UNIVERSITI PUTRA MALAYSIA

ACCEPTANCE OF ORGANO-MINERAL FERTILIZER BY VEGETABLES FARMERS IN BINTULU

NOOR HAYAA IBRAHIM

ACCEPTANCE OF ORGANO- MINERAL FERTILIZER BY VEGETABLES FARMERS IN BINTULU

By

NOOR HAYAA BINTI IBRAHIM

A Project Report Submitted in Partial Fulfilment of the Requirement
for the Degree of Bachelor of Science Bioindustry in the
Faculty of Agriculture and Food Sciences
Universiti Putra Malaysia Bintulu Sarawak Campus

2015

ABSTRACT

According to Department of Statistic of Malaysia, export Value of Agricultural Products (vegetables) in Sarawak in 2004 – 2013 increased from RM 6,133 to RM 14401. This shows vegetables farming is developing and active in Sarawak. Majority of the farmers in Sarawak, especially Bintulu practice conventional farming to gain high yield of vegetables production. Conventional farming resulting in increased for high usage of agricultural inputs, particularly chemical fertilizers that can lead to several problems such as environmental pollution. Therefore, a new environmental friendly agriculture input which is organo- mineral fertilizer should to be introduced to the farmers for sustainable agriculture activity. The objective of this study is to examine the acceptance of organo- mineral fertilizer by vegetables farmers in Bintulu. A survey questionnaire was done to understand farmers' characteristic and acceptance on agriculture activity and fertilizer usage. From this study it was determined that farmers in Bintulu would accept organo-mineral fertilizer based on a few considerations such as the fertilizer price, subsidy, effectiveness to reduce pest, high crop yield and ease of fertilizer handling. Hence, data and information from this study can help government agencies and other related researchers to collaborate to share ideas and construct better approach to introduce organo- mineral fertilizer to the farmers.

ABSTRAK

Menurut Jabatan Perangkaan Malaysia, nilai Eksport Produk Pertanian di Sarawak pada tahun 2004 - 2013 meningkat daripada RM6,133 kepada RM 14,401. Ini menunjukkan aktiviti pertanian yang semakin rancak di Sarawak. Majoriti petani di Sarawak, terutamanya Bintulu mengamalkan pertanian konvensional untuk mendapatkan hasil pengeluaran sayur-sayuran yang tinggi. Pertanian konvensional menyebabkan peningkatan penggunaan input pertanian seperti baja kimia yang boleh menyebabkan beberapa masalah seperti pencemaran alam sekitar. Oleh itu, input pertanian yang baru dan mesra alam sekitar iaitu baja mineral organo perlu diperkenalkan kepada para petani untuk aktiviti pertanian mampan. Objektif kajian ini adalah untuk mengkaji penerimaan baja mineral organo oleh para petani sayur-sayuran di Bintulu. Satu soal selidik kajian telah dilakukan untuk memahami ciri-ciri dan persepsi petani terhadap aktiviti pertanian dan penggunaan baja. Hasil daripada kajian ini didapati majoriti petani sayur- sayuran di Bintulu memberi pandangan yang positif untuk menerima baja mineral organo untuk tanamanan mereka. Penerimaan baja tersebut adalah megikut beberapa kriteria dan keutaamaan seperti harga baja, penerimaan subsidi, kebolehan mengurangkan serangga perosak, hasil tanaman yang tinggi dan kemudahan penggunaan baja. Oleh itu, data dan maklumat daripada kajian ini dapat membantu agensi-agensi kerajaan dan lain-lain penyelidik yang berkaitan untuk saling bekerjasama bagi berkongsi idea dan membina pendekatan yang lebih baik untuk memperkenalkan baja mineral organo kepada petani.

ACKNOWLEDGEMENTS

All praises be to Allah for bestowing me the opportunity, wisdom, and strength to complete this thesis.

I would like to thank my family for their prayers, guidance, and endless support in assuring my success. I also would like to express my sincere gratitude to my supervisor, Dr. Suraya Hanim Binti Mokhtar who has supported me throughout my thesis with her patience and knowledge whilst allowing me the room to work in my own way. Her guidance helped me in all the time of research and writing of this thesis. I could not have imagined having a better advisor and mentor for my thesis writing.

In my daily work I have been blessed with a friendly and cheerful group of fellow friends, thanks to Norshafinaz Binti Mahdah, Fatin Syafikah Binti Ismail, Ummie Nurfarhana Binti Husin and Noor Fadliana Binti Johari for the stimulating discussions, for the sleepless nights we were working together before deadlines, and for all the fun we have had in the last four years and for putting up with each other mood and problems. Thanks to my colleague too Nurfarah Adibah Bt Mohd Rafee, Muhaimin Jaafar and Khairul for helping me to finish this Final Year Project.

Last but not the least, special thanks to UPM staffs and Department of Agriculture of Bintulu for cooperation and providing me with necessary information needed for this study.

APPROVAL SHEET

I certify that this research project report entitled "Acceptance of Organo- mineral Fertilizer by Vegetables Farmers in Bintulu" has been examined and approved as a partial fulfillment of the requirement for the degree of Bachelor Science Bioindustry in the Faculty of Agricultural and Food Sciences, Universiti Putra Malaysia Bintulu Sarawak Campus.

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Dr. Suraya Hanim Binti Mokhtar
Faculty of Agriculture and Food Sciences
Universiti Putra Malaysia Bintulu Sarawak Campus
(Supervisor)

_____

Prof. Madya Dr. Nur Ashikin Psyquay Abdullah
Dean
Faculty of Agriculture and Food Sciences
Universiti Putra Malaysia Bintulu Sarawak Campus

Date:

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CHAPTER 1

INTRODUCTION

1.1 Background of research

Agriculture sectors have been recognized as a third engine of Malaysia's economic growth after the manufacturing and service sectors. Furthermore, agriculture sector are also reemphasized in Ninth Malaysia Development Plan which was conducted between the years of 2006-2010. According to the Ministry of Agriculture (MOA), with the re-branding of agriculture sector to the motto of "agriculture is business", has enabled the agriculture producers to penetrate new markets abroad, recording an average increase of 13 per cent yearly from 2003 to July 2008. The positive development of the agro-food sector has helped the country in reducing the Import Bill and increases its self-sufficiency level of food in the country.

In order to attain food self-sufficiency level, most of the agricultural policies have focused on increasing food production. Due to that, farmers are actively used the easy and fast methods to gain high yield of vegetables production. During that period, the expansion and intensification of cultivation areas were very rapid which resulting in increased for more efficient use of agricultural inputs, particularly fertilizers.

As a result, most of the farmers nowadays utilizing chemical fertilizer onto their plants to increase the production of vegetables rapidly. Unfortunately, the

chemical fertilizer can decrease the soil fertility and lead to phenomenal loss in soil productivity and reduce the water quality.

The negative effects of excess application of chemical fertilizer can be reduced by practicing the sustainable farming system. According to Sustainable Agriculture Research and Education Program (SAREP), the principle concept of sustainable farming is that we must meet the needs of the present without compromising the ability of future generations to meet their own needs. According to Agricultural Sustainability Institute, sustainable agriculture system does not only address many environmental and social concerns, but it offers innovative and economically viable opportunities for growers, laborers, consumers, policymakers and many others in the entire food system. Sustainable farming can be done by introducing new environmental friendly way to reduce the usage of chemical fertilizers by the farmers.

Alternatively, organic fertilizers need to be introduced to the farmers. Organic fertilizer such as manures and composts are good for farming because they are chemically- free, so thus it is more environmentally friendly. Organic fertilizer is composed of elements that are produced in a completely natural manner, without the aid of any synthetically manufactured components or additives. But, organic fertilizer is not effective for rapid and instantaneous fix of plants growth like what chemical fertilizer can do (Bedada *et al*. 2014).

As chemical fertilizer and organic fertilizer both have advantages and disadvantages, a new fertilizer combining the fertilizer together is good to be introduced to the farmers. Replacement of chemical fertilizer with organo- mineral fertilizer is one strategy for reducing the environmental impact of agricultural production. Organo-mineral fertilizer is a type of fertilizer which is produced by organic matter and mineral compounds bound together either chemically or by adsorption with humic acids or materials containing peat, lignite, silts, shales or humus are treated with ammonia, ammoniacal solutions of phosphates or phosphoric acid, and potassium salts. Mostly all of the chemical nutrients contained in organo- mineral fetilizers can be absorbed and used by crops because of organic matter within the fertilizers help to hold the nutrient needed by plants (El-Mageed and Semida 2015).

1.2 Problem statement

Due to the lack of organic materials and too much chemical fertilizers application onto the plants has caused some portion of plant nutrients provided in soil are washed away contaminating underground water supplies, while some other portion crystalizes within the soil in forms that cannot be used by crops. Due to this reason, only small portions of the plant nutrients supplied by chemical fertilizers can be absorbed by the plants. This situation will only lead farmers to apply more chemical fertilizers onto their plants. Unfortunately, most of farmers do not realize this problem because of lack of knowledge. They also have low awareness on the real condition and impact of excessive chemical fertilizer usage. Even some of them might know about the negative impacts, they still have to apply the chemical fertilizers because for them higher productivity and gaining higher income in the short period of time are more important.

Therefore, it is important to indicate the level of the local farmers' awareness on the sustainable farming concept. The information on that will give guidance on the finding ways to make them change or reduce the usage of chemical fertilizers in the future.

1.3 Study objective

The objective of this research is:

i) To examine the acceptance of vegetables farmers towards organo- mineral fertilizer in Bintulu.

1.4 Significant of study

The findings of this research are important to be known and understand by government, specifically the Department of Agriculture and other researchers together to make good collaboration to introduce organo-mineral fertilizers to the local farmers.

CHAPTER 2

LITERATURE REVIEWS

2.1 Introduction

This chapter gives an overview of the farmers' acceptance on sustainable agriculture and fertilizer usage. Section 2.2 discusses the acceptance of farmers towards agriculture inputs. Section 2.3 discusses the government intervention towards fertilizer input. While in section 2.4 provides information about the negative impacts of chemical fertilizer and brief information about organo- mineral fertilizer.

2.2 Acceptance of farmers towards agriculture inputs

Vegetable production currently plays a major role in providing nutrition and income generation and, indirectly, in increasing the quality of life for millions of humans in this planet (Midmore and Poudel 1996). Agriculture is one of the active economic activities in Sarawak and sustainable farming is important to be practice to conserve the environment for future generation to live. According to Agunga and Igodan (2007), sustainable agriculture approach is the overall effort to preserve and prolong the use of the earth's resources by reducing the human toll on the ecosystem, particularly, the use of agricultural chemicals. It is not easy to change the farmer's mindset in a short period of time to reduce the usage of chemical fertilizers in their farming activity.

The farmers' acceptance on new concept of agriculture system such as sustainable farming system can be easily introduced if the farmers are given the knowledge and

exposure about the advantages they would gain in the long- run. Based on a study conducted by Cavane (2011), the farmers supported to reduce the chemical fertilizers usage when they have understand about the agro ecological conditions, change their attitude towards production and traits of improved maize and knowledge of improved varieties. Hence, in order to introduce a new fertilizer like organo- mineral fertilizer, the farmers need to aware about the function, advantages of the fertilizer and the suitability of the fertilizer with the ecological condition.

2.3 Government intervention

The cost of agriculture inputs like fertilizers are very important to the farmers. As the fertilizer's price keep on increasing over the years, the government can play their role in this matter, through subsidy. In a study by (Ramli *et al.* 2012), on *The Impact of Fertilizer Subsidy on Malaysia Paddy/Rice Industry Using a System Dynamics Approach*, shown that simulation fertilizer's subsidy does give a significant impact to the paddy and rice production in the country. It is indicated that, the role of government is important in introducing a new type of fertilizer. Through giving an organo- mineral type of fertilizer's subsidy, it will help to spread the understanding of sustainable farming concept to the local farmers.

Farmers living in rural areas have difficulty to receive latest news and awareness about current problems involving agriculture practices. There is hence a need to ensure the farmers should be informed by responsible government agencies. More frequent field visit is crucial for acceptance verification and monitoring (Rizal *et al.* 2014). Nordin *et al.* (2014) on a similar ground reported that farmers are generally

hindered from receiving the latest information which requires more frequent site visits by the relevant bodies including the suppliers.

2.4 Organo- mineral fertilizers

It is well understood that, the usage of chemical fertilizers will cause environmental impact in the long- term. Hence, a new type of fertilizer that has similar advantages of chemical fertilizer such as rapidly increasing agriculture yields and reduces the negative impact to the environment need to be introduced to the farmers. One of them is organo- mineral fertilizer. The organo- mineral fertilizer is produced by organic matter and mineral compounds bound together either chemically or by adsorption. All of the chemical nutrients that contained in organo- mineral fetilizers can be absorbed and used by crops because the elements of organic matter within the fertilizers help to hold the nutrient needed by the plants. Thus, it is easy for the plants to consume the nutrients they need for growth and reduced the residue of the nutrients (Antille *et. al.* 2013).

The effectiveness of organo- mineral fertilizer was proven by a group of researcher from Mekelle University, Tigray Region in Ethiopia. By integrate the organic matter (cow dung) and chemical fertilizers (Urea and DAP) has successfully increased the maize production yields. It is also supported by other study by MARGHITAS *et al.* (2011), organo- mineral fertilizer has positive influence on the soils physical and agrochemical traits, contributed to the decrease of soil acidity and erosion (characteristic to the mountain area) and diminished the nutrition imbalances and enhancing the effect of mineral fertilizers.

CHAPTER 3

MATERIAL AND METHOD

3.1 Introduction

This chapter discusses the research methodology and data. Section 3.2 and 3.3 provide a description of the place of study and sample selection, respectively. Data sources are discussed in section 3.4 briefly.

3.2 Sampling Site

This social study was held in Bintulu where is a region in Sarawak, in East Malaysia. Bintulu's geographical coordinates located at 3° 10' 0" North, 113° 2' 0" East (see Figure 3.1) approximately 205km away from Miri. Bintulu is chosen as the study place because it was easy to deal with the local people and it was reasonable to do research and contribute to understand and help the farmers as Universiti Putra Malaysia Bintulu Campus itself located in the area.

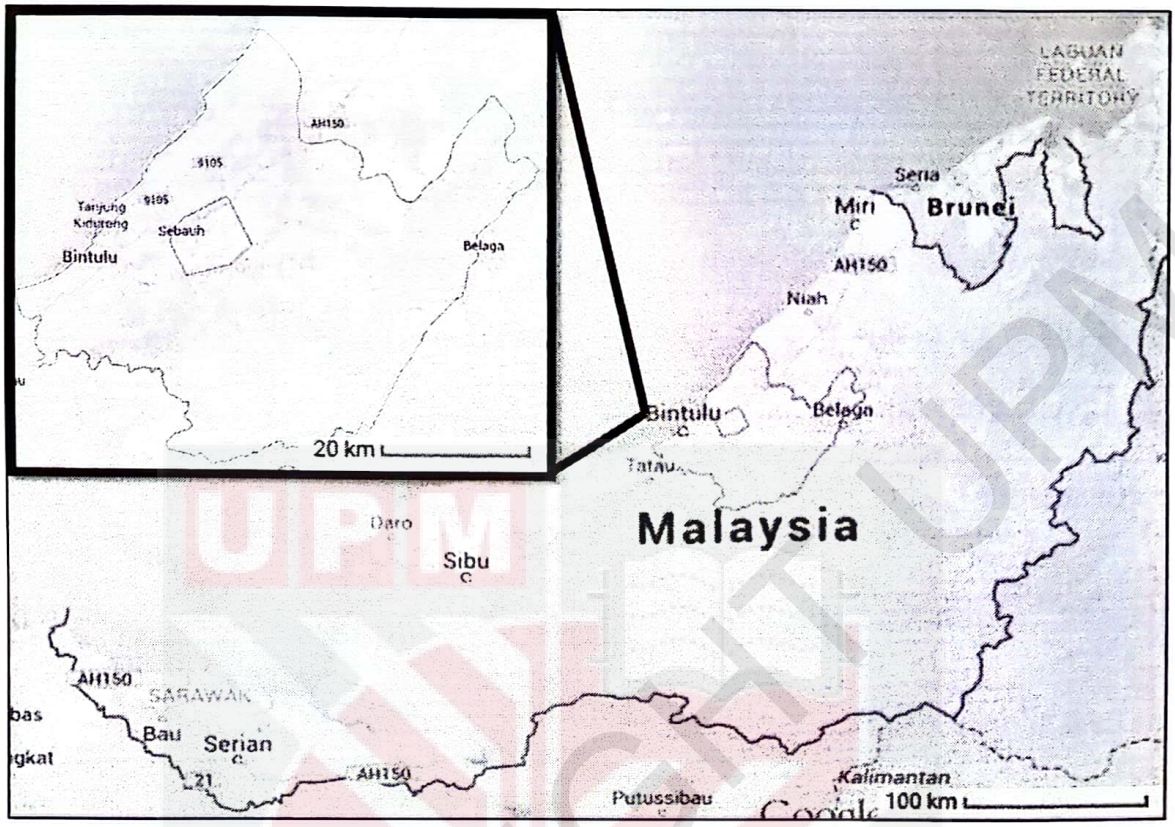

Figure 3. 1 : Sampling area in Bintulu, Sarawak.

3.3 Sample Selection

The respondents were selected by using stratified random sampling method which was to highlight a specific subgroup within the population of farmers in Bintulu based on the farmers registered under the Department of Agriculture Bintulu. The types of vegetables planted by farmers were randomly selected that are consisted various vegetables crop farming, for example chillies, cucumber and mustard. This method was useful because it ensured the presence of the key subgroup within the sample. With this method, a higher statistical precision can be indicated compared to simple random sampling due to the variability within the subgroups was lower in contrast to the variations when coping with the entire population. As this method had high statistical precision, it also means that it only involves a small sample size

which could save a lot of time, money and achievement of this research would be efficacious.

3.4 Data Sources

The primary data which was the survey method through face-to-face interview by using questionnaires to collect the data from vegetable growers in Bintulu was involved 30 respondents and started in April 2015 until May 2015. The secondary data such as reports and statistics were acquired from the Department of Agriculture in Bintulu.

Most of the respondent took about 30 to 40 minutes to answer the questionnaire. The standard questions of the questionnaires were closed-ended questions, which were followed by response options. A few examples of close ended questions were:

- Multiple choice questions (e.g. A, B, C or D)
- Dichotomous or two-point questions (e.g. Yes or No)

However, there were also questionnaires that asked open-ended questions to explore and fathom the answers of the farmers which were no predefined options or categories included and farmers should supply their own answers like the size of cultivated land.

Besides that, contingency questions were also used because this kind of questions effectively avoids asking people questions that are not applicable to them. The questions that were required to be answered only when the respondent provides a particular response to a question asked to them.

In this research, cross-sectional type of survey was done by collecting information from the respondents at a single period in time. Cross-sectional surveys usually utilize questionnaires to ask about a particular topic at one point in time. This survey conducted a cross- sectional survey asking farmers' views on the usage of fertilizers. Besides that, in order to identify the relationship between two variables, cross-sectional surveys were done too. For example, administering a cross-sectional survey about the relationship of effectiveness of fertilizers and the usage of fertilizers among farmers.

There were three section in the survey questionnaire, named as Section A, Section B and Section C respectively. Section A was outlined to gain information about the type of vegetables and fertilizers. Section B emphasized on the factor influence of fertilizer choices. In Section C, information about farmer's demographic and agricultural training participation was collected.

3.5 Calculation Techniques

After the survey was done, the information keyed into Statistical Package for the Social Science software to perform the data analysis. In order to determine the factor of farmers' acceptance towards organo- mineral fertilizer, chi-square (x^2) technique was used. The chi-square (x^2) technique was used to compare the counts of categorical responses between two independent groups, develop a two-way contingency table to display the frequency of occurrence of success and failures for each group.

$x_1, x_2, \ldots, x_k$ (3.5.1)

$x_1 + x_2 + \ldots + x_k = n$ (3.5.2)

Null hypothesis is the probability of each category is equally:

$P_i^* = 1/k, I = 1, 2, \ldots, k$ (3.5.3)

To test the null hypothesis that there is no difference between the two population proportions:

$H_0: \pi_1 = \pi_2$ (3.5.4)

Against the alternative that the two population proportions are not the same:

$H_0: \pi_1 \neq \pi_2$ (3.5.5)

$X^2 = \sum_{i=1}^{k} \frac{(f_o - f_e)}{f_e}^2$ (3.5.6)

Where f_o = observed as frequency of a contingency table and f_e = expected frequency if the null hypothesis is true. The test statistic x^2 approximately follows a chi-square distribution with 1 degree of freedom.

CHAPTER 4

RESULTS

4.1 Introduction

This chapter discusses the analysis of data from the survey on acceptance of vegetables farmers toward organo- mineral fertilizer in Bintulu, Sarawak. Section 4.2 shows the main characteristics of farmers. Section 4.3 explains about the farming activity and the usage of fertilizers by the farmers. Section 4.4 describes about the knowledge on organo- mineral fertilizer. Section 4.5 discusses about factors that influenced farmers to accept organo- mineral fertilizer to be used as a new agriculture input.

4.2 Characteristics of Farmers

This segment describes the characteristics of the farmers involving their demographics and socio- economic characteristics. From the survey questionnaires, 30 respondents were counted according to data collected. As shown in Table 4.1, there were 46.7% female and 53.3% male respondents in this research. Mostly, they were in the age of 45 to 54 years old (33.3%). 70% of them also had non- formal education and only 10% of them had pursued SPM level. Besides that, 83.3% of the farmers never experience any agriculture training and only 16.7% of them used to join agriculture training held by government agencies for example Agriculture Certificate Course (IPSM), Malaysia Good Agricultural Practice (MyGAP) and Agro Entrepreneur Training. Respondents who attended the training, they were organized by Agriculture Department of Sarawak (6.7%) and 3.3% from FAMA. Majority, the courses done by the agencies were held in one day period (6.7%).

Table 4.1 The profile of Bintulu Farmers.

Demographic		Farmers $N_1 = 30$ Count (N_1)	% of (N_1)
Gender			
	Male	16	53.3
	Female	14	46.7
	Total	30	100.0
Ages (in years)			
	18-24	0	0.0
	25-34	6	20.0
	35-44	8	26.7
	45-54	10	33.3
	55-64	4	13.3
	65-74	1	3.3
	75 and above	1	3.3
	Total	30	100.0
Education Level			
	Non- formal	21	70.0
	Standard 6/UPSR	4	13.3
	SRP/PMR	2	6.7
	SPM	3	10.0
	Certificate	0	0.0
	Diploma	0	0.0
	Degree	0	0.0
	Total	30	100.0
Agriculture Training Experience			
	Yes	3	16.7
	No	27	83.3
	Total	30	100.0
Organized by			
	Agriculture Department of Sarawak	2	6.7
	FAMA	1	3.3
	None	27	90.0
	Total	5	10.0
Period of training			
	A day	2	6.7
	A week	1	3.3
	A month	0	0.0
	More than a month	0	0.0
	None	27	90
	Total		100.0

4.3 Agriculture Activity and Fertilizer Used

This section explains about the farmers' farming activity and the usage of fertilizer by them. Majority of the farmers planted vegetables which were 24% chilies, 20.83% eggplant, 19.80% legumes, 16.67% mustard and 14.58% cucumber.

Most of the farmers had cultivated land for agriculture activity within the range 1 to 6 acres. As majority of the farmers done the farming activity for self- sufficiency, 43.3% of them had small 1 acre land size only.

90% of the farmers utilized mix (chemical and organic) fertilizer and none of them use organic fertilizer (compost) wholly onto their farming. The trend of chemical fertilizer types choices for effectiveness of plants growth in a short run were mostly NPK and Urea which are 57.69% and 42.31% respectively. Besides that, 90% of the farmers chose to fertilize their crops using animal manures (unprocessed chicken dung) as organic fertilizer because unprocessed chicken dung is cheaper to buy in market in contrast to other processed organic fertilizer. 76.7% of the farmers are not subsidized for the fertilizers; hence they get the supply from market. 23.3% are subsidized with fertilizer under *Skim Sawah.*

Table 4.2 Characteristic of farm and information of types of fertilizer.

Farmers' Farming Information	Farmers $N_1 = 30$ Count (N_1)	% of (N_1)
Type of vegetables		
Mustard	16	16.67
Legumes	19	19.80
Lady Finger	1	1.04
Chillies	23	24.0
Eggplant	20	20.83
Cucumber	14	14.58
Water Spinach	3	3.13
Total	96	100.0
Land size (acres)		
1	13	43.3
2	3	10.0
3	3	10.0
5	7	23.3
6	3	10.0
14	1	3.3
Total	30	100.0
Fertilizers		
Types of Fertilizer		
Chemical	3	10.0
Organic	0	0.0
Mix	27	90.0
Total	30	100.0
Types of Chemical Fertilizer		
NPK	30	57.69
CRP	0	0.0
GAFSA	0	0.0
Urea	22	42.31
Total	52	100.0
Types of Organic Fertilizer		
Compost	0	0.0
Biochar	0	0.0
Animal manures	27	90.0
Total	27	90.0
Sources of Fertilizer Supply		
Agriculture market	23	76.7
Homemade	0	0.0
Subsidy	7	23.3
Total	30	100.0

Next, this section also discusses about the factors of choosing certain fertilizer types by the farmers. Based on the Table 4.3, majority of the farmers used chemical fertilizer because 83.3% of them admitted it is more effective to gain faster and high crops yield. Most of the farmers (46.7%) also stated it was easier to get the fertilizer supply in Bintulu town.

46.7% of the farmers used organic fertilizer because it was effective for long term effect (act as soil conditioner) and the price of unprocessed chicken dung was still affordable to buy.

Some of the farmers who do not use organic fertilizer stated the reasons are because processed organic fertilizers (biochar, animal manure compost) are expensive (20%) and the cheap organic fertilizer (unprocessed) is not really effective for plant growth.

There were 80% of the farmers used 30% chemical fertilizer and 70% organic fertilizer composition. They used small composition of chemical fertilizer because chemical fertilizers have quick and effective action, so they only need to apply in small amount compared to organic fertilizer.

Table 4.3 The usage of fertilizers by the farmers.

Factors of Different Fertilizers Usage	Farmers $N_1 = 30$ Count (N_1)	% of (N_1)
Chemical Fertilizer		
Cheaper than processed organic fertilizer	10	33.3
It is more easy to get the supply	14	46.7
More effective	25	83.3
Easy to use and not smelly	4	13.3
Subsidised	3	10.0
Apply in small quantity	1	3.3
Total	57	189.9
Organic Fertilizer		
Effective for long term effect	14	46.7
Decrease pest population	0	0.0
No negative effect on environment	5	16.7
Cheaper (for non-processed fertilizer)	14	46.7
Homemade	0	0.0
Total	33	110.1
Reason Not To Use Organic Fertilizer		
Expensive (processed fertilizer)	6	20.0
Hard to get the supply	5	16.7
Lack of knowledge	2	6.7
Low effectiveness	6	20.0
No subsidy	0	0.0
Total	19	63.4
Fertilizers Composition		
Chemical Fertilizer Composition		
30	24	80.0
50	3	10.0
100	3	10.0
Total	30	100.0
Organic Fertilizer Composition		
0	3	10.0
50	3	10.0
70	24	80.0
Total	30	100.0

4.4 Farmers' Knowledge on Organo- mineral Fertilizer

Based on Table 4.4, this section explains the knowledge of the farmers about organo-mineral fertilizer. 100% of the farmers did not know about organo- mineral fertilizer. This is because organo- mineral fertilizer is a new type of fertilizer and it is not in the market yet. Besides that, they were also did not get any information about this new type of fertilizer from government agencies. Hence, they were not aware about organo- mineral fertilizer.

Table 4.4 Knowledge of farmers on organo- mineral fertilizer.

	Farmers $N_1 = 30$	
Knowledge About the Fertilizer	Count (N_1)	% of (N_1)
Know About Organo- mineral Fertilizer		
Yes	0	0.0
No	30	100.0
Total	30	100.0
Experience of using the fertilizer		
Yes	0	0.0
No	0	0.0
Total	0	0.0
Source of Information		
Jabatan Pertanian	0	0.0
From internet	0	0.0
From colleagues	0	0.0
Total	0	0.0

4.5 Factors Considered by Farmers on Acceptance of Organo- mineral Fertilizer

This section (Table 4.5) discusses about the factors that would influence the acceptance of the farmers to use organo- mineral fertilizers onto their crops. The chi-square (x^2) test was used to test whether there was significant difference between the farmers who had agreed (Yes) or disagreed (No) in each of factors given.

Table 4.5 Factors considered by farmers to choose organo- mineral fertilizer.

Acceptance		Farmers $N_1 = 30$ Count (N_1)
Cheaper Price		
	Yes	29**
	No	1
	Total	30
Subsidised		
	Yes	26**
	No	4
	Total	30
Easy to Use		
	Yes	29**
	No	1
	Total	30
High Yield		
	Yes	29**
	No	1
	Total	30
Effective to Reduce Pest		
	Yes	29**
	No	1
	Total	30
Have Support from Agriculture Department		
	Yes	29**
	No	1
	Total	30

Note: **, Represent 5% significant level.

This section discusses about the farmers' priority according to the factors consider to accept organo- mineral fertilizers. As shown in Table 4.6, it was clear that price of the fertilizer played an important role for farmers to accept the new fertilizer. Most of the farmers would consider buying organo- mineral fertilizer if the price is not expensive and affordable to be paid.

The second priority, they were really concern about the effectiveness of the fertilizer to produce fast and high crop yield. Third priority, of them would accept organo-mineral fertilizer if the fertilizer being subsidised by government. The fourth priority was the ease of handling the fertilizer should be easy. The last priority that they considered was the effectiveness of the fertilizer to reduce pest.

Table 4.6 Priorities of organo- mineral fertilizer acceptance.

		Farmers $N_1 = 30$	
		Count (N_1)	% of (N_1)
Priorities	Ranking		
Prices	1	16	21.62
Subsidy	3	8	10.81
Effective to reduce pest	5	25	33.78
High crop yield	2	10	13.51
Easy to use	4	15	20.27
Total	-	74	100.0

CHAPTER 5

DISCUSSION

5.1 Introduction

This chapter provides a discussion of the research findings. Section 5.2 presents a summary of the objectives and major findings. Section 5.3 discusses the implications of the research findings.

5.2 Summary and Major Findings

As agriculture sector becoming more important for Malaysia's economic and to attain self-sufficiency level of food production, pollution coming from conventional farming is increasing with the excessive usage of chemical fertilizers. Sarawak is one of the largest areas for vegetables production in Malaysia with majority of the farmers using conventional farming practices. Hence, this will lead to negative impacts to the environment and the people's health.

Most of the farmers nowadays believe that high quantity and quality of vegetables depends wholly on the chemical fertilizers without considering the effects to the environment and human health. The farmers use organic fertilizer such as chicken dung just as soil conditioner and not as the main fertilizer because organic fertilizer is not effective to gain high crops yield in short period of time. The problem can be reduced by introducing new agriculture input which organo- mineral fertilizer that promotes sustainable agriculture is and overcome the negative effects of excessive usage of chemical fertilizers.

There are not many researchers studying on the acceptance of farmers toward the usage of organo- mineral fertilizer. In order to introduce organo- mineral fertilizer, this research is conducted to examine the farmers' acceptance about the fertilizer. It is also important to understand the farmers' need and priorities in choosing fertilizers. Hence, the level of acceptance of new agriculture input can be indicated.

This research was held in Bintulu, Sarawak where the people living in rural areas of Bintulu worked and did agricultural business for self- sufficiency. They were randomly selected in vegetables farming. The face-to-face survey was started in April 2015 until May 2015. This research was done by using primary and secondary data. Primary data was based on the survey questionnaires and the secondary data was from reports and statistics by Agriculture Department in Bintulu. The acceptance of the farmers toward organo- mineral fertilizer was determined by using chi- square χ^2 technique. (χ^2) is used to compare the counts of categorical responses between two independent groups.

The findings cover the main objective of the study which is to determine the acceptance of Bintulu vegetables' farmers towards organo- mineral fertilizer. This can be done by studying the characteristics of fertilizer the farmers used and identify the factors that influenced farmers' consideration to accept the fertilizer to be used onto their crops.

5.3 Implications of the Research Findings.

The findings of this research are important to be known and understood by government, specifically the Department of Agriculture and other researchers together to make good collaboration to introduce organo- mineral fertilizers to the local farmers. Hence, the main goal to encourage the usage organo- mineral fertilizer to reduce the bad impact of excessive chemical fertilizer usage can be achieved.

5.3.1 The Profile of the Vegetables Farmers in Bintulu

Based on Table 4.1, the numbers of respondents were almost similar regarding gender which is 46.7% female and 53.3% male. This indicates that there is no significant relationship between gender and acceptance of the farmers in Bintulu towards the usage of fertilizer.

Most of the farmers were in the age of 45 to 54 years old (33.3%). No younger farmers were found working at the age of 18 to 24 years old. This shows that majority of them were adults who did the farming activity and vegetables business as a main source of income for family support such as for their children education.

As most of the farmers were busy adults who responsible for their family, they were less likely to join agriculture training organized by government agencies as shown in Table 4.1, only 16.7% of the respondents attended the training. According to a study by Burton (2014), stated that majority of studies examining the relationship between age and environmental behaviour suggest that younger farmers are more likely to undertake programs or environmental enhancements than older farmers.

Agriculture training is an important medium for the farmers to gain information to learn and raise awareness about fertilizers from government extension agent. But majority of the farmers did not have awareness and interested about the important of joining agriculture training. Particular attention should be given to public extension to strengthen farmers' attitudes towards agriculture practices.

The level of education of the respondents showed 70.0% of the farmers did not have any formal education and only 30.0% of them succeeded to have formal education in school. Farmers who had formal education had showed positive understanding about the usage of fertilizers and its effects than farmers who learned about fertilizers or farming from friends and family. Education's ability to change attitudes and increase understanding of complex issues provides a clear rationale for its role in promoting environmental behaviour. Consequently, it is widely believed that the higher the level of formal education the more likely the farmer will be to engage with environmental programs and approaches to agriculture (Burton 2014).

5.3.2 The Usage of Fertilizers by Farmers

Based on Table 4.2, farmers in Bintulu planted various vegetables such as chilies, mustard, cucumber and water spinach that are popular among the local people diet. Hence, the farmers needed to use chemical fertilizers for the vegetables to grow faster to meet the everyday demand from consumers. The data in Table 4.2 showed that majority of the farmers used chemical fertilizers such as NPK and Urea onto their plants because chemical fertilizer is more effective than organic fertilizer. For

example, optimum available phosphorus (P) during the early growth stages of cucumber can maximize crop yields (Liang *et al*. 2015).

Besides that, 90% of the farmers used mix (chemical and organic) fertilizers. Chemical fertilizer was important for effective plants' growth and organic fertilizer was also important for long term effect as soil conditioner and to retain the good condition of soil especially in drought season. Organic matter increases the moisture holding capacity of soil because organic particles absorb water like a sponge and plants can use some of this water (Schulte and Kelling 1981).

In Table 4.2, the farmers used unprocessed chicken dung as organic fertilizer. They used unprocessed chicken dung because it was cheaper than processed organic fertilizer such as biochar. Livestock manure is an excellent source of organic matter (Schulte and Kelling 1981). However, an organic material high in nitrogen, such as manure or sewage sludge, could provide too much nitrogen causing excessive top growth or ground water contamination if too much was applied (Schulte and Kelling 1981).

Some of the interviewed farmers claimed that they want to do homemade compost because it was cheaper and environmental friendly but they did not have enough organic waste to make the organic fertilizer. The farmers could get the organic waste from oil palm plantation but the neighbouring plantations used the organic wastes for their own plantation activities. So, it was easier for the farmers to just use the available fertilizers in market.

This result indicates that, most of the farmers need to buy two types of fertilizers separately for their farming activity and causing them to spend more money. By using organo- mineral fertilizer which is the chemical and organic materials are bound together as a fertilizer, could reduce money spent on fertilizers. The farmers also do not have to waste their energy to apply different fertilizers at a different time. Besides that, the effectiveness of organo- mineral fertilizer was proven by a group of researcher from Mekelle University, Tigray Region in Ethiopia. By integrate the organic matter (cow dung) and chemical fertilizers (Urea and DAP) has successfully increased the maize production yields.

In Table 4.2, some of the farmers (23.3%) were granted with fertilizers from government subsidy under *Skim Sawah*. From that, they just use fertilizer supplied by government agencies to grow their vegetables too. This shows that, government subsidy play an important role to influence the usage of fertilizers by farmers. Hence, it is a great way to introduce organo- mineral fertilizer to the farmers through government intervention.

5.3.3 Acceptance of Organo- mineral Fertilizer by Farmers

In Table 4.4, farmers in Bintulu did not have knowledge about organo- mineral fertilizer. But, when a few numbers of the farmers were briefly explained about advantages of organo-mineral fertilizers during the face-to-face survey, they did showed interest to try the new fertilizer.

Based on Table 4.5, majority of the farmers' stated positive responds to accept organo- mineral fertilizer with given consideration in the survey questionnaires which are:

i. The price of organo- mineral fertilizer is cheaper or affordable.

ii. Government subsidised the new fertilizer.

iii. The fertilizer is easy to handle and use during fertilization.

iv. The fertilizer can give high crops yield and good performances like chemical fertilizers.

v. The fertilizer is effective to reduce pest hence the farmers can save money on pesticide.

vi. The usage of the fertilizer has support and monitored by Agriculture Department in Bintulu.

In Table 4.6, the farmers had ranked their priorities based on the factors considered to accept organo- mineral fertilizer as a new agriculture input. The first priority was the price of the fertilizer. This is because most of the vegetables farmers in Bintulu were small-scale farmers with limited or no education hence they could not afford overly expensive fertilizer for their farming activity. Second priority was the effectiveness of organo- mineral fertilizer. With high demand of vegetables supplies from consumers, the farmers really need effective fertilizer that can work well with the environment and soil condition to gain high crops yield.

The third priority was the government intervention such as giving the farmers subsidised organo- mineral fertilizer. They also hope there would be systematic subsidised fertilizers distribution among the farmers. There is hence a need to ensure that the subsidized fertilizer is supplied to and received only by eligible farmers which require efficient communication management, specifically between the suppliers and consumers (Rizal *et al*. 2014).

The fourth priority was the ease of use to handle the fertilizer by the farmers during fertilization. Hence, they could save time and energy for the fertilization. The last priority was the effectiveness of the fertilizer could reduce pest attack. This is because chemical fertilizers are easily attracted the pest attack, plants grown with manure had lower densities of flea beetles during population peaks than those chemical fertilizer at similar nutrient levels (Eigenbrode and Pimentel 1988). Fertilizer is an important component of agricultural systems and its effects on pests and natural enemies will influence agro ecosystems (Garratt *et al*. 2011).

CHAPTER 6

CONCLUSION

From this study it is indicates that the farmers in Bintulu would accept organo-mineral fertilizer based on a few considerations such as the fertilizer price, subsidy, effectiveness to reduce pest, high crop yield and ease of fertilizer handling. This study's findings are important for the government agencies and related researchers to be well informed by them. This is because the findings are important for them to collaborate in order to introduce organo- mineral fertilizer to the local farmers. Organo- mineral fertilizer is a new hope for sustainable agriculture practices that could benefit both environment and human safety. Therefore, producers or farmers are need to be aware through extension programs and also training and promotional activities to become conscious of sustainable organic farming with use of those agricultural input like organo- mineral fertilizer to reduce the hazards for the environment or endanger the health of soil, plants, animals, humans and ecosystems. For further study, the acceptance of organo-mineral fertilizer should be extended to other places in Malaysia with high agriculture activity.

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APPENDICES

(A) (B)

(C) (D)

(E) (F)

Figure 3.2 (A) Vegetables sold by farmers at a stall, (B) Farmers grading the legumes after harvesting, (C) Lady fingers growing at a vegetable garden, (D) Fresh legumes harvested by farmers, (E) Cultivated land for vegetables farming., (F) Cultivated land grew with vegetables.

PUBLICATION OF THE PROJECT UNDERTAKING

This is to certify that I have no objection to publish the project entitled "Acceptance of Organo- mineral Fertilizer by Vegetables Farmers in Bintulu" by the supervisor in a join authorship. However, it has to be evaluated by the Faculty of Agriculture and Food Sciences, Universiti Putra Malaysia Bintulu Sarawak Campus and published in the form approved by the faculty.

Noor Hayaa Binti Ibrahim

Date: