FARMERS' PERCEPTION ON GOOD AGRICULTURE PRACTICE IN CAMERON HIGHLANDS, PAHANG

by

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A report submitted in fulfilment of the requirements for the degree of Bachelor of Applied Science (Sustainable Science) with Honours

FACULTY OF EARTH SCIENCE

UNIVERSITI MALAYSIA KELANTAN

2018

DECLARATION

I declare that this thesis entitled "Farmers' Perception on Good Agriculture Practices in Cameron Highlands, Pahang" is the result of my own research except as cited in the references. The thesis has not been accepted for any degree and is not concurrently submitted in candidature of any other degree.

Signature : _____

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Date :

ACKNOWLEDGEMENT

I would like to express my highest gratitude to Allah S.W.T for giving me such time and opportunity to complete my final year project and also the thesis writing. I am also would like to express this gratitude to my supervisor, Miss Nur Hanisah bt Abdul Malek for her patience in giving guidance for me to complete my final year project.

To all the respondents in Cameron Highland, thank you for being considerate by answering the questionnaire and some survey about Good Agriculture Practices (GAP). I also would like to extend my gratitude to both of my parents, Md Radzi b. Lazim and Zorina bt Abdullah and all my family whom giving me continuous encouragement and support for my study in Universiti Malaysia Kelantan (UMK). Without their support, it would be impossible for me to finish my thesis.

Finally, I would like to extend my gratitude to my groupmate, Nor Shafawati bt Arifin and Nur Madihah bt Mohd Isa for always exchange ideas, techniques and help me in this process directly or indirectly.

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ABSTRACT

In response to the improper agriculture waste management, governments in Southeast Asia have sought to improve the management by introducing public standards of good agricultural practices (GAP) by examining its effectiveness in raising the awareness and improving practices of participant farmers toward better food safety and quality assurance because it has been highlighted that agriculture waste are one of the factors that contribute to the degradation of environmental quality especially in highland areas. The study area took place in different districts in Cameron Highlands which were Tanah Rata, Brinchang, Tringkap and Kuala Terla. The purpose of this paper is to develop a scale to determine the farmers' perception on GAP and to identify the factors affecting the farmers' perception of GAP in Cameron Highlands. For this research study, survey by using questionnaire is used where it contains two sections which were part A is demographic profile and part B were divided into four sections where the knowledge, practices, awareness and perception were included and the results were analysed by using reliability test, independent sample t-test, and correlation analysis.. For this finding, the farmers' perception on GAP and the factors affecting the farmers' perception of GAP were determined.

Keywords: *GAP, agriculture waste, farmers, perception, highland*

PERSEPSI PETANI MENGENAI AMALAN PERTANIAN BAIK DI CAMERON HIGHLANDS, PAHANG.

ABSTRAK

Sebagai tindak balas kepada pengurusan sisa pertanian yang tidak sesuai, kerajaan di Asia Tenggara berusaha meningkatkan pengurusan dengan memperkenalkan piawai awam amalan pertanian yang baik (GAP) dengan mengkaji keberkesanannya dalam meningkatkan kesedaran dan meningkatkan amalan petani ke arah keselamatan dan kualiti makanan yang lebih baik jaminan kerana ia telah menekankan bahawa sisa pertanian adalah salah satu faktor yang menyumbang kepada kemerosotan kualiti alam sekitar terutama di kawasan tanah tinggi. Kawasan kajian berlaku di beberapa daerah di Cameron Highlands iaitu Tanah Rata, Brinchang, Tringkap dan Kuala Terla. Tujuan kertas kerja ini adalah untuk mengembangkan skala untuk menentukan persepsi para petani tentang GAP dan mengenal pasti faktor-faktor yang mempengaruhi persepsi para petani mengenai GAP di Cameron Highlands. Untuk kajian ini, tinjauan menggunakan kertas soal selidik digunakan di mana ia mengandungi dua bahagian iaitu bahagian A adalah profil demografi dan bahagian B dibahagikan kepada empat bahagian di mana pengetahuan, amalan, kesedaran dan persepsi dimasukkan dan keputusan dianalisis dengan menggunakan kebolehpercayaan ujian ujian bebas, dan analisis korelasi. Untuk penemuan ini, persepsi petani mengenai GAP dan faktor-faktor yang mempengaruhi persepsi petani tentang GAP telah ditentukan.

***Kata kunci**: GAP, sisa pertanian, petani, persepsi, tanah tinggi*

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CHAPTER 1

INTRODUCTION

1.1 Background of study

Agricultural waste, which includes both natural and non-natural wastes, is a general term used to describe waste produced on a farm through various farming activities. These activities can include but are not limited to dairy farming, horticulture, seed growing, livestock breeding, grazing land, market gardens, nursery plots, and even woodlands. Agricultural and food industry residue, refuse and wastes constitute a significant proportion of worldwide agricultural productivity. It has variously been estimated that these wastes can account for over 30% of worldwide agricultural productivity. When discharged to the environment, agricultural wastes can be both beneficial and detrimental to living matter. Given agricultural wastes are not restricted to a particular location, but rather are distributed widely, their effect on natural resources such as surface and ground waters, soil and crops, as well as human health, can be seen. Therefore, a proper waste management is needed.

The first goal of any waste management system is to maximize the economic benefit from the waste resource and maintain acceptable environmental standards. To be practical, the system must also be affordable and suitable to the operation. If wastes are not properly handled they can pollute surface and groundwater and contribute to air and water pollution. It is very important to fully exploit various methods of utilizing agricultural wastes. Thus, Good Agriculture Practice (GAP) is

implemented around the world. With international trade in food booming, consumers are increasingly concerned about food safety, how food is produced, and how it is handled within the supply chain. New pressures from consumers, retailers, and legislation have placed additional demands on farmers and producers. They are increasingly required to use production methods that reduce the impact of agricultural practices on the environment, to reduce their use of agrochemicals, and to make efficient use of natural resources such as land and water, all while safeguarding the welfare of workers and conserving farm ecology. GAP represents a solution for producers seeking to address consumer concerns in domestic and foreign markets.

1.2 Problem Statement

Cameron Highlands is the smallest district in Pahang which is located in the north-western corner of the state but it plays an important role in the development of agricultural sector. The farming methods used has to be considered to ensure sustainability (Ati Rosemary MA, Zuraini MA, Rosilawati Z, Serina R, Ang KH, Norjumawati S, 2014). It has been highlighted that agriculture that permits the use of fertilizers, pesticides and unsystematic agricultural practices are the factors that contribute to the degradation of environmental quality in highland areas (Yee SK, Chan NW, 2006).

In addition, not much attention has been given to agricultural runoff especially about the pesticides and fertilizers and treatment of urban area sewage entering the river system that causing environmental pollution.

1.3 Objectives

It is crucial to have a proper agriculture waste management at the highland in order to sustain the quality of crops grown as well as the soil quality that may affect the demographic of Cameron Highlands. Hence, this study will be conducted on farmers' perception assessment on good agriculture practice in Cameron Highlands, Pahang.

The objectives of this study are:

a) To assess farmers' perception on good agriculture practice in Cameron Highlands.
b) To identify the factors affecting the farmers' perception on good agriculture practice in Cameron Highlands.

1.4 Scope of study

This study focused on GAP where can ensure the safety of food and other agricultural products during on-farm and post-production processes, and enhancing environmental sustainability for permanently productive farm operations. The study area took place in different districts in Cameron Highlands which were Tanah Rata, Brinchang, Tringkap and Kuala Terla. The method used is survey by using questionnaire and for data analysis, SPSS version 21 is been used. Total respondents were 400 where 100 respondents from each district.

1.5 Significance of study

The significant from this study is to implement Good Agriculture Practices (GAP) among the farmers. It is crucial to implement it because the environment needs to be preserved from deterioration as improper agriculture practices can give negative impacts to human, environment and economy of Cameron Highlands.

CHAPTER 2

LITERATURE REVIEW

2.1 Agriculture waste

Agricultural waste otherwise called agro-waste is comprised of animal waste (manure, animal carcasses), food processing waste (only 20% of maize is canned and 80% is waste), crop waste (corn stalks, sugarcane bagasse, drops and culls from fruits and vegetables, prunings) and hazardous and toxic agricultural waste (pesticides, insecticides and herbicides).

It is estimated that about 998 million tonnes of agricultural waste is produced yearly (Agamuthu, 2009). Organic wastes can amount up to 80 percent of the total solid wastes generated in any farm (Government of Mauritius, 1997) of which manure production can amount up to 5.27 kg/day/1000 kg live weight, on a wet weight basis (Humenik &Maner, 1973).

Agricultural development is usually accompanied by wastes from the irrational application of intensive farming methods and the abuse of chemicals used in cultivation, remarkably affecting rural environments in particular and the global environmental in general. The waste generated is dependent on the type of agricultural activities carried out.

2.1.1 Wastes from Cultivation Activities

While tropical climate is favourable for growing crops, it also supports the generation and development of insects and weeds. This situation creates a high demand for pesticides in order to kill insects and protect against the spread of epidemic diseases and this need often lead to the abuse of pesticides by farmers. After using pesticides, most of the bottles and packages holding these pesticides are thrown into fields or ponds. According to an estimate made by the Plant Protection Department (PPD), about 1.8% of the chemicals remain in their packaging (Dien & Vong, 2006). These wastes have the potential to cause unpredictable environmental consequences such as food poisoning, unsafe food hygiene and contaminated farmland due to their potentially lasting and toxic chemicals.

In addition to this, existing stagnant or unused pesticides and pesticide packages with residue from the original contents poses serious environmental consequence in that they could be stored or buried in the wrong way which may leak or enter the environment through osmosis and thereby affecting the environment.

In agricultural production for example, fertilizers play an important role in maintaining the productivity and quality of plants. Inorganic fertilizer is inexpensive and characterized by high productivity. However, many farmers apply more fertilizer to their crops than the amount needed by the plants (Hai & Tuyet, 2010). The serious consequence of such an excessive application of fertilizer is that it is used to the point of abuse in order to increase the annual agricultural output. The rate

of absorption of such fertilizer compounds such as nitrogen, phosphorus, and potassium varies depending on the land characteristics, plant types, and method of fertilization (Thao, 2003). Among the fertilizer excess, a portion is retained in the soil, a portion enters ponds, lakes or rivers as a result of either surface runoff or the irrigation system adopted, which results in the pollution of surface water.

2.1.2 Wastes from Livestock Production

Waste from livestock includes solid waste such as manure and organic materials in the slaughter house. The pollution caused by livestock production is therefore a serious problem since most of them are usually built around residential areas. Air pollution includes odours emanating from cages resulting from the digestion process of livestock wastes. The intensity of the smell depends on animal density, ventilation, temperature, and humidity.

The proportion of NH_3, H_2S, and CH_4 varies along with the stages of the digestion process and also depends on organic materials, the components of foods, microorganisms, and the status of the animals' health. This untreated and non-reusable waste source can generate greenhouse gases while also having negative effects on the fertility of the soil and causing water pollution. In livestock waste, water volume accounts for 75–95% of total volume, while the rest includes organic matter, inorganic matter, and many species of microorganisms and parasite eggs (Hai & Tuyet, 2010). Those germs and substances can spread diseases to humans and cause many negative effects on the environment.

2.2 Agricultural waste in Egypt

The fast population growth and the depletion of traditional energy sources triggered many countries to search for new and renewable energy sources. Egypt can be considered as a representative country in semi-arid regions. It is an agricultural country where agriculture provides about 37% of the total employment. Although yields for many agricultural crops in Egypt are among the highest in the world, the total arable land area is only 3.3 million hectare. The yearly population growth, of about 2.7%, increases the demand for food and energy. This results in the application of intensive crop rotation, leading to an increased need for chemical fertilisers.

2.2.1 Crop residues

Major crops in Egypt include wheat, maize, rice, cotton, clover, sugar cane, beans, and soybeans. Moreover, Egypt produces some vegetables and fruits. According to the Egyptian New and Renewable Energy Authority (2000), the potential of crop residues in Egypt contributes to about 50% of the total biomass potential. Hamdy (1998) mentioned that about 52% of the agricultural residues are burnt directly on the fields or in inefficient burners in small villages. Both methods result in loss of energy as well as negative impact on the environment.

Moreover, the traditional storage in the farms and on roofs gives a large chance for insects and other disease carriers to grow and reattack human, animals or new crops. Hamdy (1998) revealed that about 30% of the agricultural residues are used for animal feeding and the rest of 18% is used as fertiliser.

2.3 Agricultural waste in Cameron Highlands, Pahang

Terracing and levelling for plantation on steep slopes in Cameron Highlands displaced all the naturally present nutrients on the habitat topsoil. Thus, farmers usually will use the untreated organic fertilizers such as chicken manure to the newly open land. (Barrow, Chan, & Masron, 2009) have reported that farmers favour the untreated chicken manure as fertilizers because of the richness in the nitrogen (NPK) content that helps to speed up and elevate the growth of their crops.

Chemical pesticides such as indoxacarb, fipronil, chlorpyrifos combined with cypermethrin, lambda-cyhalothrin, and abamectin have been preferably used by more than 90% of the farmers to cater with pest and disease control (Mazlan and Mumford 2005). These chemicals were classified ranged from medium to high environmental impact quotient (EIQ) unit that demonstrates the toxicity of the pesticide to human and environment. In general, 3–4 types of pesticides were used during the crop season and more pesticides were applied during the rainy season to compensate the washed off process during rains (Mazlan and Mumford 2005).

Only 16% of the 99 farmers in Cameron Highlands applied Integrated Pest Management (IPM) such as sticky traps, pheromones traps, parasitoids, and crop rotation while others used chemical pest control (Mazlan and Mumford 2005; Aminuddin, Wan Abdullah, Cheah, Ghulam, Zulkefli, & Salama, 2001). The application of fertilizer and pesticides can cause repeated runoff and erosion into the water bodies, particularly during rainfall. (Farina, Abdullah, Bibi, & Wan Mohd Khalik, 2016) have detected Organochlorine pesticides (OCPs) residues which are a chemical pesticide in the agricultural soils. These types of pesticides have high

persistence and also have a tendency to bio-accumulate in the soil and contaminated vegetables. Occupational exposure and direct consumption of these vegetables may cause pesticide poisoning (Farina et al. 2016). Heavy metals residual from chemical pesticides and fertilizer such as manganese (Mn), copper (Cu) and zinc (Zn) also among the elements found in the soil from farms in Ringlet and Tanah Rata. Vegetables grown in the contaminated soils have a tendency to accumulate the metals in their tissues, thus pose a health risk to human though consumption (Khairiah, Lim, Ahmad Maher, & Ismail, 2006).

2.4 Implication of improper agriculture waste management

Real and potential environmental quality problems have accompanied the changes in agricultural, productivity in recent decades (Loehr, 1974). Agricultural wastes frequently are not discharge on a regular basis. Available information suggests that potential environmental quality problems due to agricultural operations may be more dependent upon the production practices and waste management techniques utilized by farmers and procesors than the size of the operation, the number of animals fed, or the amount of waste involved.

2.4.1 Water quality

One of the most challenging problems of water quality management is the problem of excessive amounts of nutrients and the conditions they can cause. Of particular concern are nitrogen and phosphorus compounds. Although these elements are needed in small amounts for living matter, excessive amounts in surface waters can result in over fertilization and can accelerate the process of eutrophication. Other concerns include excessive amounts of nitrate in groundwaters and surface water, ammonia toxicity to fish, altered effectiveness of chlorination by ammonia, and the nitrogenous oxygen demand of reduced nitrogen compounds in surface waters.

All natural waters contain dissolved materials, including plant materials derived from natural process. The quantities of eroded solutes are highest in areas of abundant precipitation and runoff while the concentrations of the dissolved matter are highest in areas of low precipitation. Agricultural drainage, as well as urban drainage and municipal and industrial waste discharges, can contribute significant quantities of nutrients to surface waters. The quantity of rainfall or drainage water and the permeability of soil are key factors in the leaching of contaminants from the soil.

2.4.2 Odours

Odours from animal wastes are a persistent problem arising from the confinement of large numbers of animals. The problem is especially prevalent near feedlots, in and around confined and enclosed animal production operations, and

where field spreading of unstabilized waste from confinement operation is practices. There is an acute need for effective methods of odour control if agricultural industries are to coexist with their neighbours. Effective odour control must be based on an understanding of the fundamentals of odour generation and control and on knowledge of the odour causing compounds.

The fact that the odour-causing materials are reduced organic compounds suggested the possibility of an oxidative microbial process for odour control. If the stored wastes are aerated, adequate oxygen can be added so that anaerobic end products are not produced. Under these conditions the primary odorous compound will be ammonia since during the aeration of animal wastes, ammonia can be released from the mixture. If sufficient oxygen is added to the aerated mixture the ammonia can be microbially oxidized to nitrites and nitrates eliminating ammonia as an air pollution problem in the circumstances. The key in reducing anaerobically caused odours is to be sure that the oxygen supplied is equal to or greater than the oxygen demand or vice versa.

Odour causing compounds exist not only as gases but also as volatile material associated with the particulate matter in the animal confinement operations. Analysis of volatiles carried by the particulates in a poultry house revealed number of odour causing compounds. The concentration of particulate matter in a poultry house averaged 0.093mg/ft^3, consisted of fecal matter, feed particles, and feather and epidermal fragments, and when collected had a “chicken house” odour (Burnett, 1969). Filters can remove the particulate material and reduce the intensity of the odour.

2.4.3 Gases

The gases generated by microbial degradation of the waste are of concern to the health of animals and humans in confined livestock environment. The gases of greatest concern are carbon dioxide, ammonia, hydrogen sulphide, and methane. In addition, aliphatic aldehydes and sulfur dioxide were measured in the atmosphere of a commercial poultry house (Burnett & Sobel, 1968). The conditions leading to accidents have been animals in close proximity to anaerobic wastes, inadequate ventilation, and the release of anaerobic gases as the anaerobic wastes were agitated for movement or removal. Toxic gas concentrations can exist in a waste storage unit and the unit should be adequately ventilated prior to human entry after mixing anaerobic wastes.

2.5 Implementation of Good Agriculture Practice (GAP)

With international trade in food booming, consumers are increasingly concerned about food safety, how food is produced, and how it is handled within the supply chain. New pressures from consumers, retailers, and legislation have placed additional demands on farmers and producers. They are increasingly required to use production methods that reduce the impact of agricultural practices on the environment, to reduce their use of agrochemicals, and to make efficient use of natural resources, all while safeguarding the welfare of workers and conserving farm ecology. Good Agricultural Practices (GAP) represents a solution for producers seeking to address consumer concerns in domestic and foreign markets.

GAP aims to bring balance into the food production equation. It helps all stakeholders of the food production chain to understand the importance of food safety, the necessity of a sustainable food production system, and the fact that the waste must not be produced. GAP does not prescribe techniques to increase crop productivity. It does, however, help farmers to effectively produce profitable and sustainable crops, creating benefits that directly affect them.

Consumers' food consumption patterns are changing rapidly. Consumers are becoming more concerned about the food they consume. They tend to consume food that is nutritious, healthy, safe and friendly to the environment and animals. Thus, the green concept is now steadily being disseminated among consumers in conjunction with the sustainability and conservation of agricultural development. Green foods refer to foods that are safe for consumption, fine in quality and are nutritious in meeting the principle of sustainable development.

Food is the basic need for all human beings to support life; therefore, consumers have the right to choose good quality and safe foods for their own consumption. The three most considered factors by the consumers with regards to food are food safety, the protection of the environment and animal welfare (Fraser, 2001). From the public's point of view, these three factors are linked together (Blanford et al., 2002). In the case of domesticated animals, it is natural for the consumers to think that an improvement in animal rearing methods will result in better, healthier and safer food which have less of an impact on the environment and improves animal welfare (Passille et al., 2005). This phenomenon has attracted the food industry players and marketers to focus more on the safety, health, environmentally friendly and animal welfare aspects of food products.

There are some benefits of the good agricultural practices which are the use of good agricultural practices during production, harvesting, sorting, packaging, and storage operations for crops is a key to prevent pathogen contamination, the producers and marketers will increase the chance of their competition power by documenting in quality and safety of their products in the more competitive markets, retailers will be confident for the quality and safety of the products placed on their shelves, consumers can buy certificated products without worrying any environmental damage and residue problem in the production and products as well as sustainable use of natural resources will be considered.

CHAPTER 3

MATERIALS AND METHOD

3.1 Study area

This study was conducted at Cameron Highlands, Pahang. As for 2010, the population is estimated to be 38,471 (Department of Statistic Malaysia, 2010). There are 4 places that were chosen which are Tanah Rata, Brinchang, Tringkap and Kuala Terla. The places that were chosen are the hotspot area.

3.2 Material

For this research study, survey by using questionnaire is used. The questionnaire had 2 sections which are Section A and Section B. Section A was about demographic profile of respondents while Section B was divided into four parts, part A, part B, part C and part D. Types of measurement can be divided into four which are nominal, interval, ratio and ordinal. The variables in terms of its category was described by nominal scale data. The questions asked were in terms of likert scale. Likert-type or frequency scales use fixed choice response formats and are designed to measure attitudes or opinions (Bowling, 1997; Burns, & Grove, 1997). These ordinal scales measure levels of agreement or disagreement. A Likert-type scale assumes that the strength or intensity of experience is linear. Respondents may be offered a choice of five to seven or even nine pre-coded responses with the neutral point being neither agree nor disagree. Besides, ordinal level of measurement

describes about classifying data according to the rank. Interval scale that was used in the survey question of this study is by using scale 1 to 5. Number one represent "strongly disagree", number two represent "disagree", number three represents "neutral", number four represent "agree" and number five represent "strongly agree".

- Section A : Demographic
- Section B : Farmers' Perception on Good Agriculture Practices(GAP) in Cameron Highlands
    - Part A : Farmers' knowledge about GAP
    - Part B : Farmers' attitude in GAP
    - Part C : Farmers' awareness of GAP
    - Part D : Farmers' perception on GAP

3.3 Method

3.3.1 Data Collection

Survey had been conducted by using stratified sampling technique at the selected areas which were Tanah Rata, Brinchang, Tringkap and Kuala Terla. The questionnaire had been distributed to the farmers as the respondents with a total of 400 where 100 respondents for each district. The data then are analysed by using t-test and correlation analysis. The interview session had been conducted when distributing the questionnaire.

3.3.2 Survey

Ethical considerations in research are critical. Ethics are the norms or standards for conduct that distinguish between right and wrong. They help to determine the difference between acceptable and unacceptable behaviours on the part of the researcher. The integrity, reliability and validity of the research findings rely heavily on adherence to ethical principles. The readers and the public want to be assured that researchers followed the appropriate guidelines for issues such as human rights, animal welfare, compliance with the law, conflicts of interest, safety, health standards and so on. The handling of these ethical issues greatly impact the integrity of the research project and can affect whether or not the project receives funding. The manner in which research is conducted may also shape a community's views, positive or negatively, toward the researcher, the research project, the topic, the research institution and even those providing funding. Ethical issues are important in all types of research. Regardless of the type of research, the researcher should take into consideration both general research principles and those that are more specific to the type of research being conducted.

This survey used questionnaire in order to obtain the primary data about the community's behaviour towards the Good Agriculture Practices. The survey had been instructed by approaching the farmers at different location of farm such as at Tanah Rata, Brinchang, Tringkap and Kuala Terla. The significance of using survey is it can be used in describing the characteristics of a large population. No other research method can provide this broad capability, which ensures a more accurate

sample to gather targeted results in which to draw conclusions and make important decisions.

Stratified sampling had been used in surveying data because stratified sampling is a type of sampling method in which the total population is divided into smaller groups or strata to complete the sampling process. The population size is too large to run a research on. There were four strata where strata 1was Tanah Rata, strata 2 was Brinchang, strata 3 was Tringkap and strata 4 was Kuala Terla. Random samples are then selected from each stratum. This is because, it is important that the group selected be representative of the population, and not biased in a systematic manner.

3.4 Population and sample

The population that were chosen was the farmers that had farms in Tanah Rata, Brinchang, Tringkap and Kuala Terla. According to the latest statistics given by the Department of Statistic Malaysia, the total population for Cameron Highland, Pahang is 38,471. Due to time constraint, only 400 questionnaires were distributed to the targeted respondents. The target population for this study are the farmers in the four areas. The questionnaires were distributed to all races including Malay, Chinese, Indian and others.

3.4.1 Sampling size

One of the important steps in any research study is to determine the number of sample to be selected. Samples that are too small will lead to inaccurate result, meanwhile samples that are too larger may waste resources, money and time. In order to get the sample size, the size population need to be determined first.

In this study, 400 respondents were chosen as the sample size. In determining the specific size of sample, (Krejcie & Morgan, 1970) had proposed a table to determine the sample of size through the total population of the place. The process of choosing the sample size will be a lot easier by just referring to the table of the sampling size. The information needed is just the population size where N is represent the total population while S is the sample size.

Table 31: The sample size

N	S	N	S	N	S
10	10	220	140	1200	291
15	14	230	144	1300	297
20	19	240	148	1400	302
25	24	250	152	1500	306
30	28	260	155	1600	310
35	32	270	159	1700	313
40	36	280	162	1800	317
45	40	290	165	1900	320
50	44	300	169	2000	322
55	48	320	175	2200	327
60	52	340	181	2400	331
65	56	360	186	2600	335
70	59	380	191	2800	338
75	63	400	196	3000	341
80	66	420	201	3500	346
85	70	440	205	4000	351
90	73	460	210	4500	354
95	76	480	214	5000	357
100	80	500	217	6000	361
110	86	550	226	7000	364
120	92	600	234	8000	367
130	97	650	242	9000	368
140	103	700	248	10000	370

150	108	750	254	15000	375
160	113	800	260	20000	377
170	118	850	265	30000	379
180	123	900	269	40000	380
190	127	950	274	50000	381
200	132	1000	278	75000	382
210	136	1100	285	1000000	384

3.5 Data Analysis

Statistical Package for the Social Sciences (SPSS) version 21 has been used in this study for descriptive analysis and also inferential analysis. Correlation analysis was used to analyse between the farmers' perception on GAP in Cameron Highlands and the factors affecting the farmers' perception of GAP. The null hypothesis for this test is that there is no relationship between farmers' perception on good agriculture practice and factors affecting the farmers' perception on GAP while alternative hypothesis is the opposite. Descriptive statistics are brief descriptive coefficients that summarize a given data set, which can be either a representation of the entire or sample population. Descriptive statistic helps describe and understand the features of a specific data set, by giving short summaries about the sample and measures of the data. The most recognized types of descriptive statistics are the mean, median, and mode, standard deviation, minimum and maximum. People use descriptive statistics to repurpose hard-to-understand quantitative insights across a large data set into bite-sized descriptions.

3.5.1 Inferential Statistics

3.5.1.1 Reliability test

Reliability Test is referring to the extent which is a test is stable and consistent in measuring a particular measurement. The reliability test is determined by using Cronbach' Alpha value. This test was carried out to measure the reliability of the questionnaire by considering zero of very little random measurement error. The acceptable value of alpha was ranging from 0.70 to 0.95. Thus, if the value of the Cronbach's Alpha is unacceptable, the question is said to be as not relatable and the questionnaire will need to be revised. 40 respondents were selected to answer the questionnaire during pilot study. This number is obtained from 10% of sample size which is 400.

Table 3.2: The Cronbach's Alpha test proposed by (Sekaran & Bougie, 2013)

Cronbach's Alpha	**Internal Consistency**
$0.9 \leq \alpha$	Excellent
$0.8 \leq \alpha \leq 0.9$	Good
$0.7 \leq \alpha \leq 0.8$	Acceptable
$0.6 \leq \alpha \leq 0.7$	Questionable
$0.5 \leq \alpha \leq 0.6$	Poor
$\alpha < 0.5$	Unacceptable

3.5.1.2 Independent Sample T-test

The statistical test that was used in this study is T-test. This test was used to study to groups of subjects such as the gender of the community in Cameron Highland which are female and male. The differences in attitude, knowledge and awareness between genders can be determined by this test.

3.5.1.3 Correlation Analysis

Correlation is a bivariate analysis that measures the strength of association between two variables and the direction of the relationship. If correlation is found between two variables it means that when there is a systematic change in one variable, there is also a systematic change in the other; the variables alter together over a certain period of time. If there is correlation found, depending upon the numerical values measured, this can be either positive **or** negative. In terms of the strength of relationship, the value of the correlation coefficient varies between +1 and -1. A value of ±1 indicates a perfect degree of association between the two variables. As the correlation coefficient value goes towards 0, the relationship between the two variables will be weaker. The direction of the relationship is indicated by the sign of the coefficient which is a + sign indicates a positive relationship and a – sign indicates a negative relationship. Usually, in statistics, there are four types of correlations which are Pearson correlation, Kendall rank correlation, Spearman correlation, and the Point-Biserial correlation.

However, Pearson *r* correlation is used in the study as Pearson correlation is the most widely used correlation statistic to measure the degree of the relationship

between linearly related variables. Pearson *r* correlation is used to measure the degree of relationship between the questions.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.1 Descriptive Analysis

4.1.1 Demographic information

Cameron Highland is one of the biggest potential attraction for agritourism in Malaysia due to the natural topography which is steep and highly dissected with the temperature which is mild, with an average daytime reading of 24 ◦C and an average night-time reading of 14 ◦C throughout the year and the favourable climate has allowed it to become a major producer of vegetables in Malaysia. The magnificent growth of the tourism industry makes Cameron Highland to be developed into tourist spot, to attract tourists continuously, thus numerous chalets, luxury bungalow and are also resorts are quickly developed. For this study about 400 respondents have participated in this survey.

The questionnaires were distributed to male and female among the farmers. Most of the respondents are male with the percentage of 62.8% while the remaining 37.3% are female. The highest percentage of age of the respondents is between 21 – 30 years old which is 24.8%, followed by 51 years old and above, 23.5%, 31 – 40 years old, 23.0%, below 20 years old, 15.3% and lastly the age of 41 – 50 years old with the percentage of 13.5%. Most farmers interviewed in Cameron Highlands are Malay (58.0%), followed by Chinese (21.5%), Indian (17.3%) and others (3.3%). Agricultural practices among the respondents are divided into four categories and the

top agricultural practices is fruits with the percentage of 64.8% followed by vegetables, 29.8%, flowers or plants, 9.5% and lastly is livestock with the percentage of 6.0%. The respondents with Sijil Pelajaran Malaysia (SPM) has the highest percentage of educational level which is 60.3%. This shown that more than half of respondents just gained the experienced by working with their parents or started the worked or business at the early age. The highest percentage of respondents who had earned below RM 10 000 is 74% followed by RM 21 000 – RM 30 000, 14.5%, RM 11 000 – RM 20 000, 7.8%, RM 41 000 and above, 2.0% and lastly is RM 31 000 – RM 40 000, 1.8%. 0 – 5 years of experiences has the highest percentage among the farmers as the farmers needed to gain some skills and knowledge about the agriculture before started up their own business followed by 11 – 20 years and more than 20 years which have the same percentage 22.3% and lastly is 6 – 10 years of experiences with 12.5%.

Table 4.1: Farmers' Demographic Profile

Farmers' Demographic		Frequency (n)	Percentage (%)
Age	Below 20 years old	61	15.3
	21 years – 30 years old	99	24.8
	31 – 40 years old	92	23.0
	41 – 50 years old	54	13.5
	51 years old and above	94	23.5
	Total	**400**	**100**
Gender	Male	251	62.8
	Female	149	37.3
	Total	**400**	**100.0**
Race	Malay	232	58.0
	Chinese	86	21.5
	Indian	69	17.3
	Others	13	3.3
	Total	**400**	**100.0**
Agricultural practices	Livestock	24	6.0
	Fruits	219	64.8
	Vegetables	119	29.8
	Flowers or plants	38	9.5
	Total	**400**	**100.0**
Education level	UPSR	25	6.3
	PMR	48	12.0
	SPM	241	60.3
	DEGREE	73	18.3
	Others	13	3.3
	Total	**400**	**100.0**

Income (RM)	Below 10 000	296	74.0
	11 000 – 20 000	31	7.8
	21 000 – 30 000	58	14.5
	31 000 – 40 000	7	1.8
	41 000 and above	8	2.0
	Total	**400**	**100.0**
Years of experiences	0 – 5 years	172	43.0
	6 – 10 years	50	12.5
	11 – 20 years	89	22.3
	21 years and above	89	22.3
	Total	**400**	**100.0**

4.1.2 Farmers' knowledge on Good Agriculture Practices (GAP)

Farmers are often characterized as having ties to the land that give them deep awareness of natural cycles, appreciation for natural beauty and a sense of stewardship, but at the same time farmers are characterized as primarily utilitarian, causing misuse of the land (Sullivan, McCann, Young and Ericson, 1996).Farmers play an important role in sustaining the environment as they can give a positive or negative feedback to the environment. In order to sustain, Good Agriculture Practices (GAP) had been promoted by the government and as the result shown in Table 4.2, the farmers' knowledge towards GAP are high since most of the respondents' are agreed with the questions on that section.

Table 4.2: Farmers' knowledge on Good Agriculture Practices (GAP)

Questions	**Assessment description**	**Mean**	**Standard deviation**
I know what is Good Agriculture Practices	**Totally agree**	**4.2175**	**1.00385**
I know applying GAP is good for social, environment and economy.	**Totally agree**	**4.2525**	**1.14762**
I know the names of some the pesticides that are banned or restricted for use. Examples include dichlorodiphenyl-trichloromethane (DDT).	**Totally agree**	**4.2225**	**0.94085**
I do have any experiences and	**Agree**	**3.7675**	**1.12988**

knowledge on agricultural practices and agro-environmental scheme.			
I know applying GAP can facilitate agricultural work.	**Totally agree**	**3.6075**	**1.45903**
I read GAP and performed at least one self-assessment each year.	**Neutral**	**3.5125**	**1.22621**
I have the knowledge of pesticides including exposure routes, effects on the environment and human health and their awareness of pesticides laws and regulations.	**Agree**	**3.8325**	**0.93629**
I do have any knowledge on biodiversity and nature protection in relation to agriculture in general and to my farm site.	**Agree**	**3.7200**	**1.04130**
I know that production cost will be too high, and that few consumers will be willing to pay the high price for organic crops.	**Totally agree**	**4.0975**	**0.97229**
I apply GAP in my agricultural practices	**Totally agree**	**3.7750**	**1.30331**

4.1.3 Farmers' attitude in Good Agriculture Practices

From the result shown in Table 4.3, the way of farmers handling the waste are in good condition as most of the farmers' are agreed with the questions on that section. Agriculture can contributes more to other forms of environmental degradation than any other economic sector. Between 30%–35% of global greenhouse gas (GHG) emissions come from agriculture, and crop irrigation accounts for 70% of the world's freshwater withdrawals (Foley, Ramankutty, Brauman, Cassidy, Gerber, 2011). The use of synthetic nitrogen fertiliser has increased nearly 21-fold since 1950, and more nitrogen is now added to agricultural soils than from natural processes (Bouwman, Goldewuk, Hoek, Beusen, Vuuren, 2013). Virtually all human-derived nitrogen is lost to the atmosphere or receiving waters (Galloway, Aber, Erisman, Seitzinger, Howarth, 2003). This eutrophication suffocates aquatic ecosystems (Diaz, Rosenberg, 2008). Phosphorus from fertiliser and livestock manure MacDonald, Bennett, Potter, Ramankutty, 2011), pesticides, and nanoparticles are also exacerbating environmental pollution. Additionally, poor agricultural management causes soil degradation, reducing agricultural productivity and creating further demand for nutrients, water, and land conversion (Diaz, Rosenberg, 2008). Due to the problems stated, GAP guideline had been proposed to all farmers to be able to follow the appropriate steps because it is not a compulsory thing as GAP is defined as production standards that were developed to reduce the risk of contaminating agricultural products with disease-causing microbes or other harmful materials.

Table 4.3: Farmers' attitude in GAP

Question	Assessment description	Mean	Standard deviation
I do not buy pesticides that are banned or restricted.	**Totally agree**	**3.9825**	**1.01477**
I received any training or technical support on the judicious use and safe handling of pesticides.	**Neutral**	**3.2800**	**1.26910**
I buy only the amount of pesticides that I need.	**Neutral**	**3.6425**	**0.93909**
I read or follow instructions on pesticide labels.	**Totally agree**	**4.0925**	**0.88368**
I always follow the SOP for handling the waste.	**Totally agree**	**3.6450**	**1.23401**
I stored the pesticides in locked chemical storages designated only for pesticides.	**Neutral**	**3.5275**	**1.17801**
I buried the containers on-farm or discarded them on the farm.	**Neutral**	**2.5750**	**1.08504**
I reused empty pesticides containers for household purposes.	**Totally disagree**	**1.6900**	**1.06147**
I apply the leftover solution on other	**Neutral**	**3.0325**	**1.34758**

crops, disposed the solution in the field, in the sewer and deliver the solution to the municipality hazardous waste collection sites for disposal.			
The common way of disposing of empty pesticide containers was placing them in garbage containers and/or dumpsters for disposal at the landfill, incinerating them on the farm, and delivering them to the municipality hazardous waste collection sites for disposal.	**Agree**	**3.3600**	**1.20167**

4.1.4 Farmers' awareness of Good Agriculture Practices

The result shown in Table 4.4, the awareness of farmers of GAP were in good condition as most of the farmers' are agreed with the questions on that section. Chronic overuse and misuse of agricultural pesticides characterizes crop production in many parts of Southeast Asia as well as in China, exposing farmers, consumers, and ecological systems to the risk of pesticides (Xu et al. 2008;Schreinemachers et al. 2011; Mazlan and Mumford 2005;Van Hoi et al. 2009; Lamers et al. 2011; Panuwet et al. 2008). To address this problem, several countries in the region have recently introduced public standards of good agricultural practices (GAP) aimed at increasing the supply of safe and high quality food by promoting a more sustainable crop production that uses fewer pesticides. Like many other countries undergoing rapid economic development, Malaysia is experiencing a very sharp increase in pesticide use. In order to reduce the deterioration of environment, the awareness of GAP among the farmers were crucial.

Table 4.4: The awareness of farmers of Good Agriculture Practices

Question	Assessment description	Mean	Standard deviation
I aware about GAP.	**Totally agree**	**4.2600**	**0.85101**
I aware that obtaining information regarding organic farming is difficult.	**Neutral**	**2.7475**	**1.08012**
I aware that organic farming is too labour intensive.	**Totally agree**	**4.0550**	**0.81156**
I aware that local consumers would be willing to pay higher prices for organic products.	**Neutral**	**3.7075**	**0/92957**
I aware the using of chemical inputs improves products appearances.	**Totally agree**	**3.8400**	**0.98835**
I aware that organic products can be sold for higher prices compared to conventional products.	**Totally agree**	**4.0650**	**0.96077**
I aware that organic farming reduces chemical output to the environment.	**Totally agree**	**4.1750**	**1.02811**
I aware that there is lack of subsidies for organic farming.	**Totally agree**	**3.9725**	**1.12691**
I aware that it is hard to find business buyers (e.g. wholesalers) who pay higher prices for	**Neutral**	**3.3750**	**1.20541**

organic products.			
I aware that improper disposal of agricultural waste gives impacts to the environment and human health.	**Neutral**	**3.3275**	**1.01874**

4.2 Statistical Analysis

4.2.1 Independent t-test of farmers' knowledge on GAP between gender

Table 4.5 had shown that F value for Levene's Test is 3.760, and significant value is 0.53 meaning that it is more than $\alpha = 0.05$, so the variances is equal. Thus, the t-value for equal variance assumed was used which is 4.141 and corresponding significant value is 0.000. Therefore, there is statistically significant difference for the mean knowledge of farmers' on GAP.

Table 4.5: Independent t-test of farmers' knowledge on GAP for gender

		Levene's Test for Equality of Variances		t-test for Equality of means	
		F	Sig.	t	Sig (2-tailed)
I do have any experiences and knowledge on agriculture practices and agro-environmental scheme.	Equal variances Assumed	3.760	0.53	4.141	.000
	Equalvariances not assumed			4.054	.000

4.2.2 Independent t-test of farmers' attitude in GAP between gender

There was high significant difference shown in Table 4.6 as the significant value is more than $\alpha = 0.05$, so the variances is equal. Thus, there is statistically significant difference for the farmers' attitude in handling the waste for gender which meant that both gender did have a good behaviour in handling the waste by not disposing them as they please.

Farming in the Cameron Highlands seriously pollutes streams and groundwater with eroded soil, chemical fertilizer, manure, pesticides and other agrochemicals, and pathogens which were derived from un-composted chicken manure and sewage from expanding settlements (Midmore et al., 1996; Wan Abdullah et al., 2001; Wong et al., 2002). Attempts to raise productivity through chemical fertilizers, manure, and pesticides are evident in many countries causing similar environmental impacts (Wilson, 2000). There have been valuable studies of soil erosion and soil degradation in the Cameron Highlands (Nooi, 1991; Aminuddin et al., 2001, 2005), which have provided physical data and suggest there are less environmentally damaging strategies, notably adoption of rain-shelters and a shift to flower growing. Therefore, GAP was promoted and the expectations from the government so farmers can follow the guidelines eventhough it is not crucial because GAP guidelines is just to facilitate thereby the farmers do not harm the environment approximately.

Table 4.6: Independent test of farmers' attitude in GAP between gender

		Levene's Test for Equality of Variances		t-test for Equality of means	
		F	Sig.	t	Sig (2-tailed)
I have knowledge of pesticides, including effects on the environment and human health.	Equal variances Assumed	2.655	0.104	-0.367	0.714
	Equal variances not assumed			-0.375	0.708
I received any training or technical support on the judicious use and safe handling pesticides.	Equal variances Assumed	2.599	0.108	1.037	0.301
	Equal variances not assumed			1.056	0.292
I buried the containers on farm and discarded them on the farm.	Equal variances Assumed	0.166	0.684	8.442	0.000
	Equal variances not assumed			8.924	0.000
I sored the pesticides in locked chemical stores	Equal variances Assumed	2.186	0.140	3.343	0.001

designated only for pesticides.	Equal variances not assumed			3.198	0.002
The common way of disposing of empty pesticide containers was placing them in garbage containers and/or dumpsters for disposal at the landfill, incinerating them on the farm and delivering them to the municipality hazardous waste collection sites for disposal.	Equal variances Assumed	1.291	0.257	-0.117	0.907
	Equal variances not assumed			-0.116	0.908

4.2.3 Independent t-test of farmers' awareness of GAP between gender

Based on the result shown in Table 4.7, there is statistically significant difference between male and female farmers for their awareness on organic farming gives a positive image to a farm (p-value=0.000). There is also significant difference between male and female farmers on their awareness about the use of chemical inputs improves product appearances (p-value=0.049).

The Malaysian government is strongly involved in promoting food safety, environmental protection and animal welfare among all the firms that are involved in the food industry. The government has launched the good agricultural practices (GAPs) program to crops, livestock and fishery producers in order to enhance the objectives of sustainable agriculture and to improve food quality and productivity. Along with the GAP the government has also introduced the Malaysian Farm Accreditation Scheme (SALM) which was developed for the fresh fruits and vegetables sectors which operate in a more environmentally friendly way and yield products that are safe, have a high quality and are suitable to consume. The Malaysian government has also introduced the Malaysia Organic Scheme (SOM) which provides guidelines on the production, processing, labelling and marketing of plant based organically produced foods which is in accordance to Malaysian Standards (Golnaz et al., 2011). These schemes will provide benefits to the consumers, producers, workers and to the environment. Since synthetic fertilizers and pesticides are prohibited from being used under the organic farm system, environmental pollution and the incidental poisoning of farm workers is minimized.

Table 4.7: Independent t-test of farmers' awareness of GAP for gender

		Levene's Test for Equality of Variances		t-test for Equality of means	
		F	Sig.	t	Sig (2-tailed)
Organic farming gives a positive image to a farm	Equal variances Assumed	0.355	0.552	4.184	0.000
	Equal variances not assumed			4.014	0.000
Use of chemical inputs improves product appearances.	Equal variances Assumed	1.735	0.189	-1.979	0.049
	Equal variances not assumed			-2.003	0.046
Organic products can be sold for higher prices compared to conventional products.	Equal variances Assumed	3.508	0.062	1.475	0.141
	Equal variances not assumed			4.485	0.139

4.2.4 The correlation between the implementation of GAP and the farmers' attitude in GAP.

As result shown in the Table 4.8, the correlation between the questions is moderate (0.560) which can simplify that some of the farmers did follow the GAP guidelines by reading and following the instructions on pesticide labels before using it as it may necessary or not in terms of the fertilizers itself or the quantity.

Environmental degradation due to marginal management practices and their multiple, global consequences has been a serious impediment to agricultural and economic development in the tropics (Lal, 1989). Concern over the depletion of natural resources in general, and land degradation in particular, has stimulated the development and implementation of policies aimed at changing farmers' attitude toward adopting practices to protect the environment. Some researchers (Gould et al., 1989; Bultena and Hoiberg, 1983; Norris and Batie, 1987; Burton et al., 1999; Featherstone and Goodwin, 1993; Shields et al., 1993; Sureshwaran et al., 1996) pointed out the importance of demographic and socioeconomic factors, such as age, education, farm income, off-farm employment, risk aversion, and subsidies in determining farmers' land management behaviours. This is because an individual's personal background is crucial as it may affect the decision making of something which may give positive or negative effect to the environment.

Table 4.8:The correlation between the implementation of GAP and the farmers' attitude in GAP.

Correlations

		I apply GAP in my agricultural practices	I read and follow instructions on pesticides labels
I apply GAP in my agricultural practices	Pearson Correlation	1	.560**
	Sig. (2-tailed)		.000
	N	400	400
I read and follow instructions on pesticides labels	Pearson Correlation	.560**	1
	Sig. (2-tailed)	.000	
	N	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

4.2.5 The correlation between the farmer's knowledge on GAP and the awareness of organic farming

In general, climate change and variability are a considerable threat to agricultural communities, particularly in lower latitudes. This threat includes the likely increase of extreme weather conditions, increased water stress and drought, and desertification, as well as adverse health such as malaria. Adverse effects are likely to multiply if adaptation fails. This may then overstretch many societies' adaptive capacities, which may lead to destabilization and security risks, including loss of livelihoods, malnutrition, forced migration, and conflicts (IPCC 2007a; WBGU 2008; Lobell et al. 2008). In order to reduce the threats, GAP guidelines itself, stressed about the applying organic farming among the farmers as it is a holistic production management system which promotes and enhances agroecosystem health, including biodiversity, biological cycles, and soil biological activity. It emphasizes the use of management practices in preference to the use of off-farm inputs, taking into account that regional conditions require locally adapted systems. This is accomplished by using, where possible, cultural, biological, and mechanical methods, as opposed to using synthetic materials, to fulfil any specific function within the system. An organic production system is designed to enhance biological diversity within the whole system, increase soil biological activity, maintain long-term soil fertility, recycle wastes of plant and animal origin in order to return nutrients to the land, thus minimizing the use of non-renewable resources, rely on renewable resources in locally organized agricultural systems, promote the healthy use of soil, water, and air, as well as minimize all forms of pollution thereto that may result from agricultural practices. Based on the result shown in Table 4.9,

4.10 and 4.11, there is strong positive correlation between farmers' knowledge about the advantages of organic farming and organic farming gives a positive image to a farm. However, they were lacking of subsidies from the government as organic farming is very expensive and difficult to cultivate. Therefore, some of them just continue the conventional farming. As said by respondent 1 "I had been applied the subsidies from the government for the past 5 years but nothing happen. Then, I had to continue the business by using our very own money which are my partners and me".

Table 4.9: The correlation between the farmer's knowledge on GAP and the awareness of organic farming

Correlations

		I know that organicproduce are safe, high quality and costly	Organic farming gives a positive image to a farm
I know that organicproduce are safe, high quality and costly	Pearson Correlation	1	.817**
	Sig. (2-tailed)		.000
	N	400	400
Organic farming gives a positive image to a farm	Pearson Correlation	.817**	1
	Sig. (2-tailed)	.000	
	N	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.10: The correlation between the farmer's knowledge on GAP and the awareness of organic farming

Correlations

		I know that organicproduce are safe, high quality and costly	Organic farming reduces chemical output to the environment
I know that organicproduce are safe, high quality and costly	Pearson Correlation	1	.641**
	Sig. (2-tailed)		.000
	N	400	400
Organic farming reduces chemical output to the environment	Pearson Correlation	.641**	1
	Sig. (2-tailed)	.000	
	N	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.11: The correlation between the farmers' knowledge on GAP and the awareness of organic farming

Correlations

		I know that organicproduce are safe, high quality and costly	There is lack of subsidies for organic farming
I know that organicproduce are safe, high quality and costly	Pearson Correlation	1	.564**
	Sig. (2-tailed)		.000
	N	400	400
There is lack of subsidies for organic farming	Pearson Correlation	.564**	1
	Sig. (2-tailed)	.000	
	N	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

CHAPTER 5

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusions

Through these findings of four sections in questionnaire, the farmers' perception on GAP affecting by the factors of farmers' perception on GAP were found. This outcome presents a scale to measure the perception. The findings of factors, like awareness and knowledge, would be beneficial for an investigation of general perception of the local community on GAP as well as external variables such as the selected socio-demographic variables like race, area, age, education level and income have a strong relationship with farmers' awareness and perception towards GAP. Such information can enable governance to shift from reactive responses to a proactive approach more likely to yield improved environmental management and to support sustainable development. Acting quickly when clearances become noticeable is less effective than identifying a trend toward clearing, perhaps a few years earlier. The farmers did understand about the GAP but it may have some problems in implementing it because of some issues. For instances, lack of subsidies from the government may hinder them from pursuing the GAP concept despite they had applied every year and there was no output. Furthermore, it is also difficult for some farmers that had small scale of farm to apply GAP because they felt troublesome due it contains too much content although it may give positive feedbacks to their farm and to their own.

5.2 Recommendations

For the further study, the implementation of GAP among the farmers should be stressed as it can reduce the deterioration of pollution in Cameron Highlands. This is because a good hospitality can give satisfaction to the tourists and to the farmers itself. The GAP is a must guideline to follow by the farmers in the future as it is towards sustainable way and can give positive impacts to the social, economy and environment. In addition, the farmers should go to training to improve some skills that have been organised by Malaysian Agricultural Research and Development Institute (MARDI) especially because it is their expertise to consult farmers about agricultural practice in the way to improve their farm and yields. The government and non-government organization (NGOs) should hand in hand to create awareness campaign to the farmers as it can give positive positive feedbacks either in the shor-term or in the long-term.

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APPENDICES

APPENDIX A

A SURVEY ON FARMERS' PERCEPTION ON GOOD AGRICULTURE PRACTICE IN CAMERON HIGHLANDS, PAHANG.

TINJAUAN MENGENAI PERSEPSI PETANI MENGENAI AMALAN PERTANIAN YANG BAIK DI CAMERON HIGHLANDS, PAHANG.

QUESTIONNAIRE

SECTION A: DEMOGRAPHIC INFORMATION
BAHAGIAN A: MAKLUMAT DEMOGFARI

Age: ( ) below 20 years old
Umur bawah umur 20 tahun

( ) 21 – 30 years old
21 – 30 tahun

( ) 31 – 40 years old
31 – 40 tahun

( ) 41 – 50 years old
41 – 50 tahun

( ) 51 years old and above
51 tahun dan ke atas

Gender: ( ) Male ( ) Female
Jantina Lelaki Perempuan

Race: ( ) Malay ( ) Chinese
Bangsa Melayu Cina

( ) Indian Others: _____
India Lain-lain

What is the main agricultural produce on your farm?
Apakah hasil pertanian utama di ladang anda?

Livestocks : ( ) Fruits : ( )
Ternakan *Buah-Buahan*

Vegetables: ( ) Flowers or plants: ( )
Sayur-sayuran *Bunga atau tumbuhan*

Others : _____
Lain-lain

Education level: ( ) UPSR ( ) SPM
Tahap pembelajaran ( ) PMR ( ) DEGREE
Others: _____
Lain-lain

Income (RM): ( ) below 10 000 ( ) 11 000 – 20 000
Gaji (RM) ( ) 21 000 – 30 000 ( ) 31 000 – 40 000
( ) 41 000 and above

Others: _____
Lain-lain

Years of experience: ( ) 0 to 5 years ( ) 10 to 20 years
( ) 5 to 10 years ( ) 20 or more years

Others: _____

SECTION B: QUESTIONNAIRE ON FARMERS' PERCEPTION ON GOOD AGRICULTURE PRACTICE IN CAMERON HIGHLANDS, PAHANG.

BAHAGIAN B: KAJI SELIDIK TENTANG PERSEPSI PETANI TERHADAP AMALAN PERTANIAN YANG BAIK DI CAMERON HIGHLANDS, PAHANG.

Please put a tick [√] in the box for your answer.

Sila masukkan [√] ke dalam kotak untuk jawapan anda.

Assessment Description:
Deskripsi Penilaian:

1 – Strongly Disagree (*Sangat tidak setuju*)

2 – Disagree (*Tidak Bersetuju*) 3 – Neutral (*Neutral*)

4 – Agree (*Bersetuju*) 5 – Strongly Agree (*Sangat Bersetuju*)

A. KNOWLEDGE/ *ILMU PENGETAHUAN* **(Farmers' knowledge on Good Agriculture Practices)** *(Pengetahuan petani menegenai Amalam Pertanian yang Baik)*	1	2	3	4	5
1. I know what is Good Agriculture Practices (GAP). *Saya tahu mengenai Amalan Pertanian Baik (APB).*					
2. I know applying GAP is good for social, environment and economy. *Saya tahu penerapan APB adalah baik untuk sosial, alam sekitar dan ekonomi.*					
3. I know the names of some of the pesticides that are banned or restricted for use. Example is dichlorodiphenyl-trichloromethane (DDT). *Saya tahu nama-nama beberapa racun perosak yang dilarang atau terhad untuk digunakan. Contohnya ialah dichlorodiphenyl-trichloromethane (DDT).*					

4. I do have any experience and knowledge on agricultural practices and agro-environmental scheme. *Saya mempunyai pengalaman dan pengetahuan mengenai amalan pertanian dan skim agro-alam sekitar.*					
5. I know applying GAP can facilitate agricultural work. *Saya tahu penerapan APB boleh memudahkan kerja pertanian.*					
6. I read GAP and performed at least one self-assessment each year. *Saya membaca APB dan melakukan sekurang-kurangnya satu penilaian sendiri setiap tahun.*					
7. I have the knowledge of pesticides including exposure routes, effects on the environment and human health and their awareness of pesticides laws and regulations. *Saya mempunyai pengetahuan tentang racun perosak termasuk laluan pendedahan, kesan terhadap alam sekitar dan kesihatan manusia serta kesedaran mereka tentang undang-undang dan peraturan racun perosak.*					
8. I do have any knowledge on biodiversity and nature protection in relation to agriculture in general and to my farm site. *Saya mempunyai pengetahuan tentang biodiversiti dan perlindungan alam sekitar berkaitan pertanian dan tapak ladang saya pada umumnya.*					
9. I know that production cost will be too high, and that few consumers will be willing to pay the high price for organic crops. *Saya tahu bahawa kos pengeluaran tinggi, dan beberapa pengguna sanggup membayar harga yang tinggi untuk tanaman* organik.					
10. I apply GAP in my agricultural activities. *Saya menerapkan APB dalam aktiviti pertanian saya.*					

B. ATTITUDE/ *SIKAP* **(Farmer's attitude in GAP)** *(Sikap petani dalam menangani sisa)*					
1. I do not buy pesticides that are banned or restricted. *Saya tidak membeli racun perosak yang diharamkan atau disekat.*					
2. I received any training or technical support on the judicious use and safe handling of pesticides. *Saya menerima sebarang latihan atau sokongan teknikal mengenai penggunaan yang bijaksana dan pengendalian racun perosak yang selamat.*					
3. I buy only the amount of pesticides that I need. *Saya hanya membeli racun perosak yang saya perlukan.*					
4. I read or follow instructions on pesticide labels. *Saya membaca atau mengikuti arahan mengenai label racun makhluk perosak.*					
5. I always follow the SOP for handling the waste. *Saya sentiasa mengikuti SOP ketika mengendalikan sisa buangan.*					
6. I stored their pesticides in locked chemical stores designated only for pesticides. *Saya menyimpan racun perosak di stor-stor kimia terkunci yang ditetapkan hanya untuk racun perosak.*					
7. I buried the containers on-farm or discarded them on the farm. *Saya menanam bekas di ladang atau membuangnya di ladang.*					
8. I reusing empty pesticide containers for household purposes. *Saya menggunakan semula bekas racun perosak untuk keperluan rumah.*					

9. I apply the leftover solution on other crops, disposed the solution in the field, in the sewer or deliver the solution to the municipality hazardous waste collection sites for disposal. *Saya menerapkan sisa campuran pada tanaman lain, melupuskan sisa di lapangan, dalam pembentungan atau membuang sisa ke laman pengumpulan sisa berbahaya perbandaran untuk pelupusan.*					
10. The common way of disposing of empty pesticide containers was placing them in garbage containers and/or dumpsters for disposal at the landfill, incinerating them on the farm, or delivering them to the municipality hazardous waste collection sites for disposal. *Cara biasa membuang bekas racun perosak ialah meletakkannya di dalam bekas sampah untuk dilupuskan di tapak pelupusan, membakar mereka di ladang, atau mengumpulnya ke laman pengumpulan sampah berbahaya untuk dilupuskan.*					
C. AWARENESS / *KESEDARAN* **(Farmer's awareness of Good Agriculture Practice)** **(** *Kesedaran petani tentang Amalan Pertanian yang Baik* **)**					
1. I aware about GAP. *Saya sedar tentang GAP.*					
2. I aware that obtaining information regarding organic farming is difficult. *Saya sedar untuk mendapatkan maklumat mengenai pertanian organik adalah sukar.*					
3. I aware organic farming is too labour intensive. *Saya sedar ladang organik terlalu intensif.*					
4. I aware local consumers would be willing to pay higher prices for organic products. *Saya sedar pengguna tempatan sanggup membayar harga yang lebih tinggi untuk produk organik.*					

5. I aware the using of chemical inputs improves product appearance. *Saya sedar penggunaan input kimia meningkatkan penampilan produk.*					
6. I aware organic products can be sold for higher prices compared to conventional products. *Saya sedar produk organik boleh dijual untuk harga yang lebih tinggi berbanding produk konvensional.*					
7. I aware organic farming reduces chemical output to the environment. *Saya sedar ladang organik mengurangkan pengeluaran kimia ke alam sekitar.*					
8. I aware there is a lack of subsidies for organic farming. *Saya sedar terdapat kekurangan subsidi untuk pertanian organik.*					
9. I aware that it is hard to find business buyers (e.g. wholesalers) who pay higher prices for organic products. *Saya sedar bahawa sukar untuk mencari pembeli (e.g Pemborong) yang membayar harga yang lebih tinggi untuk produk organik.*					
10. I aware that improper disposal of agricultural waste gives impacts to the environment and human health. *Saya sedar bahawa pelupusan sampah pertanian yang tidak betul memberi impak kepada alam sekitar dan kesihatan manusia*					
D**) PERCEPTION**/*PERSEPSI* **(Farrmers' Perception on GAP)** *(Persepsi Petani mengenai Amalan Pertanian Baik)*					
1. I think GAP can help developing local economy and society. *Saya berpendapat APB dapat membantu membangunkan ekonomi dan masyarakat tempatan*					
2. I think agricultural pesticides and fertilizers will cause pollution of the environment. *Saya berpendapat bahawa racun serangga dan baja pertanian akan menyebabkan pencemaran alam sekitar.*					

3. GAP generates more income for my farm. *APB menyumbang banyak pendapatan untuk ladang saya*.					