

**A STUDY ON THE RELATIONSHIPS BETWEEN KNOWLEDGE,
ATTITUDE AND PRACTICE (KAP) IN SUSTAINABLE AGRICULTURE
AND THE SOCIO-ECONOMIC STATUS OF VEGETABLE FARMERS IN
KUNDASANG**

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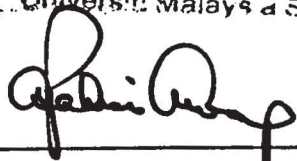
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ABSTRACT

Sustainable agriculture recently becomes popular among farmers, researchers and policy makers. As an alternative farming system, it serves to improve the environmental quality and public health. Therefore, this study had been conducted in order to determine the status of knowledge, attitude and practice (KAP) of farmers towards sustainable agriculture. A total of 30 vegetables farmers in Kundasang, Sabah were selected randomly from the list given by the Department of Agriculture Ranau. Data collection method used was face-to-face interview by objective structured questionnaire. The results showed that there was a positive correlation between the knowledge of the respondents and their practices towards sustainable agriculture. The higher the knowledge of the respondents on sustainable agriculture, the more frequent they practice the sustainable agriculture practices. This study had also identified the attitude of the farmers towards sustainable agriculture practices through Likert rating scale statements.

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KAJIAN MENGENAI HUBUNGAN ANTARA PENGETAHUAN, SIKAP DAN AMALAN DALAM PERTANIAN LESTARI DAN STATUS SOSIO-EKONOMI PENANAM SAYUR DI KUNDASANG

ABSTRAK

Sejak kebelakangan ini pertanian lestari menjadi popular diantara para petani, para penyelidik dan juga mereka yang terlibat dalam membuat polisi. Sebagai alternatif yang terdapat dalam sistem pertanian sekarang, pertanian lestari berfungsi untuk meningkatkan kualiti alam sekitar dan kesihatan orang awam. Oleh itu, kajian ini dijalankan untuk menentukan status pengetahuan, sikap dan amalan petani terhadap pertanian lestari. Sebanyak 30 responden terdiri daripada penanam sayur di daerah Kundasang telah dipilih secara rawak daripada senarai nama yang diberikan oleh Jabatan Pertanian Daerah Ranau. Kaedah pengumpulan data adalah melalui kaedah temuduga secara bersemuka menggunakan borang kaji selidik. Hasil menunjukkan bahawa terdapat hubungan korelasi positif antara pengetahuan responden dan juga amalan mereka berkaitan pertanian lestari. Semakin tinggi pengetahuan responden berkaitan pertanian lestari, semakin kerap mereka mengamalkan amalan pertanian lestari. Kajian ini juga telah mengenalpasti sikap petani terhadap amalan pertanian lestari melalui pernyataan yang diukur melalui skala Likert.

TABLE OF CONTENTS

Content	Page
DECLARATION	ii
VERIFICATION	iii
ACKNOWLEDGEMENT	iv
ABSTRACT	v
ABSTRAK	vi
TABLE OF CONTENTS	vii
LIST OF TABLES	ix
LIST OF SYMBOLS, UNITS AND ABBREVIATIONS	xi
 CHAPTER 1 INTRODUCTION	 1
1.1 Introduction	1
1.1.1 Sustainable Agriculture	2
1.1.2 Sustainable Agriculture Practices	4
1.1.3 Main Constraints to the Adoption of Sustainable Agriculture Practices	5
1.1.4 Status of Sustainable Agriculture Practices in Kundasang	6
1.2 Justification of Study	7
1.3 Objectives of Study	9
 CHAPTER 2 LITERATURE REVIEW	 10
2.1 Introduction	10
2.2 Sustainable Agriculture Practices (SAP)	11
2.3 Sustainable Agriculture Practices in Malaysia	15
2.4 Sustainable Agriculture Practices in Kundasang	16
2.5 Knowledge, Attitude and Practice (KAP)	19
2.6 KAP and Sustainable Agriculture Practices	19
2.7 KAP and Socio-economic Towards Sustainable Agriculture Practices	22
 CHAPTER 3 METHODOLOGY	 24
3.1 Research Design	24
3.2 Study Area	24
3.3 Sampling Method	24
3.4 Research Instrument	25
3.5 Research Procedures	26
3.5.1 Preliminary Data Gathering	26
3.5.2 Instrument Development	27
3.5.3 Pretesting Instrument (Pilot Study)	27
3.5.4 Modification of Instrument	27
3.5.5 Data Collection	27
3.5.6 Data Analysis	28

CHAPTER 4 RESULTS	29
4.1 Introduction	29
4.2 Demographic Characteristics	29
4.2.1 Ethnic, Gender, Age and Status	29
4.2.2 Origin, Education Level, Status as Entrepreneur, Total Area for Vegetables Cultivation	30
4.2.3 Year of Beginning the Cultivation, Number of Type of Vegetable (Currently) Planted and Average Monthly Income	31
4.3 Knowledge, Attitude and Practices towards Sustainable Agriculture	32
4.3.1 Knowledge	32
4.3.2 Comparison between genders, age, education level, status as entrepreneur, year of beginning the cultivation and average monthly income on the total score of knowledge	34
4.3.3 Attitudes	36
4.3.4 Practices	40
4.3.5 Comparison between gender, age, highest education level, status as entrepreneur, year of beginning the cultivation and average income per month on the total score of practices	41
4.4 Correlation between the total score of knowledge and the total score of practices	43
CHAPTER 5 DISCUSSION	44
5.1 Knowledge	44
5.2 Attitude	46
5.3 Practice	48
5.4 Knowledge and Practice Score	49
5.5 Correlation	51
CHAPTER 6 RECOMMENDATION AND CONCLUSION	52
6.1 Limitation of study	52
6.1.1 Instrument or questionnaire	52
6.1.2 Number of respondents	52
6.2 Recommendation for future study	53
6.3 Conclusion	53
REFERENCES	54
APPENDICES	57

LIST OF TABLES

Table	Page
4.1 Ethnic, gender, age and status of the respondents	30
4.2 Origin, highest education level, status as entrepreneur, total area for vegetables cultivation	31
4.3 Year of beginning the cultivation, number of type of vegetable planted (currently) and average income per month	32
4.4a Items used to test knowledge, the frequencies of right answer and the percentage of the right answer	33
4.4b Items used to test knowledge, the frequencies of right answer and the percentage of the right answer	34
4.5a Mean comparison between genders, age, highest education level, status as entrepreneur, year of beginning the cultivation and average income per month regarding total score of knowledge	35
4.5b Mean comparison between genders, age, highest education level, status as entrepreneur, year of beginning the cultivation and average income per month regarding total score of knowledge	36
4.6a Frequencies of items based on Likert-type scale	38
4.6b Frequencies of items based on Likert-type scale	49
4.7 Sustainable agriculture practices practiced by the respondents within the last one year	40

LIST OF TABLES

Table	Page
4.8a Mean comparison between genders, age, highest education level, status as entrepreneur, year of beginning the cultivation and average income per month regarding total score of practices	42
4.8b Mean comparison between genders, age, highest education level, status as entrepreneur, year of beginning the cultivation and average income per month regarding total score of practices	43
4.9 Correlation between total score of knowledge and total score of practices	43

LIST OF SYMBOLS, UNITS AND ABBREVIATIONS

\$	Dollar
%	Percentage
<	Less than
>	More than
FAO	The Food and Agriculture Organization
RQ	Research Question
ICM	Integrated Crop Management
IPM	Integrated Pest Management
IWM	Integrated Weed Management
KAP	Knowledge, Attitude and Practice
NAP3	Third National Agriculture Policy
RM	Ringgit Malaysia
SA	Sustainable Agriculture
SAP	Sustainable Agriculture Practices
SPM	Sijil Pelajaran Malaysia
SPSS	Statistical Package Social Science
SRI	System of Rice Intensification
SSA	School of Sustainable Agriculture
TFC	Territorial Farm Contract
WHO	World Health Organization

CHAPTER 1

INTRODUCTION

1.1 Introduction

Nowadays, demand for high quality vegetables generally increases due to the health awareness among consumers. Quality vegetable means healthy, succulent and fresh looking vegetables with no visible rashes or holes caused by pests or diseases (Jipanin *et al.*, 2001). Therefore, in order to fulfil consumers' needs and to gain maximum profit, the uses of good agriculture practices have not been used anymore.

The uses of pesticides, chemicals fertilizers, mono-cropping, over-tillage and any practices which lead to the degradation of environmental quality become tremendous. Thus, the issue of alternative farming arises to overcome this phenomenon. Sustainable agriculture recently became popular among farmers, researchers and policy makers. As an alternative farming system, it serves to improve the environmental quality and public health.

In Kundasang, Sabah many negative issues arise regarding agricultural activities. The issues mainly related to the environmental quality. Intensive system of vegetables production required a higher level of irrigation as well as high inputs such as fertilizers, pesticides and labour (Anderson *et al.*, 1998).

1.1.1 Sustainable Agriculture

Agriculture implies the purposefully organized application of human creativity and labour and was associated with natural resources such as flora, fauna, soils, water and climate to produce food and other agricultural products to meet societal needs. As one of the most important industries in the world, it supplies food for human and associated with other industries such as engineering, trading and manufacturing. However, nowadays agriculture field faces the sustainability problems due to the extensive and expensive subsidies to agriculture in the industrialized world and extreme poverty and environmental degradation in much of the less developed world (Solomonovich *et al.*, 1997).

Thus, the words "Sustainable Agriculture" arise as the alternative farming system. Recently, sustainable agriculture was being used more and more frequently in conversations about the future of farming. New terms often start out meaning different things to different people, because peoples have their own perception and definition. Therefore, sustainable agriculture has no exception.

A logical meaning of sustainable agriculture is the farming system related to agricultural systems which are capable of sustaining, and being sustained by, present and future generations (Barracough, 2000). This term has emerged as alternative agricultural system to many resource-poor farmers who faces many constraints and as well as to ensure the environmental sustainability (Kassie and Zikhali, 2009). Some associated the term sustainable agriculture with conservation agriculture. Conservation agriculture is the approach used to rebuilding the soil, optimizing crop production input, including labor and optimizes the profit (Dumanski *et al.*, 2006). It was based on optimizing yields and profits, to achieve a balance of agricultural, economic and environmental benefits. Theoretically, conservation agriculture and sustainable agriculture are the same. Sustainable agriculture was also being defined as the ability of any farmland to produce food and other agricultural products in order to satisfy human needs indefinitely as well as having sustainable impacts on the broader environment as well as enhancing environmental quality (Convention on Biological Diversity, 2010). Meanwhile Menalled *et al.* (2008) defined sustainable agriculture as site-specific ranching and farming practices designed to meet current and future needs for food, fiber, energy, and ecosystem services and not limited to the soil conservation,

clean water and biodiversity only. It involves design and management procedures that conserve all resources, minimize waste and avoiding environmental damage, while maintaining or improving farm profitability (MacRae, 1997). Thus, sustainable agriculture emphasizes production and food systems that are giving profit in return, environmentally sound, energy efficient and improve the quality of life for individuals that involves in sustainable agriculture activities.

Sustainability is the key element towards a profitable long-term future for farming and rural areas (Passel *et al.*, 2006). The principles or the components of sustainable agriculture are: economic sustainability which means that in order to truly sustain a farm should be economically profitable; environmental sustainability which means that sustainable agriculture is environmental sound or environmental friendly that have little to zero negative effects to the ecosystem; and should enhance ecological quality and third principles are social sustainability which related to the quality life of the communities involves in sustainable agriculture activities (Kassie and Zikhali, 2009; Dumanski *et al.*, 2006).

However, it leaves a lot of questions, in other words, crucial question (Barracough, 2000). Who will get the benefit and who is willing to perform sustainable agriculture (SA)? What type of system will be used to obtain sustainable farming system? Can it be applied in widely diversified area? Barracough (2000) also stated that "If one takes seriously the declarations of national governments, their international organizations and non-governmental development agencies, agricultural sectors in every country are expected to contribute to food security and hence to dynamic sustainable development". This suggestion implies a lot of cost-effective agricultural production for domestic consumption, exports and imports and even will develop rural markets associated with the production sites for non-agricultural goods and services as well as providing significant contribution from agricultural sources to public revenues and to productive investments (Barracough, 2000).

One of the major objectives of the Malaysian Third National Agricultural Policy (NAP3) was to conserve and utilize natural resources on a sustainable basis. Adopting the strategy which uses the concept of environment-friendly agricultural and forestry practice, there is a hope for a decrease of negative impacts of agriculture activity on the environment.

Sustainable agriculture is a very wide concept. Sustainable food and fiber production should be replicated naturally as one of the principles of the science of agro-ecology (Guthman, 1998). As we know that sustainable food and fiber production was related to the sustainable agriculture due to the production chain; product from agriculture will be processed to produce food. We can assume that in this situation, the component of environment (farming) and economy (food and fiber production) was associated. Safety food production started from the beginning of farming in agricultural activity should concerns on human health (social). Now, three component of sustainable agriculture was present and it can be assumed that SA was applied to produce food. According to Barraclough (2000), "sustainable agriculture could not be viewed only or primarily as farming systems that are technically able and was used to maintain or increase yields while conserving their natural resource base and enhance environment quality without concerning on economic and other social issues that have to be faced simultaneously with ecological ones at all levels from local to global". Decreasing hunger among population requires a higher food production which in turn requires farmers' skills, knowledge and attitudes (Kassie and Zikhali, 2009). This in turn needs an approach in order to succeed.

1.1.2 Sustainable Agriculture Practices

According to Kassie and Zikhali (2009), sustainable agriculture practices include:

- i. Soil and water management, such as, conservation tillage, mulches, cover crop, preventing soil erosion, nitrogen fixing legumes;
- ii. Soil fertility management, such as, application of manures and composts, application of green manures and integrated soil fertility management;
- iii. Crop establishment, such as, planting pits, system of rice intensification (SRI), intercropping and alley cropping; and
- iv. Controlling weeds and pests, such as, integrated pest management (IPM) and integrated weeds management (IWM).

These were the most prominent sustainable agriculture practices.

Kassie and Zikhali (2009) was supported by Menalled *et al.* (2008). Menalled *et al.* (2008) state that among the sustainable practices are: use water and nutrients efficiently; keep soil covered throughout the year; reduce or eliminate tillage in a manner consistent with effective weed control; diversify your farming enterprise to

spread agronomic and economic risk; use cover crops and green manure and/or animal manure to build soil quality and fertility; protect water quality; develop ecologically-based pest management programs; integrate crop and livestock production; increase energy efficiency in production and food distribution; maintain profitability; rotate crops to enhance yields and facilitate pest management.

Although the practice of conservation agriculture on a large scale emerged out of Brazil and Argentina, similar developments were occurring in many other areas of the world, especially North America in zero tillage, and Africa and Asia with technologies such as agroforestry. Approximately 47 % of the zero tillage technology was practiced in South America, 39 % was practiced in the United States and Canada, 9 % in Australia and about 3.9 % in the rest of the world, including Europe, Africa and Asia (Dumanski *et al.*, 2006).

1.1.3 Main Constraints to the Adoption of Sustainable Agriculture Practices

The adoption of sustainable agriculture depends on the spatial variation and temporal variation of the area. It also depends on the situation or the socioeconomic status of the farmers. According to Kassie and Zikhali (2009), several constraints that may impede the adoption of sustainable agriculture are:

- i. Heterogeneity in agro-climatic environments implies that there are no single approach can be applied all over the world in a uniform manner. The reason is due to the variation of agro-ecological condition;
- ii. Biomass availability, such as, crop residues and animal dung because resource-poor farmers depends on it;
- iii. Economic incentives, which was important in the determination of economic viability in both short and long term;
- iv. Access to information is important in order to create awareness and attitudes towards adoption of sustainable agriculture practices;
- v. Land issues, such as, insecurity of land tenure has been proven to be the constraints to any investment;
- vi. Institution as the important agent to promote and facilitate. Without institution, applied research and extension service could not serve as a vehicle for development;

- vii. Lack of proper extension will also become one of the major constraints in order to ensure correct and up-to-date information; and
- viii. Political constraints at the national and international level will play the major role whether or not it is more or less conducive.

1.1.4 Status of Sustainable Agriculture Practices in Kundasang

The study area was situated in the Malaysian state of Sabah. This area was mostly used for agricultural purpose, which was suitable for temperate vegetable production. The level of mechanization was low and most work was done by hand (Anderson *et al.*, 1998). According to Jipanin *et al.* (2001), Kundasang covered 45 % of the total area for vegetable plantation in Sabah.

Forestry and agricultural run-off, which contains fertilizers, pesticides and eroded soils, were the major sources of pollution (Juin *et al.*, 2000). Higher yield of agricultural productivity results largely from the used of high yielding crop varieties which required intensive use of inputs, such as, irrigation water, chemical fertilizers and pesticides (Juin *et al.*, 2000). The excessive use of fertilizers and pesticides for vegetable production in Kundasang leads to potential health risks for the people living downstream due to the pollution it caused. Heavy metals, organic compounds and pathogenic agents are potential pollutants of the river water (Murtedza *et al.*, 2002). This was also supported by Datuk Abdul Rahim Ismail, Minister of Agriculture and Food Industry 2006, said that farmers in Kundasang used excessive use of pesticides. Following this, he said that the Agriculture Department carried out research to develop technology to tackle crop infestation (Daily Express, 2006). In addition, the application of fertilizers may spill into rivers and other water bodies, which can be harmful to human, and the aquatic ecosystems (Juin *et al.*, 2000). The United Nations, in 1990 as cited by Juin *et al.* (2000) stated that in Asia the uses of fertilizer doubled from 1977 to 1987 and the rate of use increased by 7.5 % per annum while the uses of pesticides increased by 57 % per annum in the 1980s. The impacts of the use of fertilizers include the eutrophication of lakes and pollution of rivers.

The general landscape of Sabah faced negative impact due to the shifting cultivation (Juin *et al.*, 2000). This activity involves land clearing by burning vegetative residue and replanting with fast growing crops such as hill paddy, maize, tapioca and

various types of vegetables (Juin *et al.*, 2000). It was reported that a massive fire probably started by farmers preparing land for planting burnt out of control in Kampung Tomis, a foothill village of Mount Kinabalu reported on Daily Express (Daily Express, 2005). This issue gave an impression that the farmers did not apply sustainable agriculture practices because open burning was not encouraged in sustainable agriculture. The consequence, some of the big trees in a nearby forest also caught fire. The farmers were blamed for turning the supposedly temperate climate in Kundasang into another hot tropic (Daily Express, 2005). If this phenomenon continues, the problems of soil erosion and land degradation can be potentially serious.

1.2 Justification of Study

Since the Rio Summit, international organizations, such as, The Food and Agriculture Organization (FAO), the Organization for Economic Co-operation and Development (OECD) and other United Nations (UN) organizations have taken sustainable agriculture on board to some degree and have repeatedly emphasized sustainability as a key issue until it becomes agenda and of course part of the policy-making process (Urech, 2000). Kundasang covered 45 % of the total area for vegetable plantation in Sabah (Jipanin *et al.*, 2001). This area was the main vegetables production area in Sabah. Thus, it is important to study the knowledge, attitude and practice (KAP) of the farmers regarding sustainable agriculture practices. As we know, sustainable agriculture basically is the integration between the aspects of economy, social and environment. If the farmers have not heard or even have no idea regarding to sustainable agriculture practices, how would the future of agriculture in Sabah be in the future? How would the farmers strive for profitable and environmental safe in their farming system?

The population growth and increased population density will substantially influence the availability, quality and sustainability of almost all natural resources in Sabah (Juin *et al.*, 2000). One cannot tell the exact population in future but yet can do some prediction. One thing we can agree is that the population in Sabah will increase in future. This will increase the need for conversion of land to agricultural purposes because high population growth increases consumption and the generation of all kinds of wastes. Therefore, it is now the right time to implement the sustainable agriculture

practices on the farming system in Sabah starting in the vegetables production, and it will lead to other agriculture production such as palm oil and rubber especially.

Sabah is still dependent on agriculture (especially oil palm) as its primary sources of income (Juin *et al.*, 2000). The agriculture activity had negative environmental impacts of current agricultural practices including soil degradation, water contamination, inefficient energy use, loss of plant and animal genetic diversity, and destruction of non-agricultural habitat. Sustainable agriculture is perceived in many aspects to provide solutions to most of these problems (MacRae, 1997). The uses of chemicals in production were very low in comparison to conventional systems, so the environmental and health issues associated with their uses do not occur. Energy use in sustainable systems may be reduced by up to 60 %, depending on the region and production system (MacRae, 1997).

Significant benefits would result by using sustainable agriculture practices, such as, higher net farm income and lower government subsidies to agriculture. Another contribution of sustainable agriculture practices were small to medium size farms could become more available, provide job opportunities, local development and creation of new businesses (MacRae, 1997).

As the first step to know the status of sustainable agriculture in Kundasang Sabah, the knowledge, attitude and practice (KAP) study on farmers should be determined first. By the findings of this study, only then we can plan what is the next step, either to continue implement the sustainable agriculture practices or to find another alternative for agriculture in Sabah. Finding in this research could also be used to design and implement more detailed planning regarding the guidelines and methods of implementation of sustainable agriculture in the region (Reyahi Khoram *et al.*, 2006).

1.3 Objectives of Study

The objectives of this study were:

1. To determine the status of knowledge, attitude and practice of vegetables farmers in the Kundasang area on sustainable agriculture practices; and
2. To examine the relationships between the socio-economic factors of the farmers and their knowledge, attitude and practice towards the sustainable agriculture practices.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

In many developing countries, agriculture plays a vital role in the economy (Sadati *et al.*, 2010). Malaysia during the colonization was an agricultural country as the rubber becomes the main commodity. Although Malaysia was fast developing into an industrial country, agriculture still plays a major role for country. Malaysia has 4.06 million hectares of agricultural land distributed throughout 13 states. Eighty percent of this land was cultivated with industrial crops, such as, oil palm, rubber, cocoa, coconut and pepper (Mohd *et al.*, 2008). In 2006, Malaysian agricultural sector contributed significantly to country's Gross Domestic Product (GDP) and it became the third main industry next to the manufacturing sector and service sector (Mohd *et al.*, 2008). Clearly, Malaysian agriculture has major impact on society, economy and environment.

Nowadays, conventional farming should be replaced by sustainable agriculture. Sustainable agricultural emphasis biophysical, economic and social factors operating at the field, farm, watershed, regional and national scales (Smith and McDonald, 1998). Smith and McDonald idea was the challenges to determine what are sustainable agricultural uses before they are implemented, specifically at the planning stage. Before sustainable agriculture being practiced, planning on how to implement it with suitable methods regarding temporal and spatial variability is very important. They argue that these approaches must include, from the beginning, sustainability criteria. These stages were involving policy makers in order to implement sustainable agriculture practices. Otherwise, implementation of sustainable agriculture practices will become useless.

2.2 Sustainable Agriculture Practices (SAP)

Sustainable agriculture is an approach that has been used to indicate a more economically, environmentally sound and socially responsible system of agricultural production (Mohd *et al.*, 2008). Gamon *et al.* (1994) and her colleagues had conducted a research in Central Iowa regarding the adoption of sustainable agriculture practices. The information of sustainable agriculture practices were given at two Central Iowa Extension Conferences on sustainable agriculture. A month after the conference, an external evaluation was carried out to determine their effect and to know what was influencing the adoption of sustainable agriculture practices. Their findings showed that Central Iowa farmers were interested in long term profitability as the criteria to implement any sustainable agriculture practices. There was an increase on the level of information but there was no significant different between attendees and non-attendees and the level of information could not influence the adoption. Perhaps or it is also possible that the non-attendees received extension education by farm magazines, news or any other sources.

Farmers' perceptions with regards to the profitability and compatibility impacts of selected sustainable agricultural practices were necessary to be elicited. Soil degradation, erosion, water pollution, extreme uses of chemicals, waste of water, damage of natural habitats for wildlife and insects and pests resistance against insecticide and pesticide were only a few of the concerns expressed by environmentalists, ecologists, agricultural professionals, policy makers, farmers and public ((Allahyari *et al.*, 2008; Sadati *et al.*, 2010). Another research conducted in Iowa the following year by Alonge and Martin (1995). They agreed that high productivity of conventional agriculture had been achieved in parallels with massive damage to our environment and troublesome social disruption. Thus they conducted a study aiming to determine the perception of selected farmers regarding sustainable agriculture practices. More specifically, they sought to determine the perception of selected Iowa farmers regarding the profitability and compatibility of selected sustainable agriculture practices and to determine the degree of the adoption of the selected practices. Alonge and Martin (1995) also tried to determine the relationship between farmers' socio-demographic, attitude, perception and their adoption of the selected sustainable agriculture practices. Majority of the respondent perception was positive regarding the profitability and compatibility of the selected practices. What happens in agriculture

was not only an economic issue, yet it also has importance on biological, environmental, social, cultural and ethical aspects (Mohd *et al.*, 2008). If agriculture activity was practiced in an unsustainable manner or system, vital natural and cultural resources and qualities will be lost (Mohd *et al.*, 2008).

A review from McLaughlin and Mineau (1995) and Sadati *et al.* (2010) showed that agriculture had been identified as one of the largest contributors to the loss of biodiversity world-wide. They suggest that we need to fully consider the effects of common agricultural practices, such as, tillage, drainage, intercropping, rotation, grazing, pesticide and fertilizer the environment to preserve the biodiversity and enhance environmental quality. This paper has very good reviews which agreed with Alonge and Martin (1995) that agriculture activity affects the environment. Conservation tillage, as proposed by McLaughlin and Mineau (1995), was an effort to promote sustainable agriculture practices.

Urech (2000) on his paper considers the role of chemical crop protection, particularly in Western Europe. The issues are how sustainable the chemical crop protection? Does it enhance or impede sustainable agriculture? Could it be validated as an enabler of sustainable agriculture? Equally, the adverse effects of elevated pesticide residues in water, soil and crops to man, domestic animals, wildlife and the environment in general, are well recognised and documented (Abdul Rani, 1995). It offers, according to Urech (2000):

- i. Securing the quantity and quality of harvested products;
- ii. Contributing to conservation tillage;
- iii. Forming an indispensable part of Integrated Crop Management (ICM); and
- iv. Keeping land free as a natural habitat for wildlife.

Reyahi Khoram *et al.* (2006) found that the least amount of knowledge was related to the application of non-chemical methods to combat pest attacks. This meant that the farmers were mostly use chemical crop protection methods to combat pest attack which themselves did not realize that they were using one of the sustainable agriculture practices. However, the issue was whether they applied the chemical crop protection using recommended doses or vice versa.

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