EFFECT OF INCORPORATED DIFFERENT TYPES OF ORGANIC FERTILIZERS WITH SOIL OF PLOT-17 SPL-UMS ON GROWTH AND YIELD OF PADDY VARIETY TQR-8

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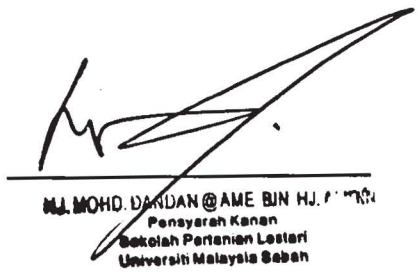

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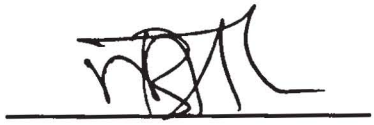

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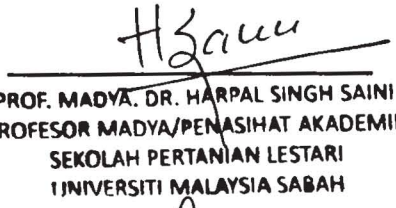

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ABSTRACT

A study was conducted on paddy variety TQR-8 with different types of organic fertilizers incorporated with soil of assigned for paddy plot 17 SPL-UMS. The objectives of this study were to identify the effect of using different types of organic fertilizers towards the growth and yield of paddy and to identify which was the best organic fertilizer that can improve the fertility of the soil located at the paddy plot 17 SPL-UMS. The study was conducted at the rain shelter house in school of Sustainable Agriculture (SPL), Universiti Malaysia Sabah with the coordinate of 5° 55′ N and 118° 02′ E and it started on 22nd June 2012 until 22nd October 2012. Treatments that have been used were Poultry manure, Goat manure, Bio-S Organic fertilizer, Vermicompost , Bokashi EM and NPK (90: 60: 60) kg/ha as the control and the effects of the treatments towards paddy plant were examined based on vegetative growth, yield component and soil fertility parameters. This experiment was done using Complete Randomized Design (CRD) and was analyzed using one-way ANOVA. Paddy seedlings were transplanted in the pot with two seedlings for each treatment. The rate of fertilizer application was based on the recommended rates for respective treatments. According to the results, for vegetative growth (plant height, culm height, number of tillers and percentage of productive tillers) overall showed having significant different mean values ($p < 0.05$) for all treatments. Bio-S showed high plant height (111.73 cm) and culm height (76.84 cm) compare to other treatments. Poultry manure showed high percentage of productive tiller (95.47%). Goat manure has the highest value for number of tillers (24 tillers). For yield component, the parameters (number of panicles, length of panicles, number of grain per panicle, number of filled grain per panicle, number of empty grains per panicle, percentage of filled grain, weight of1000 grain and extrapolated yield) showed having mean value of significant different ($p < 0.05$) among the treatments. Goat manure has the highest number of panicle (24 panicles), highest number of grains per panicle (121 grains), high number of filled grains (108 grains), lowest number of empty grains (14 grains), high percentage of filled grains (89.43%), high weight of 1000 grains (29.29 g) and high extrapolated yield of 8.9 tons per hectare. For soil fertility, vermicompost increased the percentage of Nitrogen content from 0.0004% to 0.0011%. In conclusion, Goat manure is the suitable organic fertilizer that can give good growth and yield of paddy variety TQR-8. From this study, farmers who are planting paddy crop in the same type of soil as plot 17 SPL-UMS are encouraged to use goat manure with the rate of 20 ton per hectare because it produce high yield.

KESAN SEBATIAN BEBERAPA JENIS BAJA ORGANIK DENGAN TANAH PLOT 17 SPL-UMS TERHADAP PERTUMBUHAN DAN HASIL PADI VARIETI TQR8

ABSTRAK

Kajian ini telah dilakukan ke atas padi varieti *Tuaran Quality Rice* 8 (TQR-8) dengan menggunakan beberapa jenis baja organik yang disebatikan dengan tanah plot 17 SPL-UMS. Objektif kajian ini adalah untuk mengenalpasti kesan baja organik yang terlibat ke atas pertumbuhan dan hasil padi dan untuk mengenalpasti baja organik yang paling sesuai untuk memulihkan kesuburan tanah di plot 17 SPL-UMS. Kajian ini dijalankan di dalam sebuah rumah lindungan hujan yang terletak di Sekolah Pertanian Lestari, Universiti Malaysia Sabah dengan koordinat 5° 55' N dan 118° 02' E dan bermula pada 22 Jun 2012 sehingga 22 Oktober 2012. Rawatan beberapa baja organik yang digunakan ialah baja tahi ayam, baja tahi kambing, baja organic Bio-S, vermikompos, Bokashi EM dan NPK (90:60:60) kg/ha sebagai kawalan dan kesan rawatan ke atas padi telah dikaji berdasarkan parameter pertumbuhan, komponen hasil padi dan kesuburan tanah. Penanaman padi telah dilakukan secara mengubah ke dalam pasu penanaman. Pemberian baja dilakukan mengikut kadar yang telah disyorkan bagi setiap rawatan yang berbeza. Berdasarkan keputusan kajian, dari segi pertumbuhan (ketinggian tanaman, ketinggian *culm*, bilangan anakan padi dan peratusan anakan produktif) secara keseluruhan mendapatkan hasil kajian perbezaan nilai min yang signifikan ($p<0.05$) bagi semua rawatan. Baja Bio-S memberikan ketinggian pokok yang tertinggi iaitu 111.73 cm dan ketinggian *culm* yang tertinggi iaitu 76.84 cm. Baja tahi ayam pula memberikan peratusan anakan produktif yang tinggi iaitu 95.47%. Baja tahi kambing memberikan bilangan anakan padi yang tertinggi iaitu 24 anakan. Dari segi komponen hasil pula (bilangan tangkai, panjang tangkai, bilangan butiran, bilangan butiran penuh, bilangan butiran kosong, peratus butiran penuh, berat 1000 butiran (g) dan unjuran hasil tan sehektar) menunjukkan perbezaan min yang signifikan ($p<0.05$). Baja tahi kambing memberikan bilangan bilangan tangkai yang tertinggi iaitu 24 tangkai, bilangan butiran setangakai yang tertinggi iaitu 121 butir, bilangan butir kosong yang terendah iaitu 14 butir, peratusan butir penuh yang tinggi iaitu 89.43%, berat 1000 butir yang tertinggi iaitu 29.29g dan unjuran hasil yang tertinggi iaitu 8.6 tan sehektar. Bagi kesuburan tanah, vermikompos dapat meningkatkan peratus kandugan Nitrogen dalam tanah dari 0.0004% ke 0.0011%. Kesimpulannya, baja tahi kambing merupakan baja organik yang dapat memberikan pertumbuhan dan hasil yang memberangsangkan pada padi variety TQR 8. Daripada kajian ini juga, para petani yang menggunakan jenis tanah seperti di plot 17 SPL-UMS amat digalakkan menggunakan baja tahi kambing dengan kadar 20 tan sehektar kerana ia memberikan hasil yang tinggi.

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LIST OF SYMBOLS AND ABBREVIATIONS

%	percentage
≥	Equal or more than
°C	degree celcius
ANOVA	Analysis of Variance
Ca	Calcium
CEC	Cation Exchange Capacity
cmol	centimol
CRD	Complete Randomized Design
EM	Effective Microorganism
g	gram
ha	hectare
K	Potassium
kg	kilogram
Mg	Magnesium
MOP	Muriate of Potash
N	Nitrogen
OM	Organic Matter
P	Phosphorus
SOC	Soil Organic Carbon
SOM	Soil Organic Matter
SPL	Sekolah Pertanian Lestari
SPSS	Statistical Package for Social Science
TQR-8	Tuaran Quality Rice 8
TSP	Tri Super Phosphate
UMS	Universiti Malaysia Sabah

LIST OF FORMULAE

$\%N = [(V-B) \times M \times R \times 14.01 / Wt \times x1000] \times 100$

Where: V = Volume of 0.01 M H_2SO_4 titrated for the sample (mL)
B = Digested blank titration volume (mL)
M = Molarity of H_2SO_4 solution
14.01 = Atomic weight of N
R = Ratio between total volume of the digest and the digest volume used for distillation
Wt = Weight of air-dry soil (g)

CHAPTER 1

INTRODUCTION

1.1 Introduction

School of Agriculture, UMS is surrounded by Silabukan series soil which is made up of mudstone and alluvium parent materials. The soil is high in clay content of Acrisols that is low in total Nitrogen, moderate to high amount of available Phosphorus, low Cation Exchange Capacity due to its acidity and low in soil organic matter and soil organic carbon (Bavani, 2010; Norhafizan, 2010; Ligunjang, 2010). This type of soil having poor structural stability due to high clay particles and internal porosity of aggregate is low when drying thus making the pores collapse

Since the soil is low in fertility and the soil structure is poor when there is climate change, incorporating the soil with organic matter such as organic fertilizer or chemical fertilizer can help to improve the soil. Organic matter on the other hand can help to loosen the clay minerals in the soil by improving the structure, aggregates and aeration of the soil. It helps by loosen the clay particles and increase crumb formation by adding air spaces which makes flow of water between the spaces and improve drainage of soil. It provides nutrients that are essential for plant growth and thus making carbon dioxide available for plant assimilation. Evaluation of the soil physical properties and soil fertility is important to ensure the optimum production of agronomic or horticultural crops.

Paddy is one of the main crop grown in Malaysia and it contribute to the economic benefits to farmers. It is said that rice is known as the staple food for most of the Asian country (Corales and Higa, 2000). It is estimated that the human population in Malaysia is 28.7 million and thus the population number will increase gradually (Department of Statistics Malaysia, 2012). Eventually, our food security will be

inadequate to sustain the increasing number of Malaysian citizens. Rice growers in Malaysia are decreasing due to lack of land and also low interest from the younger generations.

Available soil nowadays unfertile or the soil condition and structure are not suitable to grow paddy. Farmers tend to use high amount of chemical fertilizers with the intention of increasing the nutrient content of the soil and providing adequate amount of nutrients to paddy so that farmers can get high production of paddy per hectare. Farmers are not aware that excessive application of chemical fertilizer can harm the environment thus cause harmful effect to human health. They will also decrease the pH of the soil and destroy important microbial in the soil. The soil fertility will decrease and in the end will affect the paddy plantation growth and productivity.

The common NPK fertilizer that farmers used is Urea, Tri Super Phosphate and Muriate of Potash. Not many farmers practice apply organic fertilizer in paddy plantation because in chemical fertilizer the nutrient contents will dissolve faster in the soil thus provide all the essential nutrients for paddy growth compare to other organic fertilizers which is a slow releasing nutrients. But, some farmers have interest in incorporating livestock manures in paddy soils because it has the possibility of recycling valuable components such as organic matter, N, P and K with little added cost (Myint, *et.al.,* 2010).

In this experiment, organic fertilizers that were used are poultry manure, Bio-S organic fertilizer, goat manure, Effective Microorganism Bokashi and vermicompost. These fertilizers were compared with chemical NPK fertilizer (90:60:60) kg per hectare which act as a control. NPK fertilizer with the rate of (60: 30: 30) kg per hectare will be incorporated with organic fertilizer as the treatments. NPK fertilizer is used was control because it is the common fertilizer used by farmers in paddy farm. Comparison were made between all the treatments to identify which treatment can provide high amount of nutrients in the SPL soil type and give high yield of paddy production.

In previous research by Sharifuddin, *et. al.* (1995), states that Effective Microorganism that apply with organic amendments give high yields of rice and vegetables compare to chemical fertilizers. Besides that, application of vermicompost

and farm yard manure produce optimum amount of Basmati rice yield of 4.05 tonnes per hectare and also improve the rice grain and soil structure (Singh, Y.V. *et. al.*, 2007).

1.2 Justification

SPL-UMS Sandakan has assigned plot 17 as plot for paddy plantation. This experiment is conducted to help in improving the soil condition and fertility in that area so that it will be favorable for planting paddy. The soil in SPL Sandakan is high in clay minerals and mudstones and the soil condition is unbearable as the climate change. The soil will be hardened and in clod structure when it is in dry condition whereas when it is in wet condition, the soil will be muddy and water will be retained on the surface. Crops will not survive on this soil due to its low in fertility, porosity and pH. When soil pH is low, the CEC of the soil will also decrease. CEC is important to maintain plant available Calcium (Ca^{2+}) ion, Magnesium (Mg^{2+}) ion and Potassium (K^{+}) ion in the soil which will be a good indicator for soil quality and productivity.

Paddy can grow in any types of soil textures varying from heavy clay loam to sandy loam but soils that having 35% of clay is more suitable because it can retain water (Jabatan Pertanian Perak, 2009). SPL soil is said to have high clay content, low total Nitrogen ranging of 0.00% to 0.21%, moderate to high of available Phosphorus with the range of 11.34 mg kg^{-1} to 90.71 mg kg^{-1} (Bavani,N., 2010), soil organic carbon of 0.2 to 1.76% (Norhafizan, 2010), pH of 3.5 to 5.6 and low in CEC (Ligunjang, 2010). These conditions might produce low yield and poor growth of paddy.

It is said that if incorporating organic materials in acrisols, it can help to increase the fertility especially in total N, available P, soil organic matter and carbon which is essential for plant growth especially paddy crop. Adding organic materials into the soils also help to increase the soil's CEC.

Different types of organic fertilizers will be used such as poultry manure, Bio-S organic fertilizer, sheep manure, vermicompost and Bokashi EM to examine which organic fertilizer can help to improve the soil thus help to sustain the growth of paddy. These organic fertilizers will be incorporated in the soil together with NPK fertilizer with the rate of 60 N: 30 P: 30 K as the recommended rate of fertilization done in Sabah. If one of the organic fertilizer treatments can help improve the soil and give high yield of

paddy compare to chemical NPK fertilizer, then the organic treatment can be recommended to the SPL-UMS. With this also, they can produce organic rice which is good for the health and also to environment.

1.3 Objectives:

1. To identify the effect of using different types of organic fertilizers towards the growth and yield of paddy.

2. To identify which is the best organic fertilizer that can improve the structure and fertility of the soil at the allocated paddy plot 17 SPL-UMS.

1.4 Hypothesis:

H_o: There is no significant difference in using organic fertilizers towards the soil structure and fertility and the growth and yield of paddy variety TQR-8.

H_a: There is significant difference in using organic fertilizers towards the soil structure and fertility and the growth and yield of paddy variety TQR-8.

CHAPTER 2

LITERATURE REVIEW

2.1 Paddy

The paddy variety that was used in this experiment is paddy variety TQR-8. This paddy variety was produced by the Paddy Agronomy Section of Agriculture Research Centre, Sabah (Refer to appendix B). Paddy cultivation in Malaysia needs the temperature of 18°C to 40°C and rainfall of 1240 mm annually. This variety takes about 130 days to 135 days to mature. This variety can produce up to 5.5 ton to 7.7 ton per hectare.

Raychaudhuri *et. al.* (1962) states that suitable soil condition for high yield of wet-land paddy cultivation that have the capability to retain water on the surface for example silty clay loam, clay loam and clay loam with less permeability. Table 2.4 shows favorable soil chemical properties for paddy plantation.

Table 2.4: Soil Chemical Properties of Fertile Paddy Soil

Chemical Characteristic	Composition
pH	5.5-6.5
Nitrogen	2-3%
Phosphorus	> 40ppm
Potassium	> 0.1 cmol
Soil CEC	> 20 cmol
Organic Carbon	2-3%

Source: Jabatan Pertanian Perak, 2009

2.2 Soil Properties

It is important to know the soil series of certain soil before using the soil for agricultural purposes. This is important to prevent losses because crops have its own adaptation with soils. When knowing the soil type, it is easy to evaluate the soil physical properties such as the soil structure, porosity, bulk density, water and moisture holding capacity, soil pH, organic matter content and available Nitrogen and Carbon in the soil.

2.2.1 Soil Series and Soil Type

Appendix A1 and A2 shows the soil series that are going to be taken and it is of Silabukan series which consist parent materials of mudstone and alluvium soil. This soil series consists of several main soil units such as Gleyic, Ferric and Orthic Acrisols and Gleyic, Ferric, Chromic and Orthic Luvisols.

2.2.2 Soil Physical Properties

This soil have the ability to retain water due to its high clay content in Acrisols. Acrisols usually found in the tropic and sub-tropic region with high rainfall conditions. These soils is low in fertility due to extreme deficiency of macro and micro nutrients and acidic due to aluminium toxicity (FAO, 2000).

Based on recent studies, soil analysis taken from these soils having pH reading range from 3.5 to 5.6 whereas the cation exchange capacity (CEC) of K, Ca and Mg content is said to be low with values ranging between 0.26 to 1.34 $cmol_c\ kg^{-1}$, 0.11 to 1.00 $cmol_c\ kg^{-1}$ and 0.44 to 1.63 $cmol_c\ kg^{-1}$ respectively (Ligunjang, 2010). The CEC reading is low due to low CEC activity in clay minerals. These conditions thus contribute to low fertility of these soils.

The SOM and SOC for this soil analysis is range between 0.34 to 3.03% and 0.2 to 1.76% respectively (Norhafizan, 2010). Readings of 0.34 to 3.03% for SOM is said to be low to very low (Cambardella *et. al.*, 1994). Besides that, exposure to inconsistency of rainfall and temperature can cause extreme weathering and leaching. This problem can lead to high rate of organic matter in the soil to decompose and loss thus making the soil infertile for crop cultivation.

Since these soils are tend to be extreme weather and leach due to the climate of the study area, study shows that it have low soil total Nitrogen with the range of 0.00 to 0.21% and moderate to high of available Phosphorus with the range of 11.34 mg kg^{-1} to 90.71 mg kg^{-1} (Bavani, 2010). Tropic soils have high clay content, easily weathered and leached, low fertility and thus low total Nitrogen (Harrison *et. al.*, 2006; Bretzler, 2005; Kamaruzaman, 2004). However Nitrogen is important for the development of chlorophyll and protein for the crops especially paddy.

2.3 Organic Fertilizer

Addition of organic matter into this soil can help to improve it by loosening the heavy soil (clay particles). Besides that, OM also can contribute nutrients into the soil thus increasing the fertility of the soil and making it available for crops. OM also acts as a buffer especially for sudden climate change such as drought or heavy rainfall. Organic matter can be obtained from organic fertilizers that can be easily found in the market nowadays.

Incorporating livestock manures in paddy soils has the possibility of recycling valuable components such as organic matter, N, P and K with little added cost (Myint, *et.al.,* 2010). Combined application of organic manure and chemical fertilizer could increase the uptake efficiency of plant nutrients by plants (Yeoh, 1987). Besides that, combination of organic manure and chemical fertilizer could narrow down the negative nutrient balance while improving the soil fertility (Singh and Yadav, 1994; Sharma, 1995).

2.3.1 Poultry Manure

Poultry manure is one of the organic fertilizers that is easily and readily available in market especially in Sabah. Farmers that practices organic farming in paddy plantation usually used poultry manure as their fertilizer to substitute the usage of chemical fertilizer. It can be readily available either in solid or liquid form (Arun, 2009). Below is the nutrient composition content in poultry manure.

Table 2.2 Nutrient Composition Content of Poultry Manure

utrient Content	Composition
Organic matter (g kg^{-1})	662.0
Organic C (g kg−1)	384.0
C: N ratio	15.2
Total mineral N (mg kg−1)	20.3
P (%)	0.56
K (%)	0.72

Source: Arun, (2009)

Based on the experiment conducted by Warman (1986), poultry manure applied at the rate of 33.6 wet t ha^{-1} out-yielded other amendments such as fertilizer and dairy manure by giving the highest essential nutrient uptake. But, both poultry manure and dairy manure organic carbon in clay soil. Another study also states that, poultry manure (chicken manure) gives good growth and high productivity in paddy which is 13.86 tonness per hectare (Marianah, 2010).

Muhammad *et.al* (2003) states that application of poultry manure of 20 tons per hectare will produce high paddy yield. Marianah (2010) also states that poultry manure (chicken manure) help to change the pH of the soil from acidic to alkaline which give good value to the soil pH. Usage of poultry manure (chicken manure) can help to increase the total Nitrogen content in the soil (Ariffin *et.al.*, 2006).

2.3.2 Goat Manure

Based on Arun, K.S. (2009), sheep manure contains 3% N, 1% P_2O_5 and 2% K_2O. Levels of N and P in the soil will increase with the application of animal manure in the soil attributed to the increase of microbial activities as a result of increase nutrient concentration (Maerere *et. al.*, 2001). Goat manure with the rate of 10 to 15 tons per hectare can give high yield high tiller number. (Duarsa *et. al.*, 1997; Subramaniam, 1997).

2.3.3 Bokashi Effective Microorganism

Effective Microorganism is a fermentation culture with the mixture of microorganism of soil foundation. This technology was founded by Dr. Teruo Higa at the University of Ryukyus, Okinawa, Japan (Higa, 1991). It contains populations of lactic acid bacteria and yeasts and smaller numbers of phototrophic bacteria, filamentous fungi and Actinomycetes (Higa and Parr, 1995) and abundant in a liquid media at a pH below 3.5 (Higa, 2001).

Effective Microorganism when applied with organic amendments gives high yields of rice and vegetables compare to chemical fertilizers (Sharifuddin *et. al.*,1995). Bokashi derive from microbially fermented organic fertilizer that can that made up of various agricultural and industrial organic wastes such as palm oil mill effluent (POME) and empty oil palm fruit bunch (EFB) (Sharifuddin *et. al.*, 1995). Bokashi organic fertilizer will provide nutrients to plants. In the study conducted by Iwaishi (2000), it found out that yield increases for about of 12% with paddy rice at low fertilisation rate and of 3% at high fertilisation rate, if only organic fertilisers were fermented with EM.

2.3.4 Vermicompost

Vermicompost is a simple biotechnological process whereby organic waste product have undergone the transformation process by worm activities to a better end product (Arun (2009). These organic waste products consist of farm wastes, garden wastes, kitchen waste and animal manure. Vermicompost act as an organic fertilizer thus also as a soil conditioner. Suthar (2007) states that decomposition of organic waste product by the activity of the earthworms help in increasing the mineralisation and conservation of nutrients.

Incorporating vermicompost in soil is one of the good management practices in agricultural production system whereby it help to stimulate microbial growth and activity and increasing the soil fertility and quality (Arancon et al., 2006; Ferreras et al., 2006). In previous study done by Ismail (1997), vermicompost has been found to give a favourable influence on yield parameters of paddy like plant height, number of tillers, panicles per hill, grain weight, total yield and grain yield compared to application of chemical fertilizers.

Vermicompost contains five times higher of Nitrogen content, seven times higher of phosphorus content, eleven times higher of potassium content and 1.5 times higher of calcium content compare to top soil and thus helping in paddy growth especially in tillering and spikelet formation (Parvatha, 2008). Table 2.3 shows the nutrient content in vermicompost.

Table 2.3 Nutrient Composition Content of Vermicompost

Nutrient Content	Composition
Organic matter (g kg−1)	311
Humic C (g kg−1)	64.8
Total N (g kg−1)	13.5
C: N ratio	11.5
P (mg kg−1)	8.1
K (mg kg−1)	12.6

Source: Arun (2009)

2.3.5 Bio-S Organic Fertilizer

This organic fertilizer contains 5% N, 5%P and 5%K, trace elements ≥16%, organic matter 59% and Effective Microorganism. This fertilizer is formulated based on the theory of "Balance Nitrogen Structure and Soil Fertility". It is a mixture of quality plant-based organic matters and German founded agrochemicals 'Zen Fei Dan" with effective microorganism. It is a bio-degradable product which are able to provide more balance nutrient and capable of providing effective solutions on soil fertility and high quality of agriculture products. It is used commercially in the agriculture system especially in oil palm plantation, vegetable farms, coconut plantation and pineapple farms. Bio-S Organic 5:5:5 has the following characteristics and benefits:

- Ability to improve the soil pH level, enhance supply of nitrogen which resulted a healthier plant.
- Improve and enhance the roots development, breaking up the plant cells and stimulates its growth.
- Loosen the soil structure which improves oxygen penetration and water retention thus will increase soil fertility.

- Dilute and dissolve toxic elements in the soil which prevent friability of roots and increase plants resistance against diseases.
- High presence of EM in the fertilizer could control the bacteria and insects.
- Ability to prevent and control the problem of excessive sodium in the soil.
- Increase productivity and quality of agriculture products thus increase farmer's income.
- It is bio-degradable and environmental friendly product.

When using Bio-S organic fertilizer, make sure it does not mix with any limestone, fungicides or pesticides as this will reduce the effectiveness of the fertilizer. It is recommended that the organic fertilizer is mixed with compound fertilizer to give better result. There are no studies conducted in using this organic fertilizer especially in paddy plantation. So, if this fertilizer can produce higher yield compare to chemical fertilizer then usage of this organic fertilizer can be recommended to farmers.

2.4 Effect of Organic Fertilizers on Growth and Yield of Paddy

Adequate and balance supply of plant nutrients is important to maximize crop production. Major nutrients required by paddy plant are Nitrogen, Phosphorus and Potassium. Adding organic fertilizer alone to plants might not provide all the required nutrients needed as organic fertilizer is a slow nutrient release. Adding organic fertilizers with inorganic fertilizers is said can increase the growth and grain yield of rice and thus it is a complementary in meeting the nutrients requirements of rice plants (Naing *et. al.*, 2010).

Dobermann and Fairhurst (2000) stated that combination of organic manure with inorganic fertilizers can contribute better physiological growth, improve soil structure and fertility and improved availability of macronutrients in soil. Addition of these organic fertilizer can produce high tillering which can contribute to high number of panicle number per hill (Fageria *et. al.*, 2003).

From the findings of Muhammad *et. al.* (2003) and Marianah (2010), it stated that poultry manure with rate of 20 ton per hectare that combine with inorganic fertilizer can help in growth and yield components of paddy plant. In addition, mineralization of N from poultry manure under low land paddy cropping can

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