UNIVERSITI PUTRA MALAYSIA

ASSESSMENT OF VEGETABLE FARMERS' ATTITUDE TOWARDS CERTIFICATION SCHEME FOR MALAYSIAN GOOD AGRICULTURAL PRACTICES

ELINA W. GOM

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By

ELINA W. GOM

Thesis Submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Degree of Masters of Science

February 2016

DEDICATIONS

To the loving memory of my beloved Grandma Kibabaig,

I wish you were here to see this.

To my amazing parents,

Thank you for your endless love and support.

Abstract of thesis presented to the Senate of Universiti Putra Malaysia in fulfillment of the requirements for the degree of Master of Science

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Chairman: Golnaz Rezai, PhD

Faculty: Agriculture

Farmers are the main focus in ensuring the vegetables in our country are at its best quality and is safe to be consumed. The nutritional facts of vegetables which entail health benefits to consumers have led to an increase in the demand for fresh quality vegetables. However, foodborne illness outbreaks and environmental abuse due to the use of excessive pesticides have caused not just consumers but also the government to become increasingly concerned about vegetable safety and quality. Good Agricultural Practices (GAP) is the answer to this crisis. GAP emphasizes on environment, economy and social aspects of farming to ensure that the products are safe to consume and the farming operations are sustainable, worker friendly and environmentally safe. In Malaysia, the government introduced GAP standards namely Certification Scheme for Good Agricultural Practices (MyGAP) in order to recognize fruits and vegetable farms that adopt GAP. Along with this, the government has also been providing non-mandatory training and courses, having extensions, giving promotions and exhibitions to attract farmers to the MyGAP certification scheme. However, despite all efforts to encourage the farmers to get the certification, the uptake among Malaysian farmers is still low and slow. Thus this study intends to uncover the underlying factors that could influence vegetable farmers' assigned values and consequently their attitudes towards good agricultural practices under the MyGAP certification scheme.

A survey was conducted in Peninsular Malaysia where 263 respondents were interviewed through a structured questionnaire. The study is made up of two groups of respondents: (1) Vegetable farmers with MyGAP; and (2) vegetable farmers without MyGAP. An Assigned Value Model was employed in the study and descriptive analysis; chi-square analysis; independent samples *t*-test; as well as multiple regression were used to analyze the collected data.

The results suggested that vegetable farmers with MyGAP and without MyGAP are significantly different in terms of their attitude, underlying values, assigned values,

knowledge and personal norms. In addition, it was also found that there is a significant association between the farmers' demographic profiles and MyGAP endorsement. Underlying values, knowledge and personal norms were found to have a significant relationship with the assigned values of vegetable farmers with MyGAP; which then leads to a significant relationship of assigned values and knowledge in shaping their attitudes. While for the farmers without MyGAP, underlying values, knowledge, personal norms and perceived barriers were found to have a significant relationship with the assigned values of farmers; which then leads to a significant relationship of assigned values and perceived barriers in shaping the attitude, whereas knowledge did not show any significant relationship with the attitude of vegetable farmers without MyGAP.

To move forward, policy makers should consider a number of principles to make this scheme worthwhile. Focusing profoundly on the values, self-standards, level of knowledge, and the barriers that prevent the farmers in participating in this scheme in order expand the attitude of the farmers in building a strong and convincing foundation for Malaysia to increase vegetable safety and quality in the future.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Sarjana Sains

PENILAIAN SIKAP PELADANG SAYUR-SAYURAN TERHADAP SKIM AMALAN LADANG BAIK MALAYSIA

Oleh

ELINA W. GOM

February 2016

Pengerusi: Golnaz Rezai, PhD

Fakulti: Pertanian

Fakta mengenai sayur-sayuran yang berkhasiat menjanjikan pengguna kesihatan yang baik telah menyebabkan peningkatan terhadap permintaan sayur-sayuran segar dan berkualiti. Walau bagaimanapun, wabak penyakit bawaan makanan dan pencemaran alam sekitar disebabkan oleh penggunaan racun perosak yang berlebihan telah menyebabkan bukan sahaja pengguna malahan juga kerajaan menjadi semakin bimbang tentang keselamatan, kualiti sayur-sayuran dan kemesraan alam sekitar. Oleh itu, Amalan Pertanian Baik (GAP) yang memberi penekanan kepada alam sekitar, ekonomi dan aspek-aspek sosial pertanian dalam memastikan produk yang selamat dimakan, kemapanan pertanian, mesra pekerja dan mesra alam bagi pekerja, adalah jawapan untuk menyelesaikan krisis ini. Di Malaysia , kerajaan telah memperkenal Skim Pensijilan Amalan Pertanian Baik (MyGAP) untuk mengenali buah-buahan dan sayur-sayuran yang dianugerahkan oleh GAP. Bersamaan dengan ini, kerajaan telah menyediakan latihan bukan mandatori dan kursus yang mempunyai sambungan serta memberikan promosi dan pameran untuk menarik petani berhubung skim pensijilan MyGAP. Walau bagaimanapun, segala usaha untuk menggalakkan petani untuk mendapatkan pensijilan dalam kalangan petani Malaysia masih rendah dan lambat.

Oleh itu, kajian ini bertujuan untuk mendedahkan faktor-faktor yang boleh mempengaruhi nilai-nilai pekebun sayuran dan seterusnya sikap mereka terhadap amalan ladang baik di bawah pensijilan MyGAP. Satu kajian telah dijalankan di Semenanjung Malaysia di mana 263 responden telah ditemubual melalui soal selidik berstruktur untuk mengumpul maklumat mereka. Terdapat dua kumpulan kajian yang telah dibincangkan : (1) petani sayur-sayuran dengan MyGAP ; dan (2) sayur-sayuran tanpa MyGAP. *Assigned Value Model* digunakan dalam kajian ini dan analisis deskriptif; sampel bebas ujian-*t*; analisis *chi-square* serta analisi regrasi telah digunakan untuk menganalisis data yang dikumpul.

Keputusan mencadangkan bahawa petani sayur-sayuran dengan MyGAP dan tanpa MyGAP adalah jauh berbeza dari segi sikap mereka, nilai-nilai asas, nilai-nilai yang ditetapkan, pengetahuan dan norma peribadi. Di samping itu, terdapat hubungan yang signifikan diantara profil demografi petani dan pengesahan MyGAP. Hal ini turut mencadangkan tiga komponen iaitu nilai-nilai asas, pengetahuan dan norma peribadi yang mempunyai hubungan yang signifikan dengan nilai-nilai yang ditetapkan oleh petani sayur-sayuran terhadap MyGAP. Kemudiannya, membawa kepada hubungan yang signifikan antara nilai-nilai yang ditetapkan dan pengetahuan dalam membentuk sikap mereka. Selain itu, bagi petani tanpa MyGAP, adalah dicadangkan bahawa empat komponen iaitu nilai-nilai asas, pengetahuan, norma peribadi dan persepsi halangan mempunyai hubungan yang signifikan dengan nilai-nilai yang ditetapkan kepada petani. Kemudiannya, membawa kepada hubungan yang signifikan antara nilai-nilai yang ditetapkan dan persepsi halangan di dalam membentuk sikap, manakala pengetahuan tidak menunjukkan hubungan yang signifikan terhadap sikap petani sayur-sayuran tanpa MyGAP.

Pembuat dasar perlu mengambil kira beberapa prinsip untuk membuat skim ini dalam maju kehadapan. Dengan memberi tumpuan kepada nilai-nilai, piawaian dalam diri, tahap pengetahuan, dan halangan petani untuk menyertai skim ini dalam meningkatkan sikap petani untuk membina asas yang kukuh. Hal ini dapat menyakinkan Malaysia dalam meningkatkan keselamatan dan kualiti sayur-sayuran pada masa akan datang .

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The process of earning a Master's Degree and writing a dissertation is challenging and arduous. I couldn't have done it alone, not without God's grace and never-ending blessings that He showers me with wonderful people around me. Thank you, Jesus

My deep love and appreciation goes to my awesome supervisor, Assoc. Prof. Dr. Golnaz Rezai for her genuine guidance, momentous moral support, special concern and memorable advice academically and personally. Astoundingly, my supervisor has molded me into a better person in life. To my virtuous committee member, Prof. Dr. Zainal Abidin Mohamed, a million thanks I would say, for the supervision, teaching, advice, constructive comments, and support throughout this study. Profoundly, they are not only mentors to me but my parents in this faculty. Not forgetting Prof. Datuk Dr. Mad Nasir Shamsudin, I am really grateful for all his guidance and unlimited support.

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To my seniors and friends of JPSM Bilik Siswazah One, you know who you are; I really appreciate their unlimited help with my thesis. I couldn't have done it without you girls!

Mummy, Papa, Johan, Shaan and Eliza, I love you all and you are the reason I've made it this far. From the bottom of my heart, I would like to take this opportunity to express my appreciation to all those who provide me the possibility to complete this thesis, both directly and indirectly, mentally and emotionally. To my late Mama Kibabaig, I dedicate this to you.

I certify that a Thesis Examination Committee has met on 22 June 2015 to conduct the final examination of ELINA W. GOM on his thesis entitled"**ASSESSMENT OF VEGETABLE FARMERS' ATTITUDE TOWARDS MALAYSIAN CERTIFICATION SCHEME OF GOOD AGRICULTURAL PRACTICES (MyGAP)**" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the degree of Master of Science.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

ASEAN GAP	ASEAN Good Agricultural Practices
DEFRA	Department for Environment, Food and Rural Affairs
DOA	Department of Agriculture Malaysia
DSM	Department of Statistic Malaysia
ETP	Economic Transformation Programme
FAMA	Federal Agricultural and Marketing Authority (Malaysia)
FAO	Food and Agriculture Organization of the United Nations
FAOSTAT	Food and Agriculture Organization of the United Nation Statistic
GAP	Good Agricultural Practices
GAP-VF	Good Agricultural Practices for Vegetable Farming
GLOBALG.A.P	Global Good Agricultural Practices
GMP	Good Manufacturing Practices
HACCP	Hazard Analysis Critical Control Point
IARC	International Agency for Research on Cancer
MARDI	Malaysian Agricultural Research and Development
MOA	Ministry of Agriculture Malaysia
MOH	Ministry of Health Malaysia
MyGAP	Malaysian Good Agricultural Practices Certification Scheme
NAP	National Agricultural Policy
NOISH	National Institute for Occupational Safety and Health
PMA	Produce Marketing Association
SOM	Malaysian Organic Scheme
WHO	World Health Organization
WWF	World Wildlife Fund

CHAPTER 1

INTRODUCTION

This chapter provides a brief introduction on the increasing vegetable demand among consumers and the demand for quality and safe vegetable produce. It also traces the significance of food safety assurances in providing quality and safe agricultural produce and the importance of compliance with good agricultural practices (GAP) at the farm level. The histories of GAP will also be discussed and how Malaysia has been practicing its GAP standards, particularly, Malaysian Certification Scheme for Good Agricultural Practices (MyGAP). The problem statement and the objectives of the study were then presented followed by an outline structure of this thesis.

1.1 Global Vegetable Sector Scenario

Vegetable consumption has shown to be an important part of any diet leaning towards good health. It plays a vital role in providing a diversified and nutritious diet. Like fruits, vegetables are low in calories and fats, rich in vitamins, dietary fiber, minerals and antioxidants which serve an array of important functions in the body(American Public Health Association, 2014). Table 1.1 shows some nutritional facts about vegetables that were reviewed by Dr. Kathleen Romito from Healthwise (2013), WHO (2003a) and MOH (2010).

Table 1.1: Nutritional facts of vegetables

Nutrient	Function	Sources
Vitamin B2	Energy metabolism; important for normal vision and skin health	Leafy green vegetables
Vitamin B3	Energy metabolism; important for nervous system, digestive system and skin health.	Leafy green vegetables, mushrooms and asparagus
Vitamin B6	Protein metabolism; helps make red blood cells	All types of vegetables
Folic acid	Needed for making DNA and new cells, especially red blood cells	Leafy green vegetables
Vitamin C	Antioxidant; protein metabolism; important for immune system health; aids in iron absorption	Cabbage family, peppers, tomatoes, potatoes, lettuce
Vitamin A	Needed for vision, healthy skin and mucous membranes, bone and tooth growth, immune system health	Leafy, dark green vegetables, carrots, winter squash, sweet potatoes, pumpkins
Vitamin E	Antioxidant; protects cell walls	Leady green vegetables
Vitamin K	Needed for proper blood clotting	Leafy green vegetables, especially vegetables in the cabbage family

(Source: FAO, 2003; WHO, 2003a; MOH, 2010; Healthwise, 2013)

Vegetable consumption has shown to be an important part of any diet leading towards good health (National Obesity Observatory, 2011). Up to 2.7 million lives could be saved annually with sufficient fruit and vegetable consumption (WHO, 2003a). Due to these nutritional facts about vegetables (Table 1.1), they are known as a preventer for some of the world's most widespread and debilitating nutritional disorders (FAO, 2003). Convincing scientific evidence has shown that high intake of vegetable has a protective effect against cardiovascular diseases (Lock *et al.*, 2005), stroke (He *et al.*, 2006), cancers (Lock *et al*, 2005; Gadini *et al.*, 2000; World Cancer Research Fund, 2007) and metabolic syndrome (Ford *et al.*, 2003). On the other hand, low vegetable intake is a major contributing factor to such micronutrient deficiencies. It is estimated that about 19% of gastrointestinal cancer, 31% of ischemic heart disease and 11% of stroke worldwide are caused from the low intake of vegetables and fruits (WHO, 2003a).

Nevertheless, of all dietary factors in diseases prevention, the most abundant evidence is related to the protective effect of fruit and vegetable consumption (WHO, 2003b). The International Agency for Research on Cancer (IARC) informative fruit and vegetable handbook which reviews all studies on fruit and vegetables and cancer, estimates that cancer incidence could decrease by 5 to 12 percent with increased fruit and vegetable consumption (IARC, 2003). The report specified that vegetables have: (1) a protective effect against the risk of cancers of the oesophagus, breast, lung, stomach, and colorectum and (2) no significant protective effect against the risk of cancers of the mouth and pharynx, larynx or bladder. Apart from that, FAO and WHO (2004) strongly suggested a potential reduction in the risk of type 2 diabetes mellitus through vegetable

consumption. They also reported that diets rich in vegetables significantly reduce risks of ischemic heart disease and stroke.

Vegetable is an important part of the daily diet due to the bountiful benefits of minerals and vitamins that can be found in it (Better Health Channel, 2011). About 67 percent of people are now aware of the importance of eating at least 5 portions of fruits and vegetables per day (Food Standard Agency, 2006). It was also reported that the number of consumers who claim to be eating more vegetables and salads have increased. With this kind of demand, it is essential to ensure the stability of vegetable supply (FAO, 2007b).Global trends in the production and supply of vegetables indicate that the current production and consumption vary widely among regions, as presented in Figure 1.1. In 2007, the global annual average per capita vegetable supply was 119.53 kg, with the highest level in Asia with 143.68 kg, and the lowest levels in Africa with 57.49 kg (FAOSTAT, 2011).

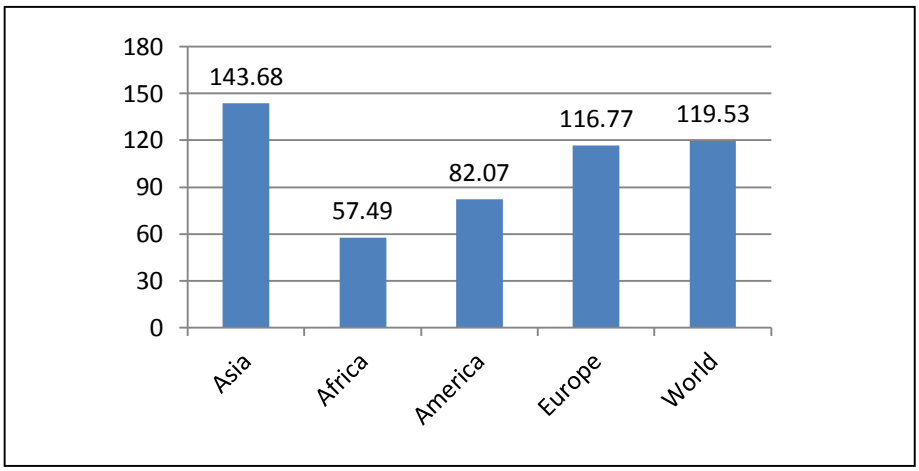


Figure 1.1: Status of Vegetable Supply in the World (kg/ capita/ year)
(Source: FAOSTAT, 2011)

The Food and Agriculture Organization of the United Nations (FAO) stated that the increase in vegetable consumption has become a global priority (FAO, 2003). Emerging developments in China's vegetable trade indicates how foreign producers could see increased competition from world's largest producer. Despite that, China has also been ranked as one of the top five countries consuming the most vegetables worldwide. Table 1.2 shows the per capita average consumption of vegetables for the year 2008. According to Table 1.2, the world's largest vegetable consumption is Greece with 257.0 kg per capita per year in 2008; followed by South Korea (249.8 kg per capita per year); Turkey (237.9 kg per capita per year); Jordan (215.5 kg per capita per year) and China (212.5 kg per capita per year).

Table 1.2: Top five countries that consume the most vegetables, 2008

	Country	Vegetable Consumption (per capita)
1	Greece	257.0 kg
2	South Korea	249.8 kg
3	Turkey	237.9 kg
4	Jordan	215.5 kg
5	China	212.5 kg

(Source: Euro Monitor International, 2013)

Increasing consumption and demand have resulted in higher demand for import in several countries. Referring to Table 1.3, the country with the largest import of vegetable is Germany with 3.8 million US dollar. According to FAO (2013), Germany is a country with the longest tradition in organic farming and marketing of healthy products. Being one of the largest importers, Germany is also one of the biggest importers of safe and quality food products (i.e. organic vegetables) and the most popular vegetable in Germany are potatoes (61 kg per capita) in 2012 (PMA, 2014). The second largest importer of vegetables is France (2.3 million US dollar), followed by Japan (1.7 million US dollar); Canada (1.6 million US dollar) and Italy (1.2 million US dollar). In the United States, fresh vegetables importation has increased from 8 percent in the 1980 to 25 percent in 2010 (Southeast Farm Press, 2015).

Table 1.3: Top five countries that import the most vegetables, 2005

	Country	Imported Vegetables (USD '000)
1	Germany	3,838,560
2	France	2,277,942
3	Japan	1,731,342
4	Canada	1,556,223
5	Italy	1,173,240

(Source: Index Mundi, 2015)

High-income countries like the United States, Europe Union, Japan and Canada, are known as a vast majority in the vegetable trade, as well as for its growth. The Europe Union and United States, in particular, are the largest traders in the global market of fruits and vegetables (USDA, 2004).

1.2 An Overview of Malaysian Vegetable Sector

Vegetable farming is an important industry in the Malaysian food production sector. Department of Agriculture (2014) reported a total of 46,040 vegetable farmers in Malaysia and about 59 percent of them were from Peninsular Malaysia. Sarawak seems to have the most populated vegetable farmers with 11,920 farmers and Kelantan has the most populated vegetable farmers around Peninsular Malaysia (11,300 farmers). The second most populated vegetable farmers in Peninsular Malaysia is Johor with 4,920

farmers, followed by Pahang (2,350); Terengganu (1,890 farmers); Kedah (1,820 farmers); Perak (1,150 farmers); Selangor (1,030 farmers) and Negeri Sembilan with 820 farmers (Table 1.4). Economic Transformation Programme (ETA) targets increasing the productivity in temperate vegetables farming by more than 40 percent, through better infrastructure, management techniques and technology. This will enable the participated farmers to double their monthly income(MOA, 2010).

Table 1.4: Numbers of Vegetable Farmers, Malaysia, 2014

State	Vegetable Farmers
Johor	4,920
Kedah	1,820
Kelantan	11,300
Melaka	620
Negeri Sembilan	820
Pahang	2,350
Perak	1,150
Perlis	140
Pulau Pinang	960
Selangor	1,030
Terengganu	1,890
Peninsular Malaysia	27,000
Sabah	7,080
Sarawak	11,920
Wilayah Persekutuan Labuan	40
Malaysia	46,040

(Source: DOA, 2013)

The DOS (2013b) also reported that about 41,078 hectares of vegetable was grown with a total production of 540,746 metric tons in 2009 which has increase to about 23,589 hectares with total production of 796,016 metric tons of vegetables in 2013 (Table 1.5). Peninsular Malaysia itself has covered 84 percent to 86 percent of the total Malaysian vegetable plantation areas and contributed around 87 percent to 91 percent of the total vegetable production. Value of vegetables production in Malaysia increase by about 54.60 percent from 2009 to 2013 (DOS, 2013b).

Table 1.5: Vegetable Planted Area and Production, Malaysia, 2009-2013

	Item	2009	2010	2011	2012	2013
1	**Plantation Area (Ha)**					
	Peninsular Malaysia	34,489	45,378	43,654	45,833	46,062
	Malaysia	41,078	52,793	51,777	53,322	53,589
2	**Production (metric tonnes)**					
	Peninsular Malaysia	540,746	784,194	833,432	798,056	796,016
	Malaysia	623,457	871,630	928,183	878,975	883,370
3	**Production Value (RM '000)**	1,594,792	2,139,347	2,581,546	2,444,684	2,456,908

(Source:Department of Statistic (2013b)

Table 1.6 shows the planting areas and production of vegetables by states in Peninsular Malaysia from 2011 to 2013. Pahang has the largest planted area of vegetables in Malaysia with a total of 15,884 hectare in 2013 and gross production of 423,114 metric tonnes (Table 1.6). Its covers around 30 percent of the national hectares and about 51 percent of the total vegetable production in Malaysia. The second largest planted area of vegetables is Johor with 10,344 hectare and a gross production of 137,661 metric tonnes in the same year.

Table 1.6: Vegetables Planted Area and Production based on states, 2011-2013

State	2011		2012		2013	
	Plantation Area (Ha)	**Production (mt)**	**Plantation Area (Ha)**	**Production (mt)**	**Plantation Area (Ha)**	**Production (mt)**
Johor	10,114	132,804	10,292	136,976	10,344	137,661
Kedah	827	9,548	1,001	12,191,	1,006	12,252
Kelantan	3,123	64,029	2,826	54,191	2,847	54,462
Melaka	1,288	27,834	1,346	28,309	1,358	28,450
Negeri Sembilan	2,322	27,438	2,394	21,473	2,406	21,580
Pahang	16,582	455,740	15,805	421,009	15,884	423,114
Perak	3,169	30,972	4,567	31,170	4,590	31,326
Perlis	237	2,847	289	2,605	291	2,618
Pulau Pinang	909	16,930	1,539	26,615	1,547	26,748
Selangor	4,085	55,582	4,725	47,585	4,748	47,823
Terengganu	999	9,708	1,048	9,932	1,053	9,981
Peninsular Malaysia	43,654	833,432	45,833	792,056	46,062	796,016
Malaysia	51,777	928,183	53,322	878,975	53,589	833,370

(Source: DOS, 2013b)

Out the 55 types of vegetable grown in Malaysia, Brassica (*Sawi*) was the largest leafy vegetable grown with a total of 10,495 hectares and total production of about 169,326 metric tonnes in 2012 (DOA, 2012a). The second largest was Cucumber (4,606.7 hectare, 93,114 metric tonnes), followed by Spinach (4,023 hectare, 53,037 metric tonnes); Water Spinach (3,832 hectare, 48.096 metric tonnes); Long Beans (3,629 hectare, 45,010 metric tonnes); and Cabbage (3,528 hectare, 94,885 metric tonnes). Other vegetables grown in more than 1,000 hectare annually were Tapioca, Sweet Potato, Chilli, Lady's Finger,

Lettuce, Tomato, Brinjal, Pumpkin, Angled Loofah and Bitter Groud. All vegetable growers' activities were monitored by the Department of Agriculture (DOA) and NGO (Vegetable Association Growers of Malaysia) and FAMA (For tagging program). DOA imposes Pesticide Extension Program to advise vegetable growers not to use excessive chemical for the market (Anem, 2010).

From 2008 to 2011, Malaysia imports more vegetables than it exports (DOS, 2013a). Based on Table 1.7, Malaysia experiences a deficit in the balance of trade for vegetables. The deficit in 2008 was RM 1.124 billion and increased up to RM 2.095 billion in 2010. However, in 2011, the deficit trend was slightly reduced with RM 1.983 billion (DOS, 2013).

Table 1.7: Vegetable Trading, Malaysia, 2008-2011

Malaysian Vegetable Trading, 2008 -2011			
Year	**Export (RM '000)**	**Import (RM '000)**	**Balance of Trade (RM '000)**
2008	665,499	1,790,116	-1,124,617
2009	632,194	2,266,601	-1,634,407
2010	682,222	2,777,794	-2,095,572
2011	750,788	2,734,600	-1,983,812

(Source: DOS, 2013b)

Also, vegetable consumption among Malaysians has also increased from 54.4 kg per capita in 2009 up to 57.3 per capita in 2013 (Figure 1.2). The rising vegetable consumption signals an increase in the demand for vegetable in this country (DOA, 2013).

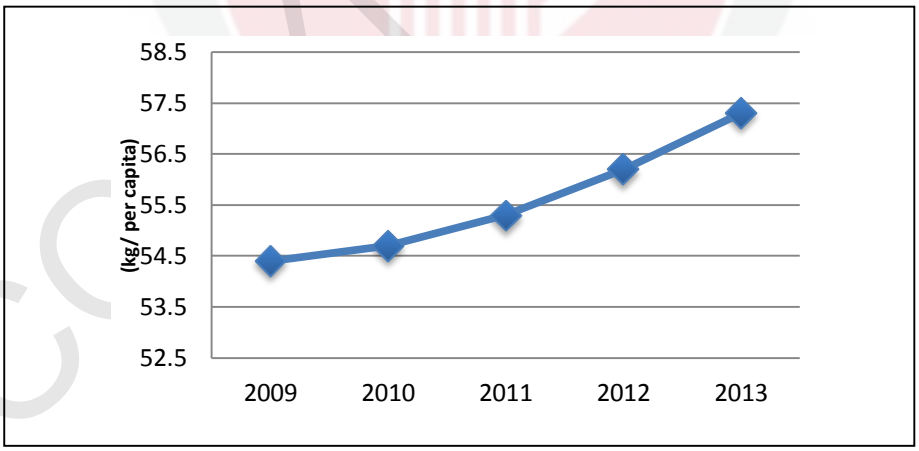


Figure 1.2: Vegetable consumption (kg per capita per year), Malaysia, 2009-2013
(Source: Department of Agriculture, 2013)

The government (Ministry of Health Malaysia) included the country health plan in the Tenth Malaysian Plan (2011-2015) to encourage citizens to attain optimal health that leads to a better quality of life (MOH, 2010). In this plan, the government also

recommended that Malaysians should take at least three servings of vegetables, which is approximately 240 grams of vegetables per day.

1.3 Usage of Fertilizers and Pesticides in Malaysian Vegetable Farming Systems

The use of pesticides, fertilizers and other agrochemical has increased substantially since 1950s (WWF, 2015). Especially pesticides, the amount sprayed on field has increased 26-fold over the past 50 years. These chemicals do not just stay on the fields they were applied to but also lead to pollution of adjacent land, rivers or wetlands. Fertilizers and pesticides also commonly run-off from fields to adjacent rivers and lakes and contaminate groundwater source due to inappropriate usage (FAO, 1996). Basically, it can upset the balance, pollute ecosystems and can be harmful to flora and fauna.

According to FAO (2004b), there are two types of fertilizers that are commonly used in Malaysia which are mineral fertilizers and organic fertilizers. Mineral fertilizers account for more than 90 percent of fertilizers used by all types of farming systems in Malaysia (FAO, 2004b). The major fertilizers used in this country are urea, ammonium sulphate, ammonium phosphate, calcium ammonium nitrate, super phosphate, phosphate rock, potassium sulphate and complex mineral NPK, NP and PK compound fertilizers. Also, due to rapid expansion in crop production, a corresponding increase in fertilizer used has been shown and potassium fertilizers have revealed the largest increase. Apart from that, the government is promoting the use of organic fertilizers in Malaysia as it was claimed that organic agriculture is essential for the sustainable use and management of natural resources and identified it as a niche market opportunity for fruits and vegetables (DOA, 2007).

According to the World Bank (2015), the amount of fertilizer consumption (kilograms per hectare of arable land) decreased by about 12.44 percent from 2011 to 2012 and increased by about 5.45 percent in 2013 (Figure 1.3). Traditional nutrients such as animal and plant manures are not included in this measurement. Fertilizer consumption measures the quantity of plant nutrients used per unit of arable land and the fertilizer products cover nitrogenous, potash, and phosphate fertilizers (including ground rock phosphate). Thus, it can be concluded that fertilizer consumption in Malaysia is high and continues to increase (The World Bank, 2015). However, their excessive presence in freshwater and marine area alters the nutrient system and in consequence the species composition of specific ecosystems. This effect is eutrophication and "dead zones" due to nutrient run-off from fertilizers from farms that affect rivers, lakes and oceans. Reduction in water quality gives a severe impact on agricultural production, drinking water supplies and fishery production. This is a direct pollution that a farm can negatively contribute to the environment.

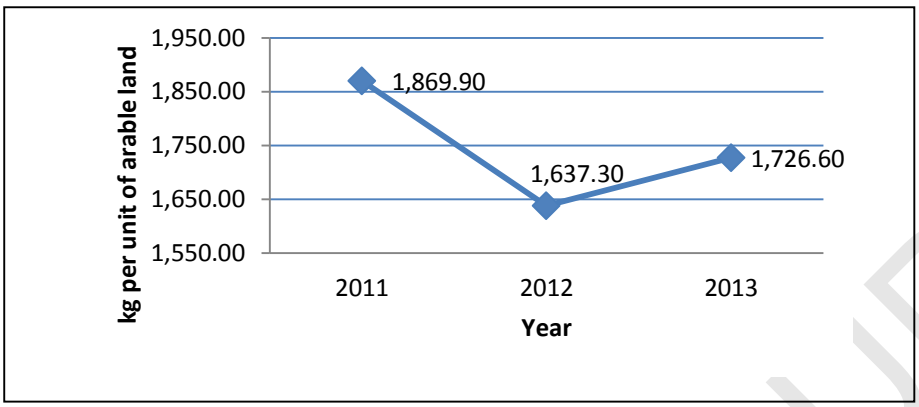


Figure 1.3: Fertilizer consumption (kilograms per hectare of arable land), Malaysia, 2011-2013
Source: The World Bank (2015)

Pesticides, on the other hand, are inherently toxic materials -- they are developed and used to destroy or prevent growth or infestations of unwanted insects, plants, and other pests in agricultural, commercial, industrial, and household settings. Malaysian agriculture depends heavily on pesticides to maintain high productivity. Under tropical conditions, crop losses from weeds, pests and diseases are high. The use of agrochemicals including pesticides have been found to be the immediate and cheaper way to produce unblemished vegetables and increased farm productivity (ATSE, 2002). The pesticides that are used are herbicides, insecticides and fungicides. Herbicides constitute about 80% of the pesticides consumed in Malaysia (FAOSTAT, 2014). The heavy dependence on herbicides, especially in the plantation sector, is due to labor shortage. The use of insecticide ranks second to herbicides and is mainly used in vegetables, rice and tobacco. The use of fungicide is less important than herbicides and insecticides. It is mainly confined to vegetable, fruits and ornamental plant production. Only small quantities of fungicides are used in vegetables and tobacco.

However, this practice has unfortunately created numerous problems associated with pesticide abuse such as directly poisoning of freshwater species as well as people, upsetting natural environmental balance and releasing toxic residues that are hazardous to health in the environment. According to Siwar and Hossain (2001), it was found that pesticides from every chemical class have been detected in groundwater beneath agricultural areas and are widespread in Malaysia's surface waters.

In addition to polluting the environment, farmers and especially those who mix and apply pesticides will face greater risks of getting poisoned by pesticides because they work with pesticides at their greatest concentrations (Farmworker Justice, 2013). The exposure of pesticide causes farmers to suffer more chemical-related injuries and illness than any other workforce in the nation (Farmworker Justice, 2015). If farmers failed to use proper attire while exposing themselves to pesticides, their health might be effected which include rash, eye irritation, dizziness, nausea and vomiting. More serious acute effects are difficulty in breathing, seizures, loss of consciousness and even death, while

chronic effects can result in cancer, neurological disorders, reproductive health problem and even infertility. Even low levels of pesticide exposure over time can lead to these chronic health effects.

The U.S Environmental Protection Agency estimates that 10,000-20,000 farmers are poisoned on the job due to pesticide exposure (NIOSH, 2015). Among agricultural workers in the United States, it was found that an average of 57.6 out of every 100,000 agricultural workers experience acute pesticide poisoning, illness or injury each year.

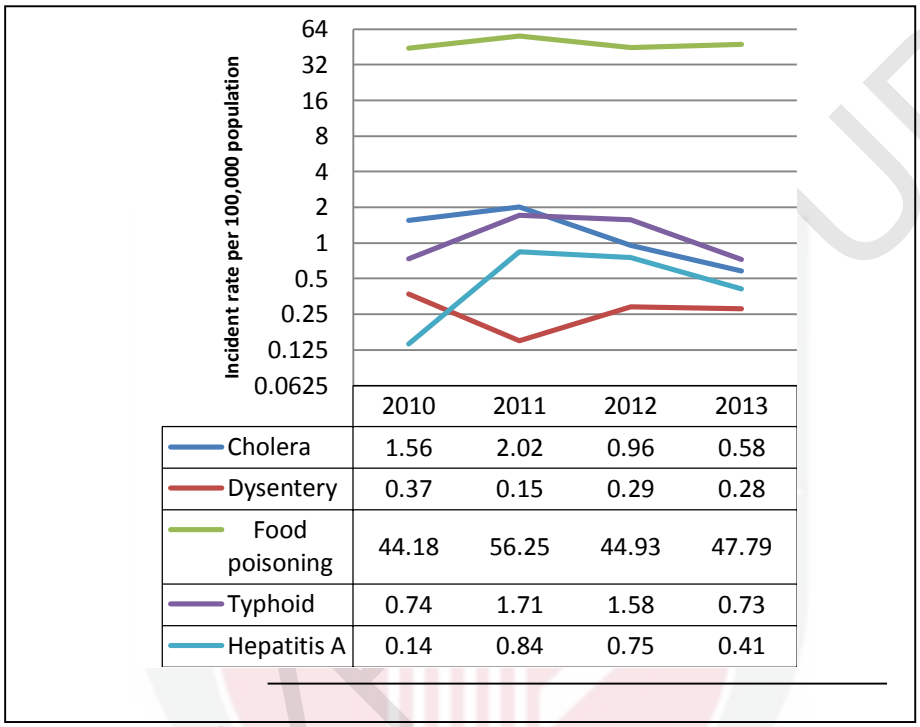
Malaysia vegetable farmers have also been reported for their excessive use of pesticide. In 1987, New Strait Times reported that Singapore Government banned all vegetable imports from the Cameron Highlands (New Strait Times, 1987). The threat by Singapore came about when some Highlands vegetables tested were found to contain alarming high levels of pesticide residues. Malaysian vegetables have encountered 40 percent rejection by Singapore as the contained pesticides level were up to 237 ppm which is over 100 times Singapore's permitted level of 2 ppm (parts per million as stipulated under the Singapore Food Act.

1.4 Demand of Safe and Quality Vegetable Produce

As indicated earlier, a diet rich in vegetables is important to maintaining good health. However, Rangarajan *et al*. (2000) reported that as fresh produce consumption increased, scientists at the Centers of Diseases Control and Prevention (CDC) noticed another important trend: a significant increase in the number of foodborne disease outbreaks associated with fresh produce. The outbreaks of human disease associated with the consumption of raw vegetables often occur in developing countries and have become more frequent in developed countries over the past decade. Vegetables that were eaten raw have long been known to serve as vehicles for transmission of infectious microorganisms in developing country (FAO and WHO, 2004).

Fresh produce, especially vegetables, can sometimes be the blame for foodborne illness (CNN Times, 2013; European Food Information Council, 2015). Food and waterborne illness is caused by consuming contaminated foods or beverages (MOH, 2013). FAO and WHO (2004) also noted that one of the factors thought to influence the occurrence and epidemiology of the transmission of infectious microorganisms in our body includes the contamination of vegetables with a range of microbial and toxic chemicals from a variety of sources, such as the excessive use of pesticides. Unwashed vegetables that contain high concentration of pesticides are one of the causes of this illness (National Institute of Diabetes and Digestive and Kidney Diseases, 2014). The largest culprit of this disease is caused by norovirus, which is spread through produce from water contaminated by fecal matter especially among the leafy greens vegetables such as spinach and cabbage. Researchers estimated that there are 17 different food category cases among 4,600 outbreaks of food illness globally and discovered that fresh produce accounted for 46% of the cases (CNN Times, 2013). Hence, there is no doubt that the amount of pesticides in vegetables has always been the one thing on a consumer's mind (Consumer Reports, 2015). In fact, a recent Consumer Reports survey of 1,050 people found that 85 percent of Americans are concerned about pesticides in vegetables (Consumer Reports, 2015).

In Malaysia, five common food and waterborne illness were recorded to occur namely, cholera, dysentery, food poisoning, typhoid and hepatitis A. Food poisoning occurs at a shocking rate of 56.25 per 100,000 people (Figure 1.4). There was a decrease in cases of cholera, typhoid and hepatitis A from 2011 to 2013, however dysentery presents an increment. Moreover, food poisoning cases shows a slight increase in 2013.



	2010	2011	2012	2013
Cholera	1.56	2.02	0.96	0.58
Dysentery	0.37	0.15	0.29	0.28
Food poisoning	44.18	56.25	44.93	47.79
Typhoid	0.74	1.71	1.58	0.73
Hepatitis A	0.14	0.84	0.75	0.41

Figure 1.4: Incidence rates of food and waterborne diseases, Malaysia, 2010-2013
(Source: MOH, 2014)

One of the reasons for this outbreak is the rapid growth in international trade of imported food (FAO and WHO, 2004). However according to the Nutrition Action Healthletter (2006), the farm is where the contamination starts and efforts of food safety have to be focused on the farm. By the same token, there won't be any foodborne pathogens on the leaves of vegetables or in the immediate area, if farmers and food handlers follow good agricultural and handling practices (Food Safety News, 2011).

1.5 Food Safety and Quality Assurance Concern

Almost one billion cases of diarrheal diseases are reported every year in developing countries (Rezai *et al.*, 2014). Every year, about 10 percent of the population in industrialized countries were diagnosed with foodborne diseases (O'Ryan *et al.*, 2005). Food poisoning outbreaks, food adulterations and many more incidents are causing consumers to give all their attention to consuming good quality food produce (Rezai *et*

al., 2014). That is, consumers are now concerned about the impact of food products on their health and safety to improve their lifestyle (Paul and Rana, 2012).

The cultivation of safe vegetables have gained attention and as the population's purchasing capacity grows, so does their demand for safe vegetables (The World Vegetable Center, 2005). In other words, consumers demand for safe and high quality products that are packaged and distributed to maintain freshness and nutrition with extended shelf-life, while ensuring good eating quality (Cantwell, 2014). At the same time, The Technomic's Healthy Eating Consumer Trend Report (2014) stated that approximately 64 percent of consumers today, which rise from 57 percent in 2010, agreed that it is important to eat healthy and pay attention to nutrition. The report also indicated that half of today's consumers (50 percent) eat healthy food to have a nutritious and balanced diet and more consumers today than polled in 2010 reported to consume local, organic, natural, safe, clean and sustainable food at least once a week.

However, there are considerable percentages of consumers which are less than convinced that the food health information they received is accurate (Watson, 2015). In other words, they want food health labeling to be clearer. A report claimed by Horovitz (2015) who surveyed more than 30,000 consumers in more than 60 nations revealed that more than 63 percent of consumers worldwide were concern on the health information that they received. Meanwhile, the Food and Standard Agency (2006) also reported that more people today are checking the nutritional information on food labels. While the facts remains that global concerns about the quality of healthy food is real, Americans and Europeans tend to readily believe the information presented to them. However, this is in contrast with the other regions as the study further indicated that:

i. 68 percent of Asian Pacific consumers were unsure of the health information they received
ii. 70 percent of African consumers questioned the validity of the health information
iii. 73 percent of Latin Americans were unconvinced of such health claims

Quality labels make it convincing and easier for consumers to identify the quality of a product that they wish to purchase (Rezai e*t al.*, 2014). Quality labels are found on product packaging that indicates the product compliance with the current standards, safety and quality characteristics specified in a certification system (SIRIM QAS International, 2012). In Malaysia, the quality assurance programs that are practiced include Good Agricultural Practices (GAP), Good Manufacturing Practices (GMP), Hazard Analysis Critical Control Point (HACCP) and Malaysian Organic Scheme (SOM). Generally, efforts of food safety begin on the farm. One key to reduce risk of foodborne illness and at the same time give farmers the opportunity to be transparent is by practicing GAP. Therefore, farmers were encouraged by a lot of parties to adopt GAP in order to produce a safe and quality produce, which are both economically and environmentally sustainable (Rangarajan *et al.*, 2000; FAO, 2003; Defra, 2009; Schneider *et al.*, 2011).

1.6 Good Agricultural Practices (GAP) in Malaysia – Crop Sector

DOA (2005) defines GAP "an integrated system to manage the hazards associated with the elements of land, input, processes and output of agricultural production, within an agricultural spatial entity, in a good way to achieve productivity, sustainability, quality and safe produce in a socially acceptable, worker friendly and environmentally safe way. Generally, GAP is a standard for good agricultural practices in achieving sustainable agriculture. GAP codes, standards and regulations are guidelines which have been developed by food industry, producers' organizations, governments and NGOs, aiming to codify agricultural practices at farm level for range of commodities (FAO, 2007a).

As a result of the issues regarding food safety and the consumer demand for food safety, especially in terms of pesticide residues, GAP schemes are required due to the challenges faced by the country when the World Organization (WTO) started to implement the concept of free trade worldwide. The requirements of sanitary and phytosanitary standards (SPS) by many countries drive Malaysia to produce agricultural products that comply with these standards.

In 2002, Malaysia Agriculture Research and Development Institute (MARDI) implemented a National GAP program to improve the farm sector under the new farming system (PEMANDU, 2013). The agencies that are involved in this program are Department of Agriculture (DOA), Department of Veterinary Services (DVS), Department of Fisheries (DOF), Department of Environment (DOE) and Federal Agricultural and Marketing Authority (FAMA) and they are all responsible for the National Food Safety Plan to develop food safety systems to meet the world market requirements and to be competitive in Malaysia and the world market.

One efficient way to assure safe, quality and environmental friendly food products is for farmers to comply with GAP. GAP is an agricultural practice which emphasizes on environment, economy and social aspects to ensure the produce is safe and of good quality. It is an integrated system to manage hazards associated with the elements of land, input, process and output of agricultural production, in a good way to achieve productivity, to be sustainable, to attain quality and safe produce in a socially acceptable, worker friendly and environmentally safe way.

Malaysia has developed a number of quality assurance programs for primary producers with a number of voluntary farm certification schemes including the fresh fruit and vegetable sector certification, *Skim Akreditasi Ladang Malaysia* (SALM); livestock certification, *Skim Akreditasi Ladang Ternakan* (SALT); fisheries and aquaculture certification, *Skim Pensijilan Ladang Akuakultur Malaysia* (SPLAM) and organic sector certification, *Skim Organik Malaysia* (SOM). These implementations of GAP standards in Malaysia started with the introduction of the Malaysian Good Agricultural Practices Scheme (SALM) in 2002 by DOA for the crop sector. The table below (Table 1.9) shows the farm certification schemes for Malaysian farm:

Table 1.8: Logo of Malaysian farm certification schemes

No.	Sector	Farm Certification Scheme	Logo
1.	Fresh fruit and vegetable	*Skim Akreditasi Ladang Malaysia*	
2.	Livestock	*Skim Akreditasi Ladang Ternakan*	
3.	Fisheries and aquaculture	*Skim Pensijilan Ladang Akuakultur Malaysia*	
4.	Organic Certification Scheme	*Skim Organik Malaysia*	

(Source: DOF, 2015; DOA, 2015; MOA, 2015)

SALM was designated in order to recognize fruit and vegetable farms with GAP certification. SALM is a certification scheme that is based on the environmental friendly, workers welfare and safety concern which are safe and suitable for consumption (MOA, 2002). The scheme was developed based on Malaysian Standard MS 1784:2005 Crop Commodities – Good Agriculture Practices (GAP).

The Ministry of Agriculture has outlined the SALM certification elements into:

1. Traceability
2. Record Keeping and Internal Audit
3. Plant Material
4. History and Site Management
5. Land and Media Management
6. Fertilizer Management
7. Irrigation and fertigation
8. Crop protection
9. Harvesting
10. Post-harvest treatment
11. Revenue Analysis
12. Farm Waste Management
13. Safety and Health of Workers
14. Environmental Management
15. Complaint Record
16. Legal

The main opportunities for farms that registered SALM are that they get prioritized in the local market because they are qualified as preferred suppliers and offer a degree of differentiation. SALM-registered farms are also eligible to qualify for the "Malaysia Best" logo, a branding exercise administered by FAMA (FAMA, 2015). The term "Malaysia Best" indicates the guarantee of high quality agriculture produce produced by Malaysia.

1.7 Malaysian GAP (MyGAP) in GLOBALG.A.P and ASEAN GAP

There are two types of regional GAP which are GLOBALG.A.P and ASEAN GAP. The first GAP was created in the late 1990s by several British supermarket chains and their major suppliers; it was called EurepGAP (FAO, 2007b).As a private standard, EurepGAP aims to bring conformity to various retailers' supplier standards, which had been creating problems for farmers. Most European customers for agricultural products now demand verification of EurepGAP certification as a prerequisite for doing business. The standards helped producers comply with Europe-wide accepted criteria for food safety, sustainable production methods, worker and animal welfare and responsible use of water, compound feed and plant propagation materials (GLOBALG.A.P, 2015). Over the next ten years, a growing number of producers and retailers around the world joined in, gaining the European organization global significance. Since its GAP standards is well-known in the world for pursuing high quality food safety for the agricultural food producer countries (Amekawa, 2010), on September 7th, 2007, EurepGAP changed its name to GLOBALG.A.P to reflect its increasingly global scope (GLOBALG.A.P, 2015).Today, it is known as the world's leading farm assurance program, translating consumer requirements into GAP in a constantly increasing list of more than 100 countries.

Malaysian GAP or SALM has been certified as GLOBALG.A.P since 2012 with only 9 aquaculture farms (GLOBALG.A.P, 2015). Compare to other countries, the number of farms that are certified as GLOBALG.A.P in Malaysia is rather low (Table 1.9). In 2011, there were only 7 farms in Malaysia certified and these farms were aquacultures. However, since 2012, there were no Malaysian farms reported to be certified under the GLOBALG.A.P (GLOBALG.A.P, 2011).

Table 1.9: GLOBALG.A.P certified farms in selected countries, 2009-2012

Country	2009	2010	2011	2012
China	272	254	280	292
Thailand	923	595	263	277
Japan	66	88	20	122
Taiwan	54	65	3	0
Malaysia	18	21	7	9
Indonesia	3	6	4	3
Philippines	1	5	5	5

(Source: GLOBALG.A.P, 2011)

The second regional GAP is ASEANGAP. Launched in 2006, ASEANGAP developed by the ASEAN Secretariat is a standard for GAP during production, harvesting and post-harvesting handling of fresh fruits and vegetables in the ASEAN region (ASEAN Secretariat, 2006). The development of this standard was based mainly on the criteria and experiences of national GAP implementation in Malaysia, Philippines, Singapore and Thailand (ASEAN Secretariat, 2006). ASEAN GAP guideline was only published in 2008 which covered only fruits and vegetables.

The purpose of ASEANGAP is:

- To enhance the harmonization of national GAP programmes within the ASEAN region;
- To improve fruit and vegetable safety for consumers
- To sustain natural resources
- To facilitate the trade of fruit and vegetable regionally and internationally

Malaysia is one of the nine ASEAN countries that have implemented good agricultural practices. Other countries that have implemented GAP among ASEAN are Brunei (BruneiGAP), Indonesia (IndoGAP), Philippines (PhilGAP), Singapore (GAP-VF), Thailand (QGAP and ThaiGAP), Vietnam (VietGAP), Cambodia (Cam-GAP) and Laos (LAO GAP) (Nabeshima *et al.*, 2015). The current alignment of national GAP programs with ASEAN GAP is listed below (Table 1.10):

Table 1.10: Current alignment of national GAP Programs with ASEAN GAP

Country	Food safety	Environmental Management	Worker's Health and safety	Quality produce
Thailand	Close alignment	Partial alignment	Partial alignment	Close alignment
Malaysia	Close alignment	Partial alignment	Partial alignment	Covered by another national standard
Indonesia	Close alignment	Close alignment	Partial alignment	Partial alignment
Singapore	Close alignment	No alignment	No alignment	Covered by another national standard
Philippines	Close alignment	No alignment	Partial alignment	Covered by another national standard
Brunei Darussalam	Close alignment	No alignment	No alignment	No alignment

(Source: Layese, 2011)

In Malaysia, only food safety is in close alignment with ASEAN GAP and both environmental management and worker's welfare are partially aligned. Besides that, Malaysian fruit and vegetable produce is covered by another national standard such as GMP and HACCP.

1.8 Malaysian Certification Scheme for Good Agricultural Practices (MyGAP)

On August 28th, 2013, SALM was rebranded to Malaysian Certification Scheme for Good Agricultural Practices (MyGAP) by the Minister of Agriculture and Agro-based Industry. This is because GAP is recognized worldwide. Unlike SALM, SALT and SPLAM, GAP is more commercialized and will not confused the consumers and entrepreneurs. MyGAP is a comprehensive certification scheme that combined agriculture sector, aquaculture sector and livestock sector. Specifically, MyGAP is the rebranding exercise of SALM, SALT and SPLAM. It is also part of the Economic

Transformation Programme (ETP) initiative under the National Key Economic Area of Agriculture (NKEA-Agriculture).

Therefore, there are four directions of MyGAP emphasized by DOA and the aim is to:

i. Increase the number of farms with MyGAP to encourage quality and safe to eat produce for domestic and export market;
ii. Increase consumers' awareness and demand for quality and safe to eat produce with MyGAP logo on it;
iii. Increase the Malaysian agricultural produce competitiveness at international level;
iv. Benchmarked with international GAP certification scheme such as ASEAN GAP and Global GAP.

Hence, MyGAP is the core of the Techno Agricultural Extension System (SPTP) of the Department of Agriculture Malaysia and aimed to be practiced by farms operators in carrying out activities in the field in order to produce fresh and quality produces which are safe to eat (MOA, 2013).

Apart from playing an essential role in a sustainable agriculture, DOA (2015) has particularly listed few advantages of this certification in terms of environmental, ecological and economic benefits. MyGAP is said to result in quality agricultural produce which are safe for consumption since the content of pesticides residues in the farm produce are at permissible levels. Other than that, MyGAP also ensures the preservation of the environment by reducing environmental pollution. Agriculture contributes significantly to emissions of the greenhouse gases and other pollutants (United States Environmental Protection Agency, 2014). It is also one of the sectors which any potential climate change will affect the most. However, farmers and grower that practice GAP can protect the water, soil and air which can help to reduce pollution (Defra, 2009). Similarly, MyGAP also gives priority to the Intergraded Pest Control approach. The mainstreamed Integrated Pest Control methods for crop production in several countries were aimed to maximize yield and reduces losses and not to seek product differentiation (FAO, 2004a). MyGAP also reduces the use of pesticides and produces better quality harvest. The certification also assures the safety and welfare of the farm workers and employees. The rights of farm hands, normally foreign workers from Bangladesh, Indonesia, Vietnam and Myanmar, are being taken care of (Salleh, 2007). They are required to use safety attire and proper knapsack while spraying pesticide on field. Furthermore, MyGAP also can contribute to an agricultural produce that is easily recognizable and can compete in the domestic and the international market. The certification also helps in supporting the development of a national agricultural industry which is sustainable and environmental-friendly. In terms of MyGAP product, the logo on the product label assures consumers of product safety (Figure 1.5).

Figure 1.5: Malaysian Certification Scheme for Good Agricultural Practices Logo
(Source: DOA, 2015)

1.9 MyGAP Application Processes

Based on the MyGAP Malaysia Guidelines (MOA, 2014b), participation in this scheme is voluntary and services provided for certification are free to the applicants. Farmers who are interested in obtaining MyGAP accreditation can apply using Application Form MyGAP 1 that is available at (1) Crop Quality Control Division, Department of Agriculture Malaysia, Putrajaya; (2) State Department of Agriculture; (3) District Agricultural Offices; and (3) DOA webpage at *http://www.doa.gov.my*.

Basically, the applicants must pass all the three requirements or evaluation criteria below in order to be accredited with MyGAP:

i. Site inspection
ii. Water and Harvest Sample for pesticide residue, heavy metal and bacterial analysis
iii. Farm verification / practices

First of all, the applicant categories for MyGAP can be individual; private company; project participants of Permanent Food Production Parks (TKPM); Agencies/statutory bodies; Contract farming participants; Agricultural centers under the supervision of the Department of Agriculture and participants of Modern Agricultural Project. The applicants also have to ensure that they are operating on legally valid land or cultivated land that is legitimate under the local Land Law. The farmer must be able to provide proof, such as land title or contracted lease, stating that the farming operation is legal. The farm also must be planted and is producing yield. Moreover, the farm produce has to be commercially produced that is suitable for the domestic or export market (MOA, 2014b).

If the farmer meets all criteria mentioned, the completed MyGAP application forms will then be sent to the assistant in the District Agricultural Offices to endorse the farm to the next step which is the site inspection.

The site inspection of MyGAP is the verification of farm practice which is the main component of MyGAP certification. There are two levels of auditory that are carried out throughout the site inspection process which are pre-audit and follow-up audit. Applicant will only undergo follow-up audit if only they pass the pre-audit. Pre-audit (or

internal audit) are undertaken by officers from the DOA at the district level to make sure that the operator of the farm is practicing GAP while waiting for MyGAP to be accredited. Harvest samples are also collected for the purpose of pesticides residue and heavy metal analysis. In farm verification, recordkeeping is very important. Every farm activity should be recorded for the sake of traceability (Salleh *et al.*, 2007). On the other hand, follow-up audit (or external audit) is conducted by competent officers or technical officers from DOA to ensure that the farm operator is practicing and complies with GAP based on the specified standards and if so, they can then be recommended for certificate.

Again, the results of the site inspection of farm practices will be recommended to the MyGAP certification committee for endorsement to go through the last step which is the award of MyGAP certification. Figure 1.6 presents the MyGAP certification process.

MyGAP certification is valid for two years. The restricted monitoring will be carried out at least once a year by the Department of Agriculture. For the purpose of renewal, applicant is required to completely fill and submit MyGAP application form again as mentioned above. The certification renewal, on the other hand, should be made every two years and the application should be sent six months before the expiry date. However, certificate renewal will only be issued if the farm is still in compliance with the specified conditions. If the farmer fail to renew the certificate after the expiry date; and/or the farm is found to be in non-compliance with the specified conditions while still in the validity period; and/or the misuse of the MyGAP and logo in anyway, MyGAP certification may be withdrawn.

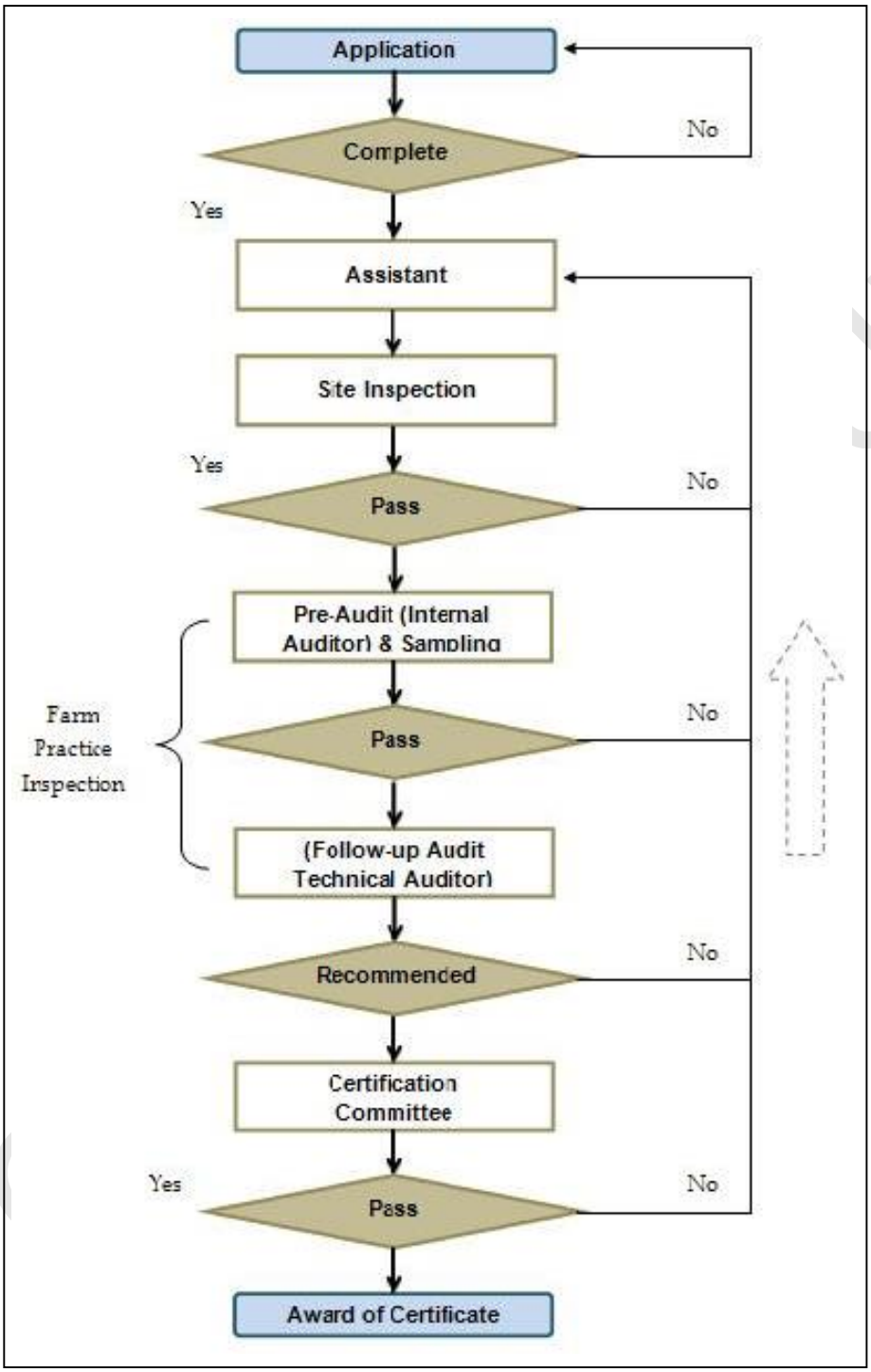


Figure 1.6: MyGAP Application Procedure
(Source: MOA, 2014b)

1.10 Farmers and MyGAP

MyGAP is a voluntary scheme thus it is not mandatory for the farmers to accredit their farm with MyGAP. That is, the service charge in order to process the certification of MyGAP is free as it is subsidized by the government. Malaysian farmers are lucky unlike GAP standards in other country such as Singapore GAP (GAP-VF) and GLOBALG.A.P, farmers who want to get certified have to take certain costs into account. Basically, they have to pay for registration, inspection and certification. In Singapore, S$ 500 will be charged for new GAP-VF application (non-refundable); S$ 250 for renewal of certification (non-refundable); and S$ 101 per hour will be charged for re-auditing based on duration of farm visit (Agri-Food and Veterinary Authority of Singapore, 2015).

Another advantage for Malaysian farmers is that they will be given free training such as on the use of pesticides prudently by professional officers of DOA (DOA, 2014). In some cases, DOA officers even visit the farmers' farm to guide them effectively. In the meantime, MyGAP will also benefit the farmers in receiving information, guidelines and exercises on a regular farm basis as well as continuous association with the safety of all labors, visitors, contractors and individuals that are involved directly or indirectly with the activities on the farm (DOA, 2014).In other words, officers of DOA will guide the farmers in practicing GAP in their farm, for instance, by educating the farmers regarding the ideal amount of pesticides that should be used in their farms to ensure maximum productivity.

According to the Senate Thirteenth Parliament (2013), MARDI has given incentives to the farmers who practiced GAP in order to increase the agriculture produce in the country. Some of the state Department of Agriculture, especially Department of Agriculture Sarawak, is prepared to provide guidance and some form of incentive to the participants since they are aware of the terms and strict procedures in the application of MyGAP (Borneo Post Online, 2012). Such incentives are: agricultural inputs, agricultural equipment and anti-insect nets.

Also, DOA has also been providing free courses and training for farmers who are interested in participating in MyGAP certification (DOA Kedah, 2015). Participants in this course will be determined by the Secretariat in collaboration with the MyGAP certification State Agricultural Department. They will be exposed to the aspects of good agricultural practices and will be trained to meet the criteria in order to be certified with MyGAP.

In order to promote and attract the farmers as well as consumers regarding MyGAP, officers of DOA hit the social media network by creating a *Facebook* Page on MyGAP (Figure 1.7). At the same time, this page aimed to connect farmers and updating the farmers regarding the certification scheme.

Figure 1.7: MyGAP's Facebook Page
(Source: https://www.facebook.com/MYGAP-Malaysia-565546160198205/)

Moreover, promotions and exhibitions have been conducted in supermarkets and hypermarkets such as TESCO. In May 20th, 2014, MyGAP launched its tagline, "Producing More, Improving Lives" with a seminar on awareness between co-operators and suppliers of MyGAP. The launching of MyGAP tagline with TESCO Malaysia was also conducted at the Ministry of Agriculture and Ago-based Industry (Utusan Online, 2014; Bernama, 2014a; MOA, 2014a).

Apart from TESCO, Malaysian farmers are also provided with the opportunity of selling their MyGAP products at Giant, Carrefour, Mydin, JUSCO and Pick 'n Pay (DOA, 2012b). Malaysian JUSCO in particular, implements "Farm to Floor" process and supports MyGAP to ensure safe and freshness of vegetables on a daily basis. They get vegetables from farms that use pesticides based on MyGAP guidelines and at the same time they are also in the midst of applying for GLOBALG.A.P. (The Star Online, 2015). Also, farmers also realize additional profits in selling their MyGAP products in these supermarkets as they are selling at a higher price. For example, normal French beans taken in Giant Hypermarket Kajang are selling at RM2.55 for 336 grams while French beans with MyGAP logo is RM5.29 for only 300 grams (Figure 1.8).

Figure 1.8: Differences in price between normal vegetable and MyGAP vegetable
(Source: Gom, 2015)

Along with that, the government also targets the adoption of internationally recognized standard by MyGAP which will help in bringing agriculture produce into more lucrative markets and thus, help to increase the income of the rural population (Jala, 2013). That is, good agriculture does not only provide food security, it also helps to increase rural incomes through agricultural entrepreneurship and thereby closing the income gaps within the country.

Furthermore, MyGAP has been included in the Eleventh Malaysia Plan (2016-2020) as a concern in improving productivity and income of farmers. One of the government strategies is to increase farm compliance to MyGAP. According to the Eleventh Malaysia Plan (Economic Planning Unit, 2015), farms will be incentivized to increase compliance to MyGAP certification so as to ensure sustainable production and safe fresh produce. Grants or soft loans priority will be given to farms with MyGAP certification. Moreover, all farms in the permanent food production parks (TKPM) will be prerequisite with MyGAP certification. In addition, the certification scheme will be aligned to the Global GAP requirements criteria to increase market access, particularly to the European Union. This will make it easier for the farmers to export their product internationally.

However, it is reported that the compliance of farmers with MyGAP is still low (Economic Planning Unit, 2015). In 2014, only 3,585 farms (4.6 percent) of the total 77,191 farms (vegetable, fruits, livestock and fisheries) complied to MyGAP and in the crop sector, only 38 percent of all farms were certified (Economic Planning Unit, 2015). To be exact, out of 46,040 vegetable farmers in Malaysia (Table 1.11), only 235 of them are certified with MyGAP (MOA, 2014a). This accounts to approximately 5 percent of the total vegetable farmers. Table 1.11 presents the amount of vegetable farmers according to each state.

Table 1.11: Numbers of Vegetable Farmers with MyGAP, Malaysia, 2014

State	Vegetable Farmers
Johor	25
Kedah	5
Kelantan	27
Negeri Sembilan	11
Pahang	50
Perak	26
Perlis	2
Pulau Pinang	29
Selangor	29
Terengganu	7
Peninsular Malaysia	211
Sabah	2
Sarawak	18
Wilayah Persekutuan Labuan	4
Malaysia	235

(Source: MOA, 2014)

The government and NGOs have tried their best in getting the farmers involved in this program but so far they are not responsive. One of the main reasons for the low compliance is the high initial capital requirements. To be accredited with MyGAP, farmers need to have proper storage of their vegetables, a special place in keeping and labeling their pesticides and attain safety attire and knapsack for their farm workers. These changes that the farmers need to adopt in their farm could be costly for the smallholder farmers. Besides that, the practice might also be new or difficult for the farmers, especially in terms of the paperwork (The Star Online, 2013). Farmers need to keep record of what pesticides they are using and how much it costs and how many times in a day they are using it, in order to be compliance with the standards.

The farmers' mindset and attitude is uncertain as to why the farmers are not interested in applying for the certification. Moreover, policy-makers at present still have limited experience of farmers' responses to environmental schemes (Falconer, 2000). There is a very diverse population of potential participants, with different attitudes and agricultural opportunity costs, and a very diverse range of schemes that they may enter.

1.11 Problem Statement

There are clear evidences that, consumers are getting more health conscious and more aware of the need to consume more vegetables in their daily life. While the demand for food safety increases, they are especially concern on the foodborne illness outbreaks due to contaminated vegetables. These outbreaks caused consumers to be needy and picky when it comes to consuming vegetables. Consequently, this puts pressure on vegetable farmers in producing high quality, safe, as well as environmental-friendly vegetables. Thus, MyGAP is the answer to this crisis. MyGAP is an agricultural practice which focuses on environment, economy and social aspects to guarantee a produce which is in good quality and safe to be consumed. Therefore, MyGAP in farms can be the way to respond to what consumers' needs and wants.

The government has provided non-mandatory training and courses, extension services, giving promotions to attract farmers as well as consumers. DOA has also been providing guidelines to encourage farmers to apply for MyGAP. Along with that, the farmers are aware that if their products are certified with MyGAP, they have the opportunity of selling their product at higher price.

Despite all attempts to encourage farmers to get the certification, the uptake among Malaysian farmers is still low and slow. Therefore, an argument arises on what actually shapes the mindset of the farmers and what is preventing them from being compliance with MyGAP. It could be because of their attitude as different farmer possessed different attitude. It could also be that the farmers are not aware of the underlying values of MyGAP or they do not assigned any values to themselves with respect to MyGAP. Probably the knowledge of MyGAP that the farmer received is not enough or maybe they have very strong personal norms which act as a personal standard in their own farming life or it could be some barriers preventing them to comply with MyGAP.

On the other hand, for the farmers who already certified their farm with MyGAP, it is important to find out what are the factors that mold them in being endorsed with MyGAP. And from there, these important factors most likely can be used to encourage the farmers without MyGAP and gain their interest in applying for this certification.

Therefore, considering all of these circumstances, there is a need to explore what shapes the attitude of vegetable farmers towards MyGAP in terms of their assigned values, underlying values, knowledge, personal norms as well as perceived barriers for those farmers who are not accredited with MyGAP.

1.12 Objectives of Study

The main objective of this study is to assess the attitude of vegetable farmers towards farming practices under Malaysian Certification Scheme of Good Agricultural Practices (MyGAP).

The specific objectives are:

i. To determine the significant differences between vegetable farmers with MyGAP and farmers without MyGAP, in terms of their attitude, underlying values, assigned values, personal norms and knowledge.
ii. To identify the association between the vegetable farmers' demographic profiles and MyGAP endorsement.
iii. To explore the relationship between underlying values, assigned values, knowledge and personal norms with the attitude of vegetable farmers with MyGAP.
iv. To discover the relationship between underlying values, assigned values, knowledge, personal norms and perceived barriers with the attitude of vegetable farmers without MyGAP

1.13 Significance of Study

Understanding the attitude of vegetable farmers towards MyGAP is essential to gain insight in to the farmers' intention towards the certification scheme. A discussion has been conducted with some of the officer in Department of Agriculture and they emphasized that recognizing the favorable or unfavorable attitude of farmers towards MyGAP could be helpful in a way for them to approach the farmers. In other words, this study will be useful for the government to find an effective and efficient way in accessing and promoting MyGAP to the vegetable farmers. Other than that, this study will also be valuable for the agricultural development policy makers as a significant guidance in improving MyGAP for the implementation of future programs and also to encourage more farmers in applying for this certification. Moreover, this will benefit the farmers as they gain more valuable information with regards to particular aspects of MyGAP (economically, socially and environmentally).

1.14 Organization of Thesis

The thesis is divided into five chapters. Chapter one discusses the background of the study and the formulation of problem. The guidelines of MyGAP are listed in this chapter. Chapter two displays a review of previous studies and findings related to farmer's attitude towards GAP and related certification scheme and all the definitions and terms used in this study are listed in the chapter. The theories and models which have been used in environmental studies and attitude studies were also discussed. Chapter three explains the methodology and tools of analysis to achieve the objective of this study. Each variable and determinant as well as data collection procedure was discussed. The conceptual framework of this study is also justified in the chapter. Chapter four presents the findings of this study that has been analyzed. Lastly, chapter five summarizes the main findings of this study and offers some recommendations for future research. Limitations and implications in conducting this study are also stated in the chapter.

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LIST OF PUBLICATIONS

Publications

Elina W. G., Golnaz R., Zainalabidin M. and Juwaidah S. (2015). Vegetable Farmers and Malaysian Certification Scheme of Good Agricultural Practices (MyGAP): Opinions and Barriers. *Australian Journal of Basic and Applied Science*. 9(32):35-39

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1. Elina W. G., Golnaz R., Zainalabidin M. (2016). Possibility of Malaysian Good Agricultural Practices Certification Scheme (MyGAP) Endorsement: Vegetable Farmers' Socio-Demographical Factors. International Conference on Science and Technology (ICOSAT). Jakarta, Indonesia. November 17th, 2016.

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5. Elina W. G., Golnaz, R., Rika T. and Munirah, J. (2015). Effects of Socio-Demographic Profile on Student's Intention in becoming Agri-Entrepreneur. International Conference on Agri-Entrepreneurship Development: Issues and Trends (CAgE 2015). Universiti Putra Malaysia, Serdang. January 26th- 27th, 2015.