneous equations for the commodity studies as compared with other methods. The 2SLS regression analysis is a statistical technique that is used in the analysis of structural equations. This technique is the extension of the Ordinary Least Squares (OLS) method. It is used when the dependent variable's error terms are correlated with the independent variables.

5.1 Two Stage Least Squares (2SLS) Test Results

The empirical results of 2SLS method of estimation will be presented. The sign of the coefficients will then be examined to determine their agreement or disagreement with theory and a priori reasoning. Examples of the economic interpretation of the estimates will also be given. In this study, the dependent variables are area planted, yield, export, import, domestic consumption and price of pepper.

An indication of the goodness of fit of each equation will be given by the value of the R^2. Each R^2 will be computed from 2SLS estimations of the individual equations.[4]

Results of the estimation are as follows:

[4] The R^2's of a simultaneous equation model can only give a qualitative indication of the goodness of fit of the equations.

Table 13: Estimated Empirical Results (1980-2011)

Explanatory Variables	Dependent Variables									
	AP_t	YD_t	XB_t	XW_t	MB_t	MW_t	CBP_t	CWP_t	FBP_t	FWP_t
Constant	1.15 (2.78)*	-1.51 (-3.56)*	1.22 (2.16)*	5.44 (2.09)*	3.13 (6.01)*	9.39 (7.11)*	-1.25 (-2.54)*	-9.34 (-2.53)*	-1.39 (-2.44)*	-5.33 (-4.03)*
FBP_t	0.29 (3.78)*									
FWP_t	0.26 (4.00)*									
IR	-0.21 (-2.78)*									
GOVDE	1.01 (2.20)*									
$FERT_t$		0.93 (5.44)*								
$REER_t$			-0.02 (-2.76)*	-0.23 (-2.63)*						
$GDPW_t$			-0.02 (-2.56)*	-0.04 (-2.97)*						
$FOBB_t$			-0.01 (-2.06)*							
$FOBW_t$				-0.10 (-2.24)*						
$MIIP_t$					8.01 (3.83)*	4.90 (6.08)*	42.21 (2.15)*	24.88 (2.28)*		
GNI							1.56 (3.62)*	1.24 (3.07)*		
WPB_t			-0.01 (-2.05)*		-0.21 (-3.05)*				2.39 (16.78)*	
WPW_t				-0.37 (-2.31)*		-0.62 (-3.32)*				2.36 (18.12)*
STBP					-0.45 (-6.11)*				-0.01 (-2.19)*	
STWP						-0.55 (-3.52)*				-0.77 (-5.26)*
RPB_t							-0.01 (-2.18)*			
RPW_t								-0.05 (-2.22)*		
CBP_t									0.66 (2.90)*	
CWP_t										0.36 (1.87)*
AP_{t-1}	0.36 (3.17)*									
XB_{t-1}			0.43 (2.97)*							
XW_{t-1}				0.32 (4.26)*						
Adjusted R^2	0.99	0.48	0.98	0.95	0.82	0.76	0.83	0.79	0.93	0.94
DW	2.21	0.24	1.04	2.51	1.15	2.01	1.25	1.48	1.43	1.17
LM	8.73	24.79	4.81	7.34	13.61	2.63	4.89	1.86	3.16	9.46
F-statistic	64.33	29.62	3.99	125.37	3.85	33.97	50.42	39.53	136.07	179.91

Note:
Values appearing in brackets are the t-values of respective estimated regression coefficients;
Asterisks * denote the statistically significance at 5% levels respectively.

5.1.1. Area Planted of Pepper

The 2SLS estimates of total area under pepper in Malaysia are presented in Table 13. The values of the F statistic and R^2 show that the estimates are statistically acceptable. However, from the LM test is 1.32. This value is smaller than 44.9 as the critical value for a χ^2 distribution with 31 degrees of freedom at the 5% level. Thus, the null hypothesis of no auto-correlation is accepted revealing that there is no evidence of first-order auto-correlation. The coefficients of specified variables follow the expected signs. For 31 degrees of freedom, the t critical point at 5% levels is 1.69. Total pepper area, farm price of black and white pepper, interest rate and government expenditure on agricultural are statistically significant at the 5% level. The area planted of pepper on farm price of black pepper, farm price of white pepper and interest rate are inelastic because the elasticity coefficient is less than 1. However, the area planted of pepper on the government agriculture expenditure is elastic because the elasticity coefficient is more than 1. The area planted of pepper has a positive relationship with the farm price of black pepper, farm price of white pepper and government agriculture expenditure. On the other hand, negative relationship with the interest rate.

5.1.2. Yield of Pepper

Overall, R^2 indicates that only 49% of the variation in pepper yields during the sample period is explained by the specified variables. It is acknowledged that other factors such as rainfall, chemical, technologies and labour are likely to have important effects on

pepper yield but their data were unavailable for estimation. The results above show that the fertilizer usage increases by 1%, the yield of pepper increases by 1%. The 2SLS estimation is statistically acceptable. Again, the LM test shows that there is no strong evidence of first-order auto-correlation in 2SLS. The pepper yield on fertilizer usage is inelastic because the elasticity coefficient is less than 1. The pepper yield and fertilizer usage have a positive relationship.

5.1.3. Export Demand of Black Pepper

Table 13 illustrate the results of 2SLS estimations of exports over the period of study. The LM tests reveal no evidence of serial correlation in the reported results. The coefficient of world price of black pepper is statistically significant. The export demand of black pepper estimation results show that the world GDP parameter carries the expected positive sign and is statistically significant. The real effective exchange rate is also important as a determinant of the quantity of Malaysian pepper exports. Malaysian black pepper exports can be increased by about 1% for every 4% decrease in the real effective exchange rate. As the results the quantities of black pepper exported tend to increase during times of weak Malaysian currency. Another important determinant of the export demand is the world price of black pepper which is found to be negative, statistically significant. The results also indicate that export demand for Malaysian black pepper is highly sensitive to the world price of black pepper. The results above show that the export demand of black pepper increases by 10%, the FOB price of black pepper decreases by 0.1%. The export of black pepper on world price of black pepper quoted in New York, real

effective exchange rate, world GDP and FOB price of black pepper in Malaysia are inelastic because the elasticity coefficient is less than 1. The export of black pepper has a positive relationship with the world GDP. However, negative relationship with world price of black pepper quoted in New York, real effective exchange rate and FOB price of black pepper in Malaysia.

5.1.4. Export Demand of White Pepper

Table 13 illustrate the results of 2SLS estimations of exports over the period of study. The LM tests reveal no evidence of serial correlation in the reported results. The coefficient of world price of white pepper is statistically significant. The estimated coefficient of FOB price of white pepper is also significant at the 5% level. The export demand of white pepper estimation results show that the world GDP parameter carries the expected positive sign and is statistically significant. The real effective exchange rate is also important as a determinant of the quantity of Malaysian pepper exports. Malaysian pepper exports can be increased by about 1% for every 4% decrease in the real effective exchange rate. As the results the quantities of pepper exported tend to increase during times of weak Malaysian currency. Another important determinant of the export demand is the world price of white pepper which is found to be negative, statistically significant. The results also indicate that export demand for Malaysian white pepper is highly sensitive to the world price of white pepper. The export of white pepper has a negative relationship with the world price of white pepper quoted in New York, real effective exchange rate and FOB price of white pepper in Malaysia. On the other hand, has a positive relationship with

the world GDP. The export of white pepper on world price of white pepper quoted in New York, real effective exchange rate, world GDP and FOB price of white pepper in Malaysia are inelastic because the elasticity coefficient is less than 1.

5.1.5. Import Demand of Black Pepper

The results of the import for black pepper are presented in Table 13. The coefficient of the Malaysian industrial production is found to be positive and statistically significant at the 5% level. As expected, the coefficient of ending stocks has a negative sign and is significant at the 5% level. A 1% decrease in world price of black pepper could increase Malaysian imports of pepper by 0.2%. Overall, the estimation results of the Malaysian black pepper market model are statistically acceptable and have identified many important factors related to world price of black pepper as well as Malaysian index of industrial production and ending stock of black pepper. The model was evaluated by a simulation analysis on palm oil by Basri and Zaimah (2002). The analysis indicated that the simulations performed are satisfactory and provided better predictions than the naive method. The import of black pepper on world price of black pepper quoted in New York and ending stock of black pepper are inelastic because the elasticity coefficient is less than 1. However, the import of black pepper on Malaysian index of industrial production is elastic because the elasticity coefficient is more than 1 and has a positive relationship. The import of black pepper has a negative relationship with the world price of black pepper quoted in New York and ending stock of black pepper.

5.1.6. Import Demand of White Pepper

The results of the imports are presented in Table 13. The coefficient of the Malaysian industrial production is found to be positive and statistically significant at the 5% level. Its elasticity is high, indicating that a one percent increase in industrial production would increase imports of white pepper by 4%. As expected, the coefficient of ending stocks has a negative sign and is significant at the 5% level. A 1% decrease in world price of white pepper could increase Malaysian imports of pepper by 4%. Results also show that world price of white pepper, Malaysian index of industrial production and ending stock of white pepper are statistically significant in determining the imports. The import of white pepper has a negative relationship with the world price of white pepper quoted in New York and ending stock of white pepper. On the other hand, has a positive relationship with the Malaysian index of industrial production. The import of white pepper on world price of white pepper quoted in New York and ending stock of white pepper are inelastic because the elasticity coefficient is less than 1. However, the import of white pepper on Malaysian index of industrial production is elastic because the elasticity coefficient is more than 1.

5.1.7. Domestic Consumption of Black Pepper

Domestic demand of black pepper is modelled by including the domestic consumption of pepper, retail price of black pepper, gross national income per capita and the Malaysian index of industrial production. The explanatory variables account for about

83% for 2SLS variation in the dependent variable. As gross national income per capita increases by 1%, the black pepper consumption will increase by 0.6%. On the other hand, if the retail price of black pepper increases then the quantity of consumption for black pepper will decrease. However, as Malaysian index of industrial production increased by 1%, the domestic consumption of black pepper is increased by 42%. The domestic consumption of black pepper on Gross National Income per capita and Malaysian index of industrial production are elastic because the elasticity coefficient is more than 1 and has a positive relationship. However, the domestic consumption of black pepper on retail price of black pepper is inelastic because the elasticity coefficient is less than 1 and has a negative relationship.

5.1.8. Domestic Consumption of White Pepper

The results in Table 13 show the important factors in determining Malaysian white pepper consumption. The current level of consumption for white pepper relies on the level of Malaysian economic activity, which is a proxy by the Malaysian index of industrial production. It also included retail price of white pepper and gross national income per capita. The explanatory variables account for about 79% for 2SLS variation in the dependent variable. As gross national income per capita increases by 1%, the white pepper consumption will increase by 0.2%. On the other hand, if the retail price of white pepper increases then the quantity of consumption for white pepper will decrease. However, as Malaysian index of industrial production increased by 1%, the domestic consumption of white pepper is increased by 25%. The domestic consumption of white pepper has a

negative relationship with the retail price of white pepper. In contrast, has a positive relationship with the Gross National Income per capita and Malaysian index of industrial production. The domestic consumption of white pepper on Gross National Income per capita and Malaysian index of industrial production are elastic because the elasticity coefficient is more than 1. However, the domestic consumption of white pepper on the retail price of white pepper is inelastic because the elasticity coefficient is less than 1.

5.1.9. Black Pepper Price at Farm level

In the case of the equation for the black pepper price, it is found that all variables could explain the variation such as farm price, world price, domestic consumption and ending stock of black pepper. World price of black pepper is found to be significant at 5 percent where this is confirms the belief that world price of black pepper could affect the farm-gate price of black pepper in Malaysia. Thus, a one percent increases in the world price of black pepper would result a 2% percent increase in the farm price of black pepper. The farm price of black pepper on domestic consumption of black pepper and ending stock of black pepper are inelastic because the elasticity coefficient is less than 1. However, the farm price of black pepper on the world price of black pepper quoted in New York is elastic because the elasticity coefficient is more than 1. The farm price of black pepper has positive relationship with the world price of black pepper quoted in New York and domestic consumption of black pepper. Conversely, has a negative relationship with the ending stock of black pepper.

5.1.10. White Pepper Price at Farm level

All the estimated coefficients in the white pepper price equation have the expected signs. The price flexibilities with respect to domestic consumption and world price are 1.4 and 2.3 respectively. The stock of white pepper is included as a proxy to model the effect of rising importance of stock on Malaysia white pepper industry as was incorporated by Basri and Zaimah (2002). The coefficient of this variable is -2.8 which is statistically significant at 5 percent level and follows the correct sign. The results are consistent with the finding of Basri and Zaimah (2002) that stock disequilibrium determines the changes in primary commodity prices. The farm price of white pepper has a positive relationship with the world price of white pepper quoted in New York and domestic consumption of white pepper. In opposition, has a negative relationship with the ending stock of white pepper. The farm price of white pepper on domestic consumption of white pepper and ending stock of white pepper are inelastic because the elasticity coefficient is less than 1. However, the farm price of white pepper on the world price of white pepper quoted in New York is elastic because the elasticity coefficient is more than 1.

5.2 Forecasting Simulation

Performance of the model is measured by the validity of its estimate on the basis of its forecasting power (Makridakis *et al*., 1998) and (Pindyck and Rubinfeld, 1998). The forecasting ability is tested based on the Root Mean Squared Simulation Error (RMSE), the

Root Mean Squared Percent Error (RMSPE) and Theil's inequality coefficient (U-statistic). The RMSE for the variable A, given by

$$\text{RMSE} = [\ 1/\text{T} \sum_{t=1}^{\text{T}} (\text{P}_\text{t} - \text{A}_\text{t})^2]^{\frac{1}{2}} \tag{1}$$

where T is number of periods in the simulation, P is the predicted value and A is the actual value. It measures the deviation of the predicted value from its actual time path. The RMPSE is defined as:

$$\text{RMPSE} = [\ 1/\text{T} \sum_{t=1}^{\text{T}} (\text{P}_\text{t} - \text{A}_\text{t} \ / \ \text{A}_\text{t})^2]^{\frac{1}{2}} \tag{2}$$

The theil's inequality coefficient (U-statistic) is defined as follows:

$$\text{U} = \frac{1/\text{T} \sum_{t=1}^{\text{T}} (\text{P}_\text{t} - \text{A}_\text{t})^2}{1/\text{T} \sum_{t=1}^{\text{T}} (\text{P}_\text{t})^2 + 1/\text{T} \sum_{t=1}^{\text{T}} (\text{A}_\text{t})^2} \tag{3}$$

In the case of perfect fit, the Theil's coefficient takes the value of zero. The value of one indicates the prediction technique is no better than a naive no change model.

Table 14: Forecasting Simulation Results (1980-2015)

Variables	Root Mean Squared Error (RMSE)	Root Mean Squared Percent Error (RMSPE)	Theil Inequality Coefficient (U-statistic)
$\mathbf{AP_t}$	125.95	0.90	0.01
$\mathbf{YD_t}$	0.26	11.81	0.01
$\mathbf{XB_t}$	482.72	3.01	0.02
$\mathbf{XW_t}$	201.60	2.99	0.02
$\mathbf{MB_t}$	475.67	6.23	0.13
$\mathbf{MW_t}$	231.60	7.40	0.11
$\mathbf{CBP_t}$	384.70	2.86	0.07
$\mathbf{CWP_t}$	170.47	2.74	0.07
$\mathbf{FBP_t}$	473.00	1.22	0.05
$\mathbf{FWP_t}$	123.35	1.12	0.05

Data for all relevant variables are collected and the certain time series data was only available from 1980 to 2011. Forecasts are generated for 1980 to 2015 (35 observations).

A dynamic simulation was carried out through the sample period to see how far the model could track the path of the actual data. We shall measure this tracking ability by using the Root Mean Square Error (RMS Error), Root Mean Square Percent Error (RMSP Error) and Theil Inequality Coefficient (predictive power) in Table 14.

The best forecasting model would be the one that produces the lowest of RMSP Error and U-statistic. Based on the root mean square percent error criterion indicates that the errors are less than five percent for area planted, export of black and white pepper, and domestic consumption of black and white pepper and farm price of black and white pepper. However, the root mean square percent errors for the yield, import of black and white pepper are all more than five percent.

In order to see more clearly the paths of selected endogenous variables, their simulated and actual values are graphed as shown in Figures 9 to 18. By and large, the model could trace the directions of the actual values quite well. The domestic consumption of black and white pepper is on an upward trend and the simulated values follow the movement of the actual values quite well. The area planted, yield, farm price, export and import of black and white pepper are on a downward and upward trend and its simulated values also follow the actual path satisfactorily.

The Theil's inequality coefficients for all the variables (area planted, yield, export, import, domestic consumption and farm price of pepper) are less than one which meant that the forecasting performance of the estimated models were satisfactory. Thus, revisions of the models are not necessary.

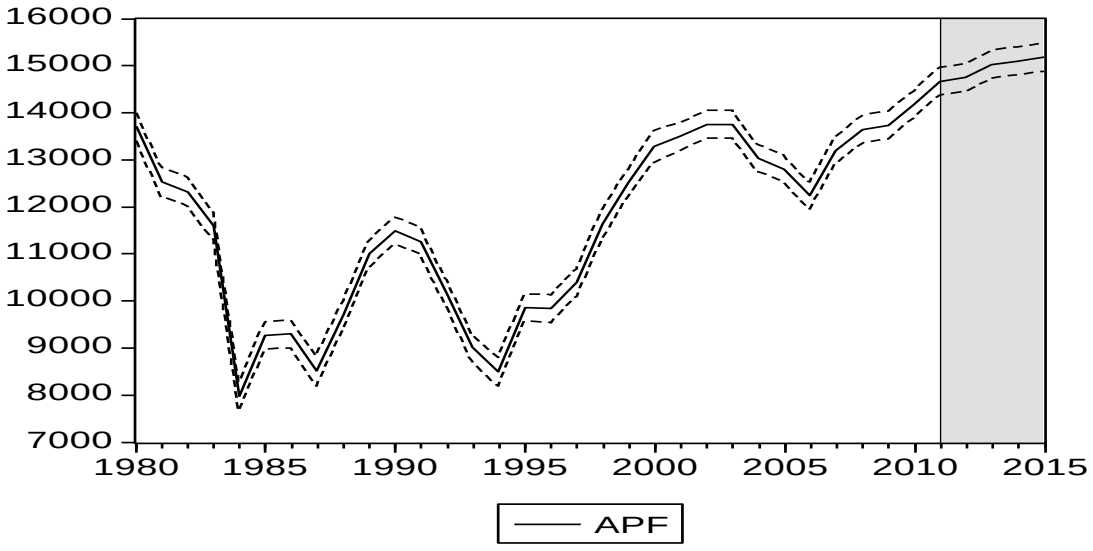


Figure 9: Forecasting Simulation of Area Planted for Pepper

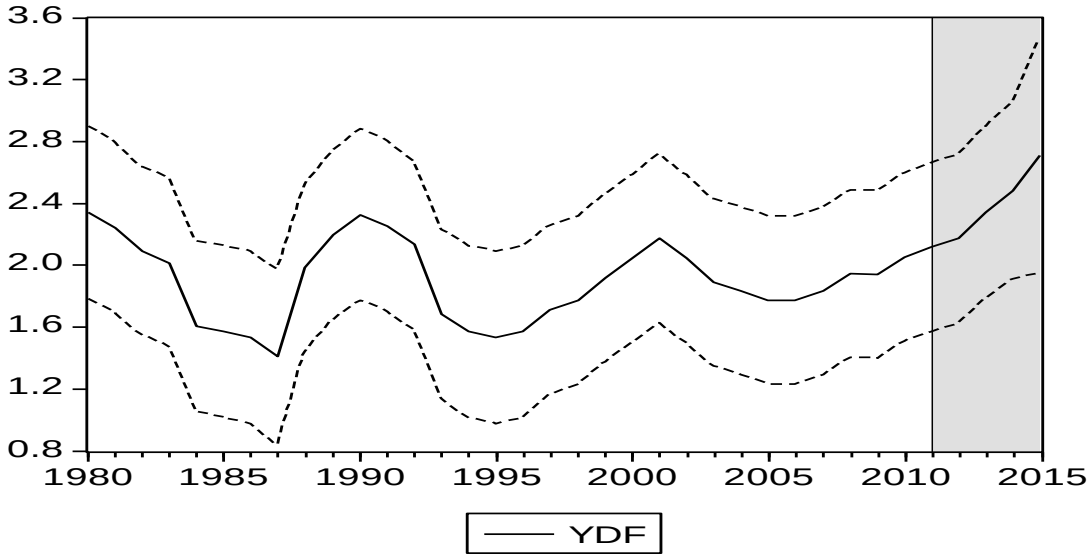


Figure 10: Forecasting Simulation of Yield for Pepper

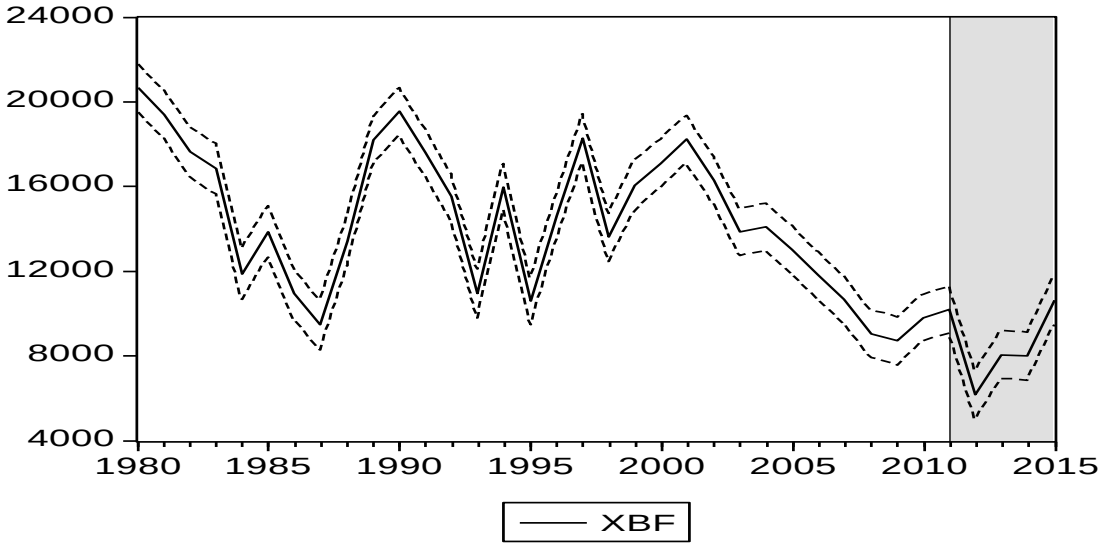


Figure 11: Forecasting Simulation of Export Demand for Black Pepper

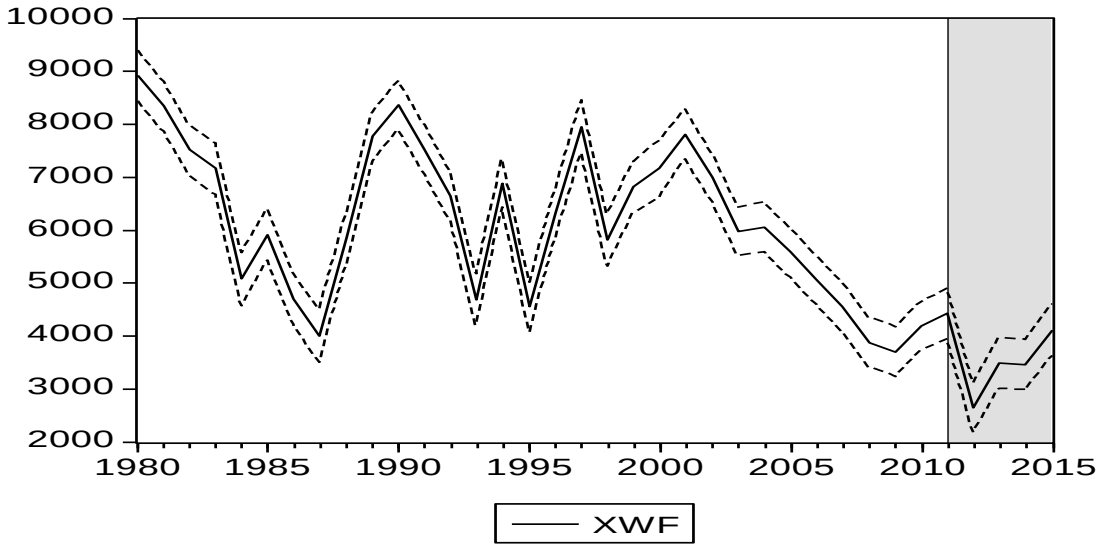


Figure 12: Forecasting Simulation of Export Demand for White Pepper

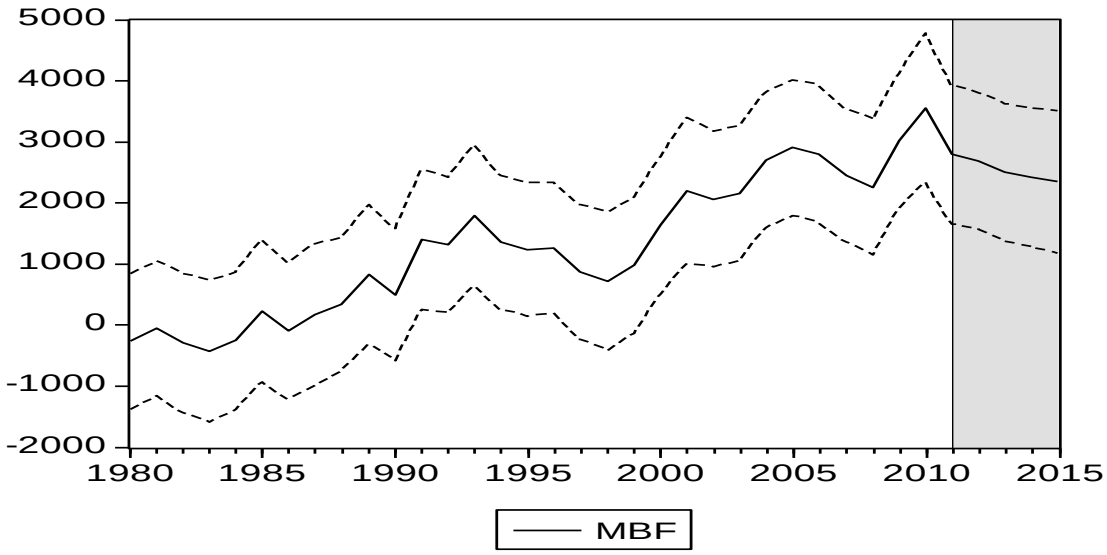


Figure 13: Forecasting Simulation of Import Demand for Black Pepper

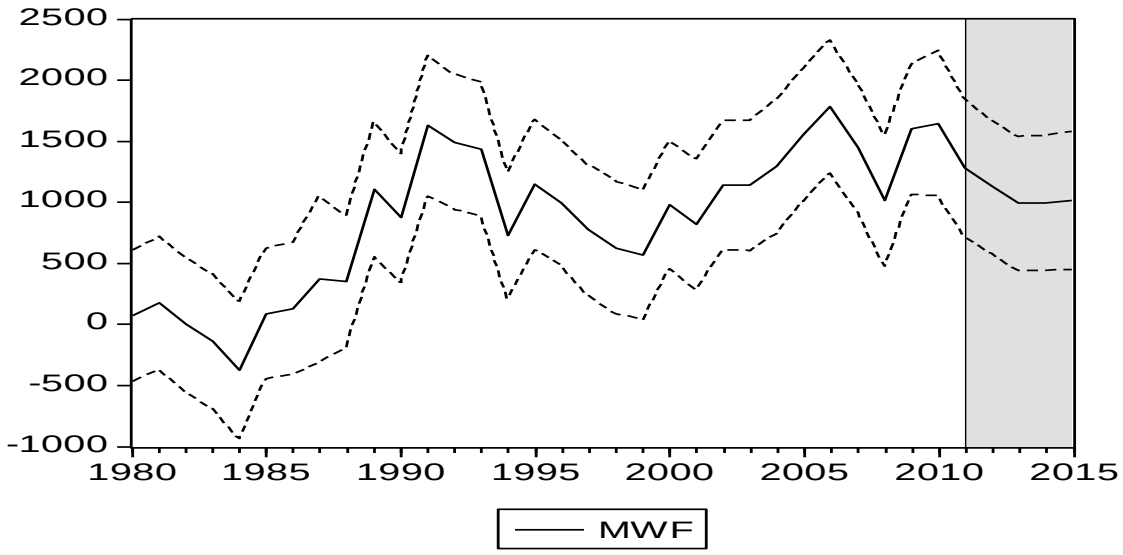


Figure 14: Forecasting Simulation of Import Demand for White Pepper

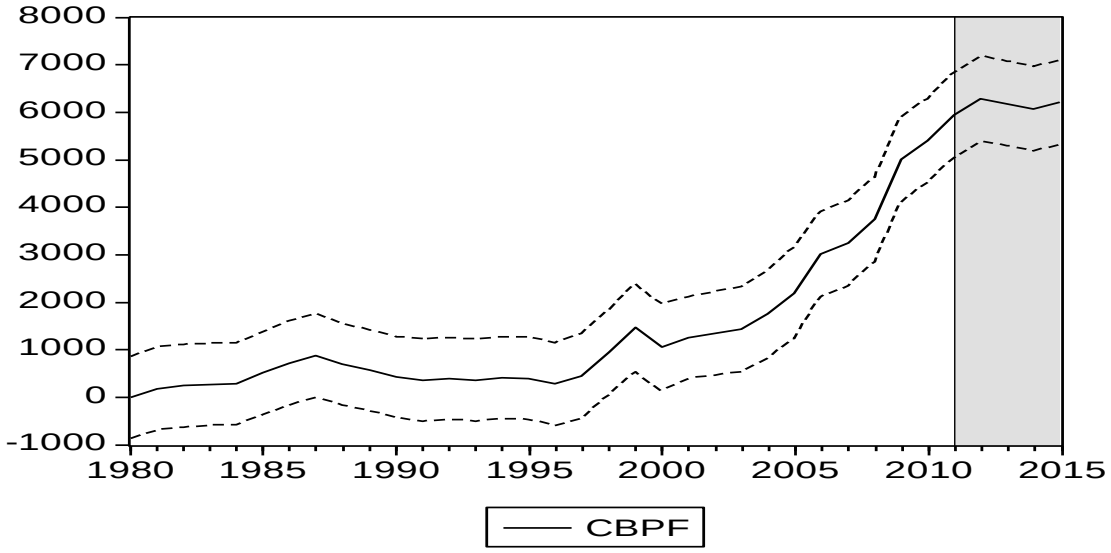


Figure 15: Forecasting Simulation of Domestic Consumption for Black Pepper

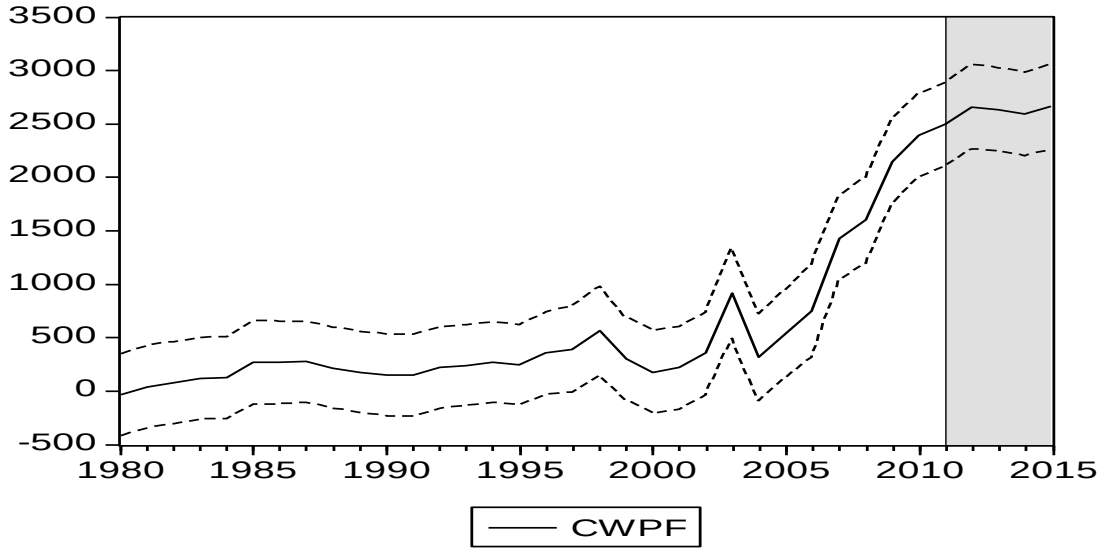


Figure 16: Forecasting Simulation of Domestic Consumption for White Pepper

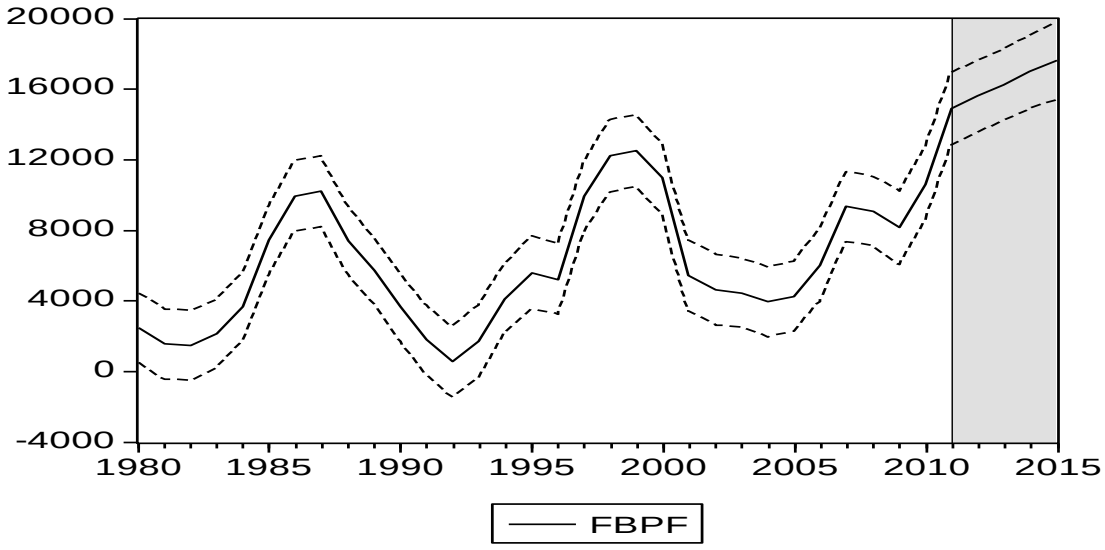


Figure 17: Forecasting Simulation of Price at Farm level for Black Pepper

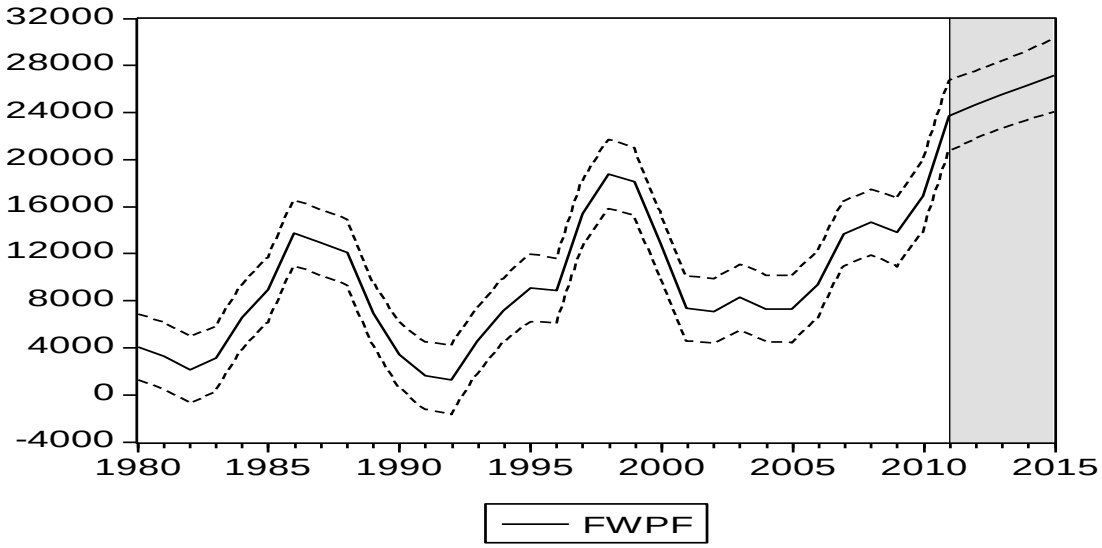


Figure 18: Forecasting Simulation of Price at Farm level for White Pepper

CHAPTER SIX

CONCLUSION

6.0 Concluding Remarks

This study presents an analysis of the domestic structure of the Malaysian pepper market. The Malaysian pepper market has undoubtedly made significant contributions towards the domestic economy as well as to the development of the world pepper market. Apart from fertile soils, favourable weather and political stability, proper management and effective implementation of programmes and policies by private and public sectors have also contributed to successful development. Malaysia's ability to compete for increasing market shares has resulted in the rapid expansion of pepper production over the last three decades. The success of the crop itself lies mainly in its high degree of profitability.

While Malaysian black and white pepper domestic consumption can be explained by quantity consumed in the past year and by the current level of industrial activity, the amount of black and white pepper exported are highly dependent on the level of industrial activity and the price of black and white pepper.

The structural model discussed here has also exposed that the real effective exchange rate played an important role in explaining the quantity of pepper exported. The recent economic crisis that reduced the value of the Ringgit through foreign exchange

adjustment encouraged greater export of pepper. The reduction in the value of the Ringgit relative to other currencies cheapened Malaysian pepper in the world market, resulting in an increased uptake by foreign buyers.

The general economic performance of Malaysia as well as the rest of the world is also an important determinant of the level of Malaysian pepper consumption and export. This factor is derived from the increased purchasing power of domestic and foreign consumers, which to a certain extent has an increased tendency to consume pepper.

Stabilization of pepper prices in Malaysia is not an easy task that can be workout by Malaysia independently. It needs the cooperation from all the pepper producing countries which will be leaded by the International Pepper Community (IPC). This is because the price stabilization funds for pepper are exclusively burdensome, cumbersome and costly to be really workable and justifiable. Such schemes involved huge sum of money, very difficult to administer, introduced unnecessary bureaucracy and make the system slow to respond to changing circumstances.

Furthermore, expansion of size for planting pepper is also essential in Sarawak for our future production. According to Soils Division Research Branch, Department of Agriculture Sarawak about 14% of land which is suitable for planting pepper in Sarawak. However, from the 14%, only 0.8% (14,453 hectare in year 2011) was used to plant pepper in Sarawak.

6.1 Major Findings

The primary issue affecting the production, marketing and utilization of pepper over the last few decades has been the volatility of prices. Pepper prices have followed a cycle of troughs and peaks that accompany increases and declines in supply, while demand for pepper has continued to rise at a steady rate over the period. The deep troughs in the price of pepper that have occurred fairly regularly, every eight to ten years, (most recently beginning in 2004) have affected farmers' incomes seriously and consequently led to poor maintenance, high incidence of disease and pests, and even abandonment of farms. Subsequent shortages of supply and high prices affect industrial users and consumers adversely, increasing costs of production and sometimes requiring changes in food product formulations. Other issues that require the attention of pepper producing countries include the incidence of pests and diseases that cause significant losses to farmers and the rising costs of some of the inputs for pepper production and marketing. The need for uniform quality standards and guidelines to meet concerns regarding food safety and quality is an important issue that has to be addressed by producers working together with private and public sector agencies in consuming countries.

6.1.1. Pepper Price Volatility

The price of pepper has followed a cyclical pattern of troughs and peaks, with the FOB price for Black pepper rising to as high as US$ 6,583 per tonne (ASTA Black, Kuching in November 1999) and falling to as low as US$1,610 per tonne (ASTA Black, Kuching in December, 2004) for the current cycle. In November 2012, prices of black

pepper in the New York market were US$7,231 per tonne and for white pepper the prices were US$9,810 per tonne. At these low levels, the price of pepper may be well below the cost of production and farmers experience considerable hardship.

The price of pepper is influenced primarily by supply and demand, in turn, is affected by price over the medium and longer term, as production is affected by farmers' inability to maintain their pepper holdings because of low returns.

While various mechanisms to match supply to market requirements have been considered at different times, it has not been possible to achieve consensus among producing countries to effectively limit production when necessary. As pepper is grown mainly by small farmers, in Malaysia and often in disadvantaged areas, it is difficult to restrain new planting and production increases when prices are high. At the same time, withholding supplies from the market would require large amounts of funds that few developing countries can afford. The way forward appears to be to increase market uptake significantly through promotion, increasing consumption of pepper in the producing countries, development of new uses and products for pepper and expanding consumption in new and emerging markets. Educating and providing support to farmers at times of very low prices, to ensure that production levels do not fall drastically can help to ensure that price peaks at not so excessive as to lead to declines in consumption. Cooperation and joint action at the international level is essential to the success of any long term program for price stability.

6.1.2. Heavy Plant Losses Due to Phytophthora Foot Rot

Although many different diseases affect pepper vines, Phytophthora Foot Rot is the most serious and the one which has threatened pepper production for many years. It is so wide spread that there is no producing country is free from this disease. The damage is severe and plants may die within a few months of infection. Scientists have developed integrated disease management practices but farmers do not easily adopt these practices as they are more laborious and treatments are not cheap. It now appears that development of disease resistant varieties is the long term answer to this problem.

6.1.3. Need for Repeated Harvesting

The harvesting period for pepper normally spreads over two months and sometimes may be even longer. Harvesting is labour intensive and often the most expensive activity when the plants have begun yielding. With a prolonged harvesting season it becomes necessary to undertake frequent picking of berries, at least 3-4 times per season, if only properly matured spikes are to be collected. Where non-farm labour is used harvesting can be an expensive operation. If farmers complete harvesting in one or two rounds, a high percentage of immature pepper will be picked and the resulting black pepper will contain an excessive amount of light berries. For making white pepper, harvesting of only mature, almost ripe berries is even more crucial and more frequent rounds need to be undertaken. It is therefore necessary to evolve varieties that complete flowering in a short period and the berries become mature more uniformly. This will enable harvesting to be completed in one

or two rounds, requiring less labour input and consequently less cost to farmers. This issue is more serious in countries where labour costs are high.

6.1.4. High cost of non-living Support

Another issue related to cost of production is the relatively high cost of suitable deadwood or other non-living supports. Posts made from "Belian" wood provide the best non-living support for pepper cultivation in Malaysia and similar hardwoods are used in other countries. Such posts are becoming increasingly expensive as the supply of hardwood tropical timber becomes scarce. It is essential to develop suitable alternative supports for growing pepper, particularly in areas where live supports are not preferred. In Thailand some farmers are using earthenware pipes as supports for pepper. Other supports, including brick structures, and cement poles that are cheap and able to provide support for pepper vines for a reasonable period (such as twenty years) need to be developed, with particular attention to the cost of such supports. Over the long term, the use of live supports should be encouraged to replace the use of a depleting hardwood timber resource in pepper cultivation.

6.1.5. Low yield of bush pepper

Growing bush pepper is less expensive than pepper trailed on supports, as costly supports are not required and harvesting is easier. However, the yield from bush pepper is low as the lateral branches, which are used for planting do not grow taller than 60cm to 75cm. If the height of the plants can be increased and if stem has the strength to carry a

larger canopy, the yield could be increased considerably. This is an area of research that can bring significant benefits to farmers.

6.1.6. Lack of an Early Warning System for Pests and Diseases

Because pepper is a food item, stringent restrictions on pesticide residues have been prescribed in many countries. However, plant protection chemicals are often applied to pepper holdings as a prophylactic measure, without knowing whether the incidence of pests and diseases is beyond threshold levels. Much of the pesticide residue problems could be reduced if reliable early warning systems and pests and disease surveillance practices were developed and farmers trained in their use.

6.1.7. Tedious process of making white pepper

Traditional preparation of white pepper requires flowing water or a large expanse of stagnant water. The harvested pepper, separated from the stalk, conventionally has to be retted in water for a long period, extending up to 10-14 days. Isolating the right bacteria and releasing its culture to the retting water or addition of retting enzymes will definitely accelerate retting. Selection of suitable varieties, which have soft skin but with hard core inside is also desirable to reduce retting time.

6.1.8. Uniform Quality Standards for Pepper

Various quality standards exist to facilitate trade in pepper. These include standards at farm level, used in producing countries to determine prices paid to farmers and FOB (Free-On-Board) quality standards that specify quality at time of shipment and standards set by importing countries (or trade organizations) to comply with the concerns of users. Increasing concern with food safety among consumers has led to regulations imposed by authorities in importing countries that specify stringent restrictions to physical, microbiological and chemical contamination of pepper imports.

Pepper producing countries, working through the International Pepper Community (IPC), have formulated standards that set specifications, identify testing methods and provide guidelines for handling and processing of pepper. Promotion and use of these standards and methods is an ongoing effort and requires the support of governments as well as the trade to ensure acceptability and adoption. In summary the various pepper industries and governments in pepper producing countries along with IPC need to focus on these issues to benefit producer, traders and consumers.

6.2 Policy Implication

6.2.1. Strategies for Improving Demand of Pepper

As pepper production has deceased over the last two years and total demand for pepper has registered a consistent growth the prices of pepper has increased to a record high in October 2011 of US$ 8.50 per Kg for black pepper and about US $ 13.00 per Kg for white pepper.

Since supply has not kept pace with this increase in demand, importers have faced with price increases that have caused them much hardship. The low price levels prevailed during 2004-2005 has resulted in poor maintenance and low yields in Malaysia where most of the farms are relatively old. However there are possibilities or increasing production as there are new holdings coming into production in some countries that embarked on extensive new plantings between 2009 and 2011. Given this scenario, Malaysia as a pepper producing country has to make every effort to improve demand for pepper.

Three areas can be identified as the focus of strategies to improve demand:

i. New and Emerging Markets

Efforts to improve consumption in new markets have to be stepped up as demand growth in traditional markets (USA, Western Europe and others) is almost saturated. Promotion should be targeted at countries with relatively large populations, where the food processing industry is growing and incomes are improving.

New economics such as the Non-Traditional Markets for imported pepper have increased imports of pepper in recent years are shown in Table 15.

Table 15: Import of Pepper into Non-Traditional Markets (Tonne)
(Average 2002-2004 and 2008-2010)

Countries	Average 2002-2004	Average 2008-2010	Increase	
			Tonne	%
United Arab Emirates	6,430	10,808	4,378	68%
Pakistan	4,868	6,935	2,067	42%
Canada	5,680	6,444	764	13%
Poland	4,255	5,398	1,143	27%
Turkey	2,999	3,556	557	19%
Ukraine	3,241	3,489	248	8%
Philippines	1,314	3,173	1,859	141%
Australia	2,521	2,871	351	14%
South Africa	1,681	2,566	885	53%
Botswana	432	2,191	1,759	408%
Senegal	1,426	1,801	375	26%
Morocco	1,282	1,609	327	25%
Yemen	312	1,602	1,291	414%
Argentina	1,207	1,445	238	20%
Czech Republic	908	1,108	199	22%
Bulgaria	718	1,001	283	39%
Kazakhstan	411	735	324	79%
Jordan	456	681	225	49%
Mali	313	675	361	115%
Peru	308	654	347	113%
Ireland	410	602	191	47%
Dominican Republic	310	549	239	77%
Jamaica	391	542	151	39%
Nigeria	293	520	227	77%
Oman	229	507	278	121%
Estonia	245	449	204	83%

Source: International Pepper Community (2012), Various issues.

ii. Development of New Products and New Uses

Long term support for research and development of new products and uses of pepper is an important strategy for increasing demand for pepper. Where demand is price inelastic, changes (increases) in demand patterns are brought about primarily by changes in taste and innovation in products and uses. Develop a standard to identify organic green, black and white pepper in the market.

iii. Increasing Consumption in Malaysia

Malaysia has a good potential not only in consumption of pepper and pepper products within the country but also as intermediate markets, producing value-added food and non-food items for export. Thus, increasing utilization of pepper in domestic markets should not be seen as a loss of foreign exchange earnings, but as an enhancement of value of exports, as less raw materials and more value-added products are exported.

6.2.2. Strategies for Stabilization of Pepper Price

The global supply of pepper has been registering a fluctuating trend for more than 50 years. This highly fluctuating supply of pepper in the world market is resulting in extreme price volatility. Pepper is one of the most volatile commodities traded internationally. Monthly variation in pepper supply is around 5%. This wide fluctuation creates larger risks for farmers, traders, exporters and importers of pepper, as well as, to some extent, for the Governments, who want to protect their farmer's income. Farmers run large risks because they do not know what price they will realize for their produce in future. Traders/ exporters often carry large inventories, the value of which can be significantly affected by price changes. Pepper producers, who are mainly depending for their cash earnings, are exposed to price fluctuations and any drop in pepper prices is finally passed on to them. Thus, the strategies for stabilization of pepper price are needed to emphasis on the buffer stocks, price, supply management and future market of pepper.

6.2.2.1. Buffer Stocks

It would seem best that the buffer stock aim to reduce excessive short-term price fluctuations. Thus, the buffer stock would limit or discipline the market forces giving rise to excessive price disturbances. It would not be the aim of the buffer stock to negate market forces or provide for absolute stability about the trend in prices. Nor would the aim be to raise the long-term trend in prices. Since it is generally thought that small change in supply brings about a large change in price, there are grounds to believe that buffer stock would be extremely effective in keeping prices within an agreed range.

a) Stock Size and Finance Requirement

According to Bade and Smit (1994) estimates for pepper buffer stock size and finance needed to purchase the stock can be done in two ways. The first would be to find how large the buffer stock would be when stock accumulations would be at highest. From this size a maximum finance requirement can be calculated. The second type of estimate would be to determine the average size of the buffer stock over a period of time. This second type of estimate is useful for economic feasibility assessment and for planning normal operation.

In estimating stock sizes and finance requirements, the effects of instituting a buffer stock on traditional stock holders should be taken into account. Firstly, it may be that these stock holders would not want to stock as much as they now do if they have doubts about the viability of the buffer stock and therefore anticipate release of the stock with price depressing effects. A buffer stock which functioned well would not

raise such doubts. Secondly, with a buffer stock ready to supply the market, processors might buy from the buffer stock rather than hold their own stocks which would incur cost to these processors. Thirdly, potential gains to speculators would be limited by reducing excessive price fluctuations. This could create need for a large buffer stock if speculation is of the type where speculators buy when price is low and sell when price is high. On the other hand, if speculation is of the type that speculators buy when price is rising and sell when price falls, restriction of this type of speculation would reduce the size of the buffer stock.

Another type of speculation which could raise the size of the buffer stock is if speculators would engage in betting that the market price would go below the floor price or above the ceiling price. In times when the buffer stock size was large or close to the financial or storage limits, speculators may sell to avoid possible losses if the market price goes below the floor price. These sales would create a need for additions to the buffer stock. In times when the buffer stock was low and price near the ceiling price, speculators may buy pepper anticipating gains from sales when price went above the ceiling price. Such purchases would mean that the buffer stock should have been larger to avoid the situation that attracts this kind of speculations.

Over the past year, prices have been high and rising. It would seem that any proposal for a buffer stock would not press for immediate stocking action, since purchases for the buffer stock would only raise prices to higher levels. Rather the concern should be to prepare for stocking when prices turn down, as can be expected from the sample historical evidence of pepper price fluctuations. Also the high price period over the

last few years could have stimulated plantings as happened in 1999 high price period which was followed by low prices in 2004 when the planting began to yield pepper. Thus a return to the more usual supply and demand balance with short-term price instability might occur in the near future.

b) Operation

A price would be set where purchases would take place at the floor price and sales at the ceiling price. A variant of this type of operation would be to have the floor and ceiling prices set as signals for the buffer stock management to begin activities. The view has been expressed that signal type operations could more effectively use the buffer stock resources than in operations with fixed price limits. It would be difficult to specify the exact price range for operations in an agreement but the range could be set for an initial period and revised at specified intervals according to agreed procedures, for example taking into account the costs of production (which vary from country to country) and returns to competing crop in fixing the floor price. A ceiling price would have to be set so as to dispose of stocks accumulated at low price periods and in setting this price, reap the most gains on the transaction. The gains (or losses) would be the trading profits less costs incurred in storage and others.

Table 16 show the Setting of Defence Floor Price at Farm Level. Before setting a floor price at farm level is essential to know the cost of production such as not including the cost of land but inclusive of labour during the first year of cultivation is estimated as RM41,590 per hectare using live support (Gliricidia). Then calculate the profit margin of 20% and come out with the preference price at farm level.

Setting a price alert at farm level is important to let us know that the price is below the preference price. While, setting price trigger is to inform us that the price has dropped below the profit margin. For defence floor price at farm level is to buy the stocks in the market to ensure the price will not dropped below the cost of production.

Table 16: Setting of Defence Floor Price at Farm Level

Cost of Production	:	RM 9.60 /KG	or	3.20 USD/KG
20% Profit Margin	:	RM 11.40 /KG	or	3.80 USD/KG
Preference Price	:	RM 12.00 /KG	or	4.00 USD/KG
Alert Price	:	RM 11.40 /KG	or	3.80 USD/KG
Trigger Price	:	RM 10.80 /KG	or	3.60 USD/KG
Defence Floor Price	:	RM 10.20 /KG	or	3.40 USD/KG

Source: Author's calculations for price Black Pepper Grade 1 at farm level.

Table 17 show the Setting of Defence Ceiling Price at Export Level. It would be difficult to specify the cost of purchasing and profit margin for the exporters. By setting a price alert at export level is to let us know that the price is above the market price. While, setting price trigger is to inform us to be ready to sell a certain quantity of stocks to the market. The purpose is to soften the demand in the market. For the defence ceiling price at export level is to sell the stocks in the market to ensure the price will not anticipate strengthening.

Table 17: Setting of Defence Ceiling Price at Export Level

Alert Price	:	RM 22.80 /KG	or	7.60 USD/KG
Trigger Price	:	RM 23.40 /KG	or	7.80 USD/KG
Defence Ceiling Price	:	RM 24.00 /KG	or	8.00 USD/KG

Source: Author's calculations for price Black Pepper 550 G/L at export level.

Since prices would have to be monitored, price reporting would be necessary for a buffer stock operation. Data collection production, stocks, trade and consumption by grade would also need to be greatly improved in order to assess the short-term price outlook.

The problems of relating prices of different origins could be dealt with by establishing price differentials based on historical price series on an F.O.B. basis.

It would be desirable to simplify operations by dealing in as few grades are necessary to give a large degree of stabilization for all pepper prices. Stocking could be limited to the main grades and by substitution of grades by buyers, the effects of stocking activities on the main grades would spread to the other grades.

The grades to stock and the price differentials can be related in a checking system. Over a long period of time it is desirable to carry stocks in proportion to the production of those stocks carried so that the buffer stock does not interfere with the normal pattern of production. At any one time, of course, stock of one grade may be out of this proportion due to the transactions in the market in the recent period. But if there is a persistent build-up of one grade out of its proportion in production, this is evidence that this pepper grade is overpriced and the price differential should be reduced. If there is a persistence of low level of stock of one grade, this implies that the differential is too low and it should be raised.

Exchange rate changes might present some problems in operations. In general it would be best to use market exchange rates to keep up with the actual situation; and fixed exchange rate should be avoided since they involve distortions to the actual market situations.

Export taxes may also pose some problems for the determination of floor prices and price differentials. So long as the buffer stock would buy a grade at a price that is correct in relation to prices of other grades, it would seem that the buffer stock should pay the price including export tax. But if the export tax made the price higher than it should be in relation to other grades and consequently stock of this grade persistently accumulated, the buffer stock should not be obliged to pay more than the correct price.

c) Other Issues in Operations

It may be desirable to include safeguard export of production quotas that would only be imposed when the buffer stock could not defend floor prices and hence prices would fall drastically. This may be a preferable course of action rather than to let prices fall sharply, even though export quotas disrupt trade and without government stock purchases, they force stocking on to producers. Production quotas force adjustment costs on to producers. The undesirable effects of quotas could be lessened by making action known as far ahead as possible so that the trade and producers can plan accordingly.

The buffer stock could be located in the producing countries or abroad. Storage facilities could be leased from private or government owners or the buffer stock

agency could undertake to provide their own storage facilities. The storage conditions would have to be adequate to prevent deterioration of the pepper in stock. Under pepper conditions, pepper can be stored for considered lengths of time without deteriorations.

The buffer stock would follow normal commercial practices in buying or selling pepper such as dealing with contracts, shipment documents, invoicing payment, insurance, arbitration of disputes and sampling. Particular attention would have to be paid to correct identification of quality of grades bought or sold. There would be a tendency for pepper that is actually not as good as it has been graded to be bought by the buffer stock while the better than graded pepper would be quickly bought by the trade. The buffer stock could lose by buying under graded pepper which when sold would fetch a lower price than that grade should get. In selling stock, the buffer stock should correctly grade all pepper sold to maintain the industry confidence in the grades being sold by the buffer stock.

d) Distribution of Benefits and Costs

An evaluation of the benefits and costs of the buffer stock policy would take account of the effects of the policy on producers and consumers. In addition, operating losses (or profits) would have to be shared on an agreed basis by those supporting the policy. It would be difficult to estimate the benefits to producers of avoiding low income due to downward price fluctuations since these benefits relate to the hardships they would endure if prices fall excessively. Allowance would have to be made for their higher incomes when prices fluctuate upwards. Other benefits to producers would be better

planning of investments since price uncertainty would be reduced and perhaps lower interest rates on production loans since uncertainty allowance would be reduced.

In developed countries, pepper constitutes a very small part of household expenditures for ground pepper and pepper in prepared foods. Consumers in developed countries would have slight benefits from pepper price stabilization. In some developing countries such as Morocco and India, considerable amounts of pepper consumed and expenditures on pepper could be of some importance. When prices are high in developing countries, the increased price to consumers and reduction in consumption affect their well-being. This is a consideration of some importance to the poor who cannot even afford a little pepper on their food when prices are high.

As to distribution of operating losses, non-member pepper exporting countries could benefits from price stabilization without having to bear a share of losses. It would seem most equitable if those benefiting from price stabilization would share losses in proportion to their share of benefits. For this reason, efforts should be made to have all pepper exporting countries join in a buffer stock management.

In view of the volatile nature of pepper fluctuations, it may be possible for the buffer stock to cover its operating costs in the difference between the buying and selling prices or even make an operating profit. In this case, the issue of non-members benefiting from the policy is not an import consideration.

6.2.2.2. Price

Table 18 and Figure 19 show the Monthly Average Spot Price of Black Pepper at New York in 1970 to 2012 (US$/Tonne). The spot price of New York for the last 41 years has been studied. It is observed from the study, a cycle of clear boom and bust situation. What is interesting is the lowest price recorded in 1971, 1983, 1992 and 2004 has a cycle of 11 years & 3 months, 9 years & 4 months and again 12 years & 3 months respectively. According to this cycle, the next lowest price may be possible in 2015.

The highest price achieved in 1977, 1986, 1999 and 2011 has registered a cycle of 8 years & 8 months, 13 years & 8 months and again 11 years & 9 months respectively. Hence, another record increase in price may be expected during the year 2023.

Table 18: Monthly Average Spot Price of Black Pepper at New York in 1970 to 2012 (US$/Tonne)

Lowest Price (US$/Tonne)	Year & Month	Change (Year & Month)	Highest Price (US$/Tonne)	Year & Month	Change (Year & Month)
1,012	Dec-71		2,667	Apr-77	
1,410	Mar-83	11.3	6,569	Feb-86	8.8
1,080	Aug-92	9.4	6,583	Nov-99	13.8
1,610	Dec-04	12.3	8,628	Oct-11	11.9

Source: International Pepper Community (2012).

Figure 19: Monthly Average Spot Price of Black Pepper at New York in 1970 to 2012 (US$/Tonne)

A thorough evaluation on the pattern or behaviour of monthly prices at the major global market centres and export of pepper from producing countries for over a period of five years (2007 to 2011) has been done. Seasonal price fluctuations are very common for any agricultural produce since the supply highly depends on many factors like production, weather, domestic price and consumption pattern in the producing countries. Hence a seasonal index analysis is done on both the monthly export volume and price of pepper for the last five years. The seasonal index analysis was plotted on the graph and is given below.

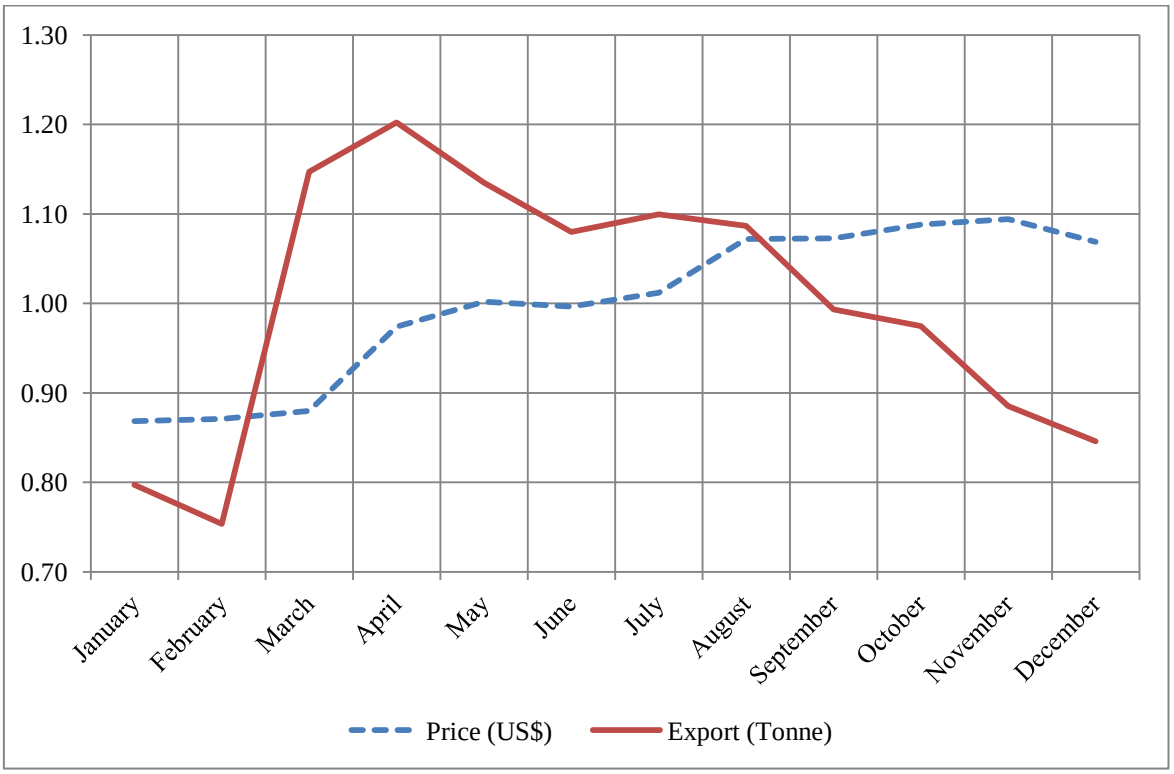


Figure 20: Seasonality Index of Export and Price of pepper for last 5 years (2007 to 2011)

From the Figure 20, it is clear that a prominent seasonal behaviour was reflected in export of pepper. Peak periods were noticed as March to August while the lowest flats

were seen during September onwards. Seasonality figures for monthly export of pepper vary from 0.75 to 1.20. The higher export of pepper during March to August is mainly due to the increased international demand. But during the period from September onwards the export shows a low seasonality and a downward trend in export.

In the case prices, peaks and flats are on marginal level as compared to export and the number of peaks and flats are more which ensures the effect of cyclic variation in pricing pattern of pepper. The seasonality figure of pricing pattern is varying from 0.87 to 1.09 only which lesser as compared to export. The cyclic behaviour explains the regular pattern of variation in more than a year period. Thus, the cyclic behaviour existed in the variables of price and export.

Based on the seasonal index analysis an in-depth analysis on monthly price of pepper for a period five years is done. During the season September – November, the price seasonality is above the export. The moving average of the monthly price of pepper from 2006 onwards is carried out and the result shows a prominent pattern in the change in pricing of pepper internationally. The analysis is given in Table 19.

Table 19: Three Years Moving Average Price of Black Pepper during 2006 - 2011 in New York Market (Price in US$/Tonne)

Month	2006-2008	2007-2009	2008-2010	2009-2011	Average
January	2,833	3,212	3,360	3,882	3,322
February	2,933	3,250	3,346	3,824	3,338
March	2,995	3,277	3,398	3,837	3,377
April	3,275	3,565	3,514	4,323	3,669
May	3,384	3,670	3,545	4,426	3,756
June	3,310	3,623	3,527	4,457	3,729
July	3,328	3,569	3,639	4,607	3,785
August	3,438	3,743	3,858	5,078	4,030
September	3,540	3,631	3,837	5,307	4,079
October	3,615	3,589	3,828	5,535	4,142
November	3,349	3,474	4,002	5,657	4,120
December	3,216	3,378	3,923	5,555	4,018

Source: International Pepper Community (2012).

From the above analysis, it is observed that the international price of pepper is higher during August to October as compared to other seasonal cycles. This may be due to different reasons like domestic and international demand, crop condition in major producing centres and may be the non-availability of exportable surplus in the producing countries. It is also note that, during these seasonal cycle the harvesting season of some of the major producing countries, including Vietnam the major producer, is already over as shown in Table 20.

Table 20: Harvest Calendar for Pepper

Countries	Jan	Feb	Mac	April	May	Jun	July	Aug	Sept	Oct	Nov	Dec
India												
Vietnam												
Thailand												
Cambodia												
Madagascar												
Sri Lanka												
Malaysia												
Indonesia												
China												
Ecuador												
Brazil												
		Peak Arrival					Low Arrival					

Source: International Pepper Community (2012).

Hence during this period the farm gate price will be high especially in the major producing countries. Normally any price hike will affect the global trade adversely which support the supply demand theory. However, the short supply will support the upward change in price. Hence more concentration should be given to analyse the trend in export from the producing countries in this season to smoothen the quantity by adopting appropriate measures. The monthly export of pepper from the producing countries (namely Brazil, India, Indonesia, Malaysia, Sri Lanka and Vietnam) for a period of 5 years were analysed and noticed that the export during November – February period is lower as compared to other cyclic seasons. The details are given in Table 21.

Table 21: Monthly Export of Pepper from Major Producing Countries during 2007 – 2011 (Tonne)

Month	2007	2008	2009	2010	2011	Average	Share
January	13,095	19,739	13,384	15,630	14,873	15,344	6%
February	12,580	16,809	19,117	13,039	12,035	14,716	6%
March	18,295	21,730	21,075	23,749	27,874	22,545	10%
April	19,213	22,657	25,078	24,771	26,611	23,666	10%
May	22,299	20,872	22,859	25,870	21,584	22,697	10%
June	20,225	19,296	22,117	23,275	23,139	21,610	9%
July	18,498	19,834	24,292	26,463	18,878	21,593	9%
August	19,720	15,622	23,950	22,376	23,927	21,119	9%
September	18,455	16,304	22,299	19,866	20,980	19,581	8%
October	18,086	17,502	23,828	18,572	18,041	19,206	8%
November	19,587	15,300	18,439	21,051	14,470	17,769	7%
December	16,259	17,100	18,145	18,529	13,263	16,659	7%
Total	**216,312**	**222,765**	**254,583**	**253,191**	**235,675**	**236,505**	**100%**

Source: International Pepper Community (2012).

From this analysis, it is observed that, on an average the share of export of pepper from the major producing countries during the seasonal cycle December – February is only 7% for each month. This ratio for the seasonal cycle is comparatively low with other cycles. Hence from the analysis of both variables like price and export volume, it can be concluded that by keeping the excess exportable surplus for the period from February to April by storing the product from the previous cycle. This will ensure more or less uniform distribution of the product throughout the year to assist achieve a better price. The quantity to be kept or stored for the price recovery mechanism is given in Table 22.

Table 22: Seasonal Export of Pepper from Major Producing Countries during 2007 – 2011 (Tonne)

Crop Season	2007	2008	2009	2010	2011	Average	Excess Quantity Exported in Other Season than Sep – Dec
Sep-Dec	72,387	66,206	82,711	78,018	66,754	73,215	
Jan-Apr	63,183	80,935	78,654	77,189	81,393	76,271	3,056
May-Aug	80,742	75,624	93,218	97,984	87,528	87,019	13,804

Source: International Pepper Community (2012).

On an average the excess supply of pepper before and after the high price and low export cycle is around 13,000 tonnes. By considering the harvesting season, producing countries can hold this much quantity during February to April proportionally to acquire the price recovery. This mechanism will ensure smooth and uniform supply of the product globally and premium price for the growers.

Table 23: Annually Export of Pepper from Major Producing Countries during 2007 – 2011 (Tonne)

Country	2007	2008	2009	2010	2011	Average	Share
Vietnam	82,904	89,705	134,200	116,861	118,400	108,414	46%
Indonesia	36,369	50,424	43,725	61,538	40,832	46,578	20%
Brazil	39,008	36,363	35,648	30,723	32,696	34,888	15%
India	33,940	26,665	21,267	17,773	24,464	24,822	10%
Malaysia	15,065	13,371	13,122	14,077	14,201	13,967	6%
Sri Lanka	9,026	6,237	6,621	12,219	5,082	7,837	3%
Total	**216,312**	**222,765**	**254,583**	**253,191**	**235,675**	**236,505**	**100%**

Source: International Pepper Community (2012).

Table 23 illustrate the Annually Export of Pepper from Major Producing Countries during 2007 – 2011 in tonne. The major producing countries are namely Brazil, India,

Indonesia, Malaysia, Sri Lanka and Vietnam which are also the members of International Pepper Community (IPC).

The past five years (2007-2011) of annual export of pepper, Vietnam has exported the highest among the producing countries which was 108,414 tonnes or about 46%. Followed by Indonesia and Brazil, have exported about 46,578 tonnes or 20% and 34,888 tonnes or 15% respectively. Malaysia ranked number five for the past five years of export of pepper which was 13,967 tonnes or about 6%. The lowest exported of pepper among the major producing countries for the past five years was Sri Lanka which was 7,837 tonnes or 3%.

6.2.2.3. Futures Markets

Futures markets allow the transfer of trade risk and a price discovery mechanism for the trade. Risk is transferred from hedgers (usually producers or industrial users) to speculators and the latter also provide liquidity to the market. Futures markets are standardized with regard to trading regulations and terms of delivery.

The establishment of futures market has brought a number of advantages to farmers. Farmers or for that matter, any sellers, may use the futures market to obtain a fair market price for their produce. They can make reasonable assumptions about the direction of future prices. Comparing futures prices with the current spot price, they can decide to hold or sell their pepper to get maximum returns. Like traders, farmers may participate

directly in the futures exchange to hedge their positions. Other benefits to the farmers of the futures exchange are as follows:

Seasonality of the crop forces farmers to sell pepper at the low prices that generally prevail during the harvesting season. However, with the futures market, farmers need not sell all their produce at one time and can stagger sales through future contracts to try and get the best price available.

a) Intermediaries and commission agents can be avoided;
b) The existence of a futures market helps to provide long-term stability in prices and to provide farmers the alternate marketing system;
c) To meet short-term cash needs, farmers may sell small quantities in the spot market and at the same time take a futures position for the balance of their pepper;
d) Every day, only 12 contracts can be traded, one for each calendar month to avoid over speculation.

Current Marketing Option in Malaysia:

There is no pepper future trading in Malaysia. The trade is mainly conducted on physical delivery on the day's price or at predetermined price between the buyer and the seller. However, the Malaysia government agency has established two marketing options which are as follows:

A. Pepper Ownership Scheme

In 1994, the Malaysian Pepper Board introduced the Pepper Ownership Scheme (POS) aimed at enabling pepper farmers to mobilize their pepper stock financially without parting ownership. Under the scheme, the Board issues an ownership certificate to the farmer storing their pepper at its designated warehouse. With the implementation of such a Pepper Ownership Scheme, farmers who wish to store their pepper stocks whilst waiting for the price to improve are given the opportunity to secure loans to meet their immediate financial needs by putting up their Pepper Ownership Certificate as collateral to the financial institution.

B. Physical Forward Pepper Market

The Malaysian Pepper Board plans to introduce a physical forward pepper market in 1997. Presently, at the export level, pepper is usually traded on the basis of prompt or forward delivery of between 1-6 months. Forward delivery sales are usually carried out between local exporters and overseas buyers with long trading relationship. The Board plans to encourage trading in Physical Delivery Contract so that the farmers will have more options to sell their produce and at the same time enable exporters to cover their forward sales.

6.2.2.4. Supply Management

Supply management through planting policies include all kind of measures aiming at influencing planting, diversification, replanting and rehabilitation. The objective is directly or indirectly affects the investment decisions of farmers in such a way that supply

reaches the target levels. Such target level in turn can be derived from what producers see as the levels at which attractive prices are to be obtained.

For a crop like pepper planting policies should best be counter-cyclical: when prices are low, replanting and perhaps some new planting, should be stimulated so that current supply is reduced and prices are somewhat alleviated. This will then lead to more pepper available in times of high prices. Such high price would then be somewhat lower, reducing the eagerness of new or existing farmers to heavily invest in pepper and then only have the vines bearing fruit when prices have become low again.

In case of structural medium to long-term surpluses other measures have to be taken. Very often low prices are enough to make farmers move to other crops. However, a discouragement of pepper planting can only be successful if there are alternative crops. Diversification measures through subsidizing and stimulating other crops seem to be the best way to reduce pepper planting. In countries where the life cycle of pepper vine is short such as Malaysia and Brazil, the effects will be larger than in India and Indonesia where an investment decision involves the next ten to twenty years. However, in India and Indonesia there seem to be more alternative crops. If no alternative crops seem viable, one may resort to replanting with better yield crops.

In many cases national policies are undertaken in field of planting, diversification, replanting and rehabilitation. These are domestic policies taking the world as given. In order to optimize the aggregate of all national policies, since they do influence the world substantially, international coordination of simulation or reduction programmes is needed.

The is first to avoid overshooting (stimulation in all producing countries could easily lead to oversupply) and secondly to make sure prices will not reach such a high level because of low supply that other countries will take up production and enter the market. There seems to be little reason to fear for substitution on the demand side at high price levels, although some irreversible loss could be the result of the development of new spice mixtures (only partly consisting of pepper) as an alternative for pepper.

6.3 Future Research Implications

A number of further research questions arise from the findings of the above study. The possible areas of research are as follows. The rapid change in the pepper market and its continuous evolution with new innovation and so on pose a challenge to Malaysia government to make sure that pepper industry is in tandem with the development. The relevant research questions are: what is the new development role of Malaysia government amid a rapid change in the pepper industry? It is also necessary to examine the variables of other pepper producing countries in terms of policy strategies and their effectiveness.

The pepper export reduction is not only by accumulating stocks Malaysia, as stock overhangs may depress prices further. This has been the experience in other commodities too, unless the stocks are held in strong hands with the capacity to withhold sales for a significant length of time. It may be useful to operate a “warehouse receipt” scheme or government funded purchases to strengthen stock-holding capacity.

The implementation of a supply management programme by pepper producing countries will require the commitment of all member countries of the International Pepper Community. There must be a commitment to report accurately and in a timely manner the data needed to determine the estimations shown here, as well as commitment to take the steps necessary to make the programme work. The programme should not depend on policing or penalties but should function as a mutually recognized need to improve the well-being of a significant number of families' dependent of the production of pepper for their livelihood.

There is a need to revisit and evaluate the various price discovery methods practiced in the system in order to institute a better pricing method that is based on fundamental rather than market power. The farm logistics need to be assessed carefully in order to design policies that support the farmers to reduce their marketing and transactions costs.

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