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THE RELATIONSHIP OF CLAY PARTICLES WITH ORGANIC MATTER FROM THE DECOMPOSITION OF GREEN MANURE CROP (JACK BEAN) ON PADDY FIELD IN NORTHEAST OF THAILAND

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ABSTRACT

Green manure is an organic fertilizer that is derived from to plow the plants still fresh in the soil while the plant is fully grown or in the flowering period. The most popular green manure crops are the jack bean, cowpea and sunn hemp, etc. The green manure, it consists part of rapid and slow decomposition. Biodegradable part sooner will be the nitrogen source for the plant to grow. Cellulose, hemi-cellulose and lignin are slow to decompose about 20% of the plant material will add organic matter to the soil. Based on previous research, it is found that increasing the organic matter in the soil to make the soil particle dispersion, soil water uptake and soil nutrient uptake is good. However, due to the organic matter, it decomposes faster in tropical climates. It is a source of nutrients in the soil in a short time. It was also found that clay particles were more resistant to degradation than organic matter and could extend the life of the organic matter in soil, thus slowing the decomposition of organic matter. For this reason, the study of the relationship between clay particles and organic matter in soils is important.

The study indicated that organic matter after cutting down green manure crop for a period of 15 days was increased. In the 30 days and 45 days, the organic matter content decreased as well as compared to before the experiment. The part of clay particles found that have a lower content compared to before the experiment after cutting down green manure crop for a period of 15 days, 30 days and 45 days, etc. In studying the relationship between organic matter and clay particles are found that organic matter is correlated with quantity of clay particles in a positive direction after the a period of 15 days, 30 days and 45 days. This is probably due to decomposition of organic compounds, causing the clay particle linked compounds "cementing agent" which is the substance that causes the soil particles to adhesive in soil aggregate. As a result, the amount of clay particles increased when organic matter was added to the soil. And also found that the green manure crop decomposition period increase will likely minimize the amount of organic matter in the soil and found that the decrease in the quantity of clay soil particles tend to rise during 15 days and 30 days. But during 45 days found that will likely decrease, etc..

INTRODUCTION

Soil of Northeast in Thailand is mostly sandy soil. There is an abundance of low. Most of the soil lacks organic matter because it is in a hot and humid climate zone, which is a high temperature. Decomposition of organic matter and parent material is rapid as a result soil loss of plant nutrients is quite high. At present, the farmer use a lot of chemical fertilizers in the area, lacking in soil maintenance for a long time affect to changes in soil structure, the soil is more acidic, soil nutrients are less beneficial to plants.

For this reason, it is necessary to improve the soil with organic matter. Organic matter is commonly used in many areas, such as manure, compost and green manure. However, because manure and compost have limits on the amount of use, moving is not easy and not enough to needs of farmers. Therefore, the use of green manure for soil improvement is an important will help to increase organic matter and soil nutrients, especially nitrogen, to soil. Seeds can also be easily found, easy to move and has easy handling.

Green manure is an organic fertilizer that is derived from to plow the plants still fresh in the soil while the plant is fully grown or in the flowering period. The most popular green manure crops are the jack bean, cowpea and sunn hemp, etc. The green manure, it consists part of rapid and slow decomposition. Biodegradable part sooner

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will be the nitrogen source for the plant to grow. Cellulose, hemi-cellulose and lignin are slow to decompose about 20% of the plant material will add organic matter to the soil. Although there is a small content but using a green manure in a long period will be able to add organic matter in to soil. (Ishikawa, 1988; Alexander, 1997) The current rate of decomposition of organic matter is more than the rate added to the soil, thus making it not able to increase the quantity of organic matter, with enough soil due to the hot and humid climate, there is no soil management and lack of biomass turnover both in organic material or organic matter back to the soil. At the same time the tilled resulting in biological oxidation of humus as a result, organic matter content to reduced. The reduction of organic matter has an effect on the reduction of crop yield. Therefore, the addition of organic matter is only a continuous treatment of organic matter in the production area. Based on further studies, which found that the clay particles resistant to decay than organic matter, and can extend the lifetime of organic matter in the soil, longer by making the decomposition of organic matter occurs slowly. For this reason, the study of the relationship between clay particles and organic matter in soils is important.

OBJECTIVE

1) To study the relationship between clay particles, with organic matter derived from the green manure crop decomposition (jack bean) in paddy field.
2) To study the relationship between the decomposition period of green manure crops (jack bean) with the clay particle and organic matter content in the soil.

MATERIALS AND METHODS

Materials

1) Seed of green manure (jack bean)
2) Soil sampling equipment such as spade, plastic bag, etc.
3) Chemical fertilizer, measuring tape, weighing

Methods

1) Experimental Plan in Observation Trial by using green manure crop (jack bean) rate of 10 kg / rai.
2) Selected areas of farmers is the paddy field. The area is divided into 5 x 5 m^2, plot of 4 plots, the distance between the plot is 1.5 m.
3) Soil samples collected before trial to analyze the soil physical properties was sand, silt, clay and soil chemical properties was organic matter, etc.
4) One time to plow the soil to plant green manure crop (jack bean) at the rate prescribed in each treatment and then sow the seed of green manure crop into the area and plow again.
5) When the green manure crop grows until the flowering stage or is fully grown in each treatment and then cutting down it in to the soil. After that collects soil samples period of 15 days, 30 day and 45 day in each treatment to analyze soil chemical and physical properties at 30 cm of soil depth. Soil samples were collected at 5 sites per plot, including soil samples for 1 sample in each plot.
6) Recorded soil data before trial, after shuffling 3 times of green manure crop such as 15 days, 30 days and 45 days. Soil samples were collected in the intermediate area, convert each 3 point of soil depth 0-30 cm and include 1 sample of each plot to analyze the physical and chemical properties of the soil.
7) Analyze data by statistical analysis which is analyzed using regression equations, it focuses on the relationship between two variables are independent variables and variables. The independent variables used in the study were organic matter in the soil and variable used in study is the content of clay particles. By using linear regression analysis, which is a simple linear regression model from SPSS.

THE RESULT

Relationship between Organic Matter and Clay Particles

1) After Shuffling of Green Manure Crop)Jack Bean) 15 days

The result revealed that organic matter in period of 15 days on average will have increased, that is, before the experiment 0.71% and after experiment 0.79% which will vary the clay particles content is reduced by prior experiments 3.18% and 1.37% after trial. (Table 1) The relationship between clay particles and organic matter after 15 days of shuffling (Figure 1) showed that the amount of organic matter was correlated with the amount of clay particles in the positive direction. This means that if the organic matter content increase, the amount of clay

particles increases. But if the amount of organic matter decreases, the amount of clay particles decreases as well, which is determined by $R^2 = 0.036$. However, the number of soil samples is too small, so the results are not clear.

Table 1 Organic matter and clay particles after shuffling 15 days average 2 year

Soil Sample	Organic Matter)%(		Clay Particle)%(	
	Pre - Trial	After Shuffling	Pre-Trial	After Shuffling
1	0.71	0.80	3.18	0.92
2	0.71	0.61	3.18	1.60
3	0.71	0.68	3.18	0.57
4	0.71	0.53	3.18	1.98
5	0.71	0.73	3.18	1.33
6	0.71	0.85	3.18	1.03
7	0.71	1.15	3.18	2.16
8	0.71	1.03	3.18	1.37
Mean	0.71	0.79	3.18	1.37

Note: Soil Analysis (2011)
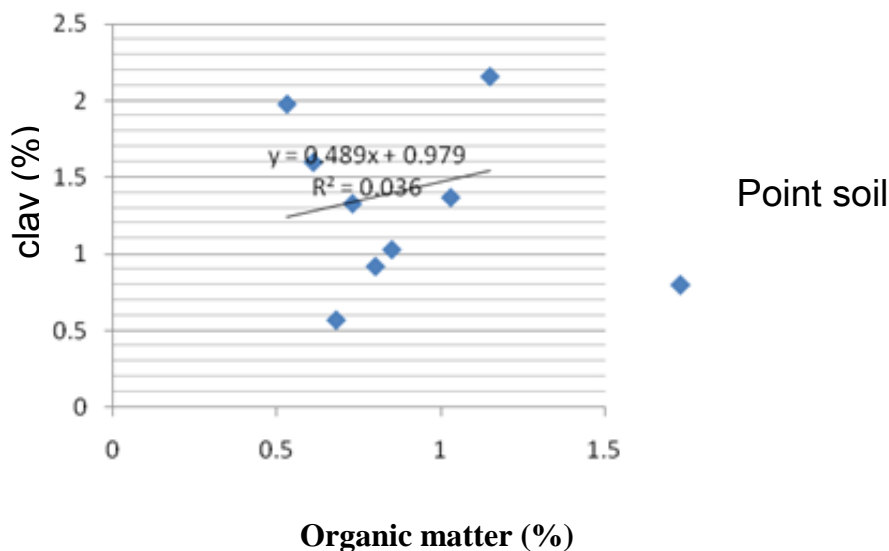

Organic matter (%)

Figure 1 The relationship between organic matter and clay particles after shuffling 15 day average 2 year

After Shuffling of Green Manure Crop)Jack Bean) 30 days
The result revealed that organic matter in period of 30 days on average will have decreased, that is, before the experiment 0.71% and after experiment 0.63% which is consistent the clay particles that will be a decrease in quantity as well by prior experiments 3.18% and 2.64% after trial. (Table 2)

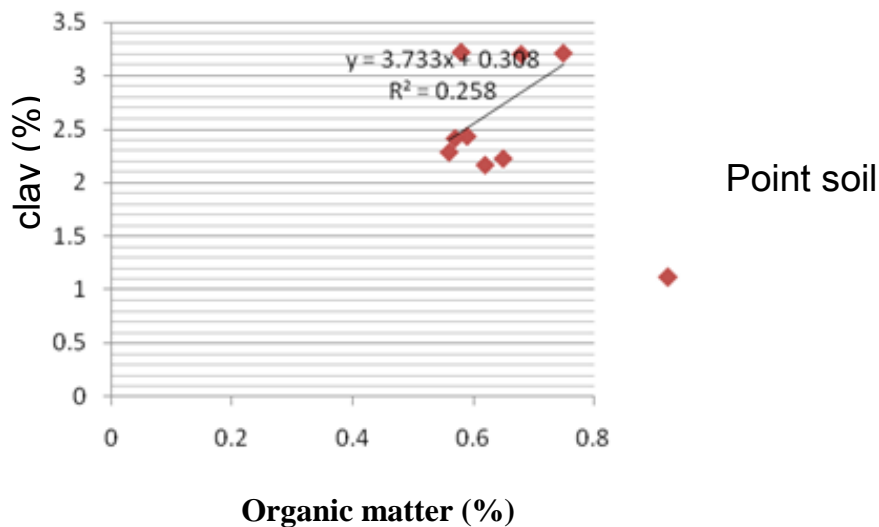*Table 2 Organic matter and clay particles after shuffling 30 days average 2 year*

Soil Sample	Organic Matter)%(		Clay Particle)%(	
	Pre - Trial	After Shuffling	Pre-Trial	After Shuffling
1	0.71	0.56	3.18	2.28
2	0.71	0.68	3.18	3.20
3	0.71	0.62	3.18	2.16
4	0.71	0.58	3.18	3.22
5	0.71	0.75	3.18	3.21
6	0.71	0.65	3.18	2.22
7	0.71	0.59	3.18	2.43
8	0.71	0.57	3.18	2.41

| Mean | 0.71 | 0.63 | 3.18 | 2.64 |

Note: Soil Analysis (2011)

The relationship between clay particles and organic matter after 30 days of shuffling (Figure 2) showed that the amount of organic matter was correlated with the amount of clay particles in the positive direction. This means that if the organic matter content increase, the amount of clay particles increases. But if the amount of organic matter decreases, the amount of clay particles decreases as well, which is determined by $R^2 = 0.258$, etc.

Organic matter (%)
Figure 2 The relationship between organic matter and clay particles
after shuffling 30 days average 2 year

After Shuffling of Green Manure Crop)Jack Bean) 45 days
The result revealed that organic matter in period of 45 days on average will have to decreased, that is, before the experiment 0.71% and after experiment 0.50% which will consistent the clay particles that will be a decrease in quantity as well by prior experiments 3.18% and 2.53% after trial. (Table 3) The relationship between clay particles and organic matter after 45 days of shuffling (Figure 3) showed that the amount of organic matter was correlated with the amount of clay particles in the positive direction. This means that if the organic matter content increase, the amount of clay particles increases. But if the amount of organic matter decreases, the amount of clay particles decreases as well, which is determined by $R^2 = 0.013$. However, the number of soil samples is too small, so the results are not clear.
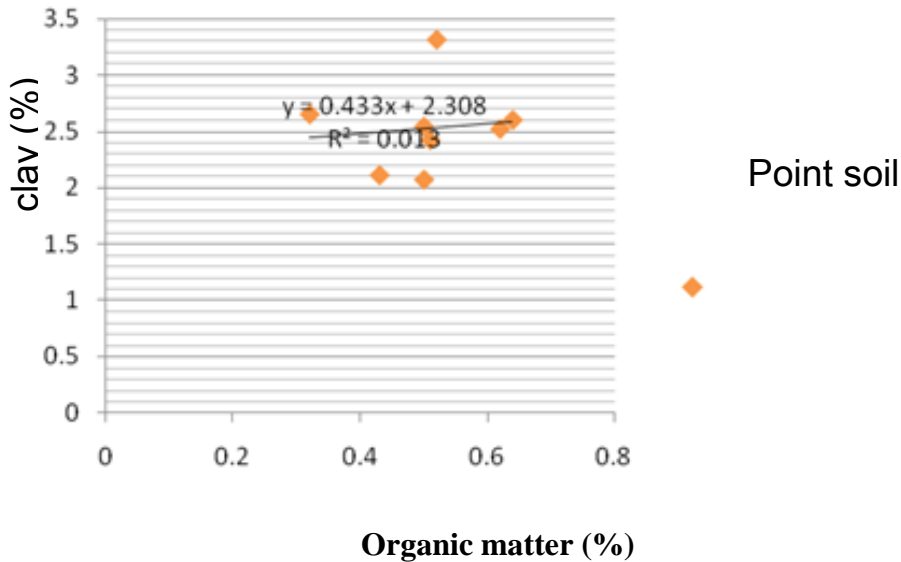
Table 3 Organic matter and clay particles after shuffling 45 days average 2 year

Soil Sample	Organic Matter)%(		Clay Particle)%(	
	Pre - Trial	After Shuffling	Pre-Trial	After Shuffling
1	0.71	0.52	3.18	3.31
2	0.71	0.64	3.18	2.60
3	0.71	0.51	3.18	2.42
4	0.71	0.32	3.18	2.65
5	0.71	0.43	3.18	2.11
6	0.71	0.50	3.18	2.54
7	0.71	0.62	3.18	2.52
8	0.71	0.50	3.18	2.07

| Mean | 0.71 | 0.50 | 3.18 | 2.53 |

Note: Soil Analysis (2011)

Organic matter (%)
Figure 3 The relationship between organic matter and clay particles
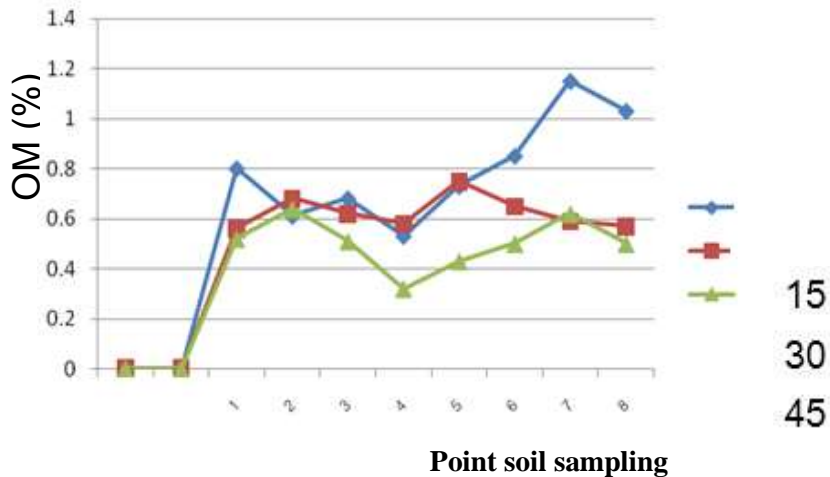*after shuffling 45 days average 2 year*

Period of Decomposition to Changes in Organic Matter and Clay Particles
1) Period of Decomposition to Changes in Organic Matter
The result revealed that organic matter after shuffling in period of 15 days, 30 days and 45 days on average will have to decrease by equal to 0.79%, 0.62% and 0.50%, etc. (Table 4) And considering the relationship between duration of decomposition green manure crop to changes organic matter in rice field area (Figure 4) found that when the period of decomposition increased quantity of organic matter decomposition in rice area will tend to decrease.

Table 4 Period of decomposition to changes in organic matter in soil average 2 years

Soil Sample	After Shuffling 15 Days		After Shuffling 30 Days	After Shuffling 45 Days
	Organic)%(	Matter	Organic Matter)%(	Organic Matter)%(
1	0.80		0.56	0.52
2	0.61		0.68	0.64
3	0.68		0.62	0.51
4	0.53		0.58	0.32
5	0.73		0.75	0.43
6	0.85		0.65	0.50
7	1.15		0.59	0.62
8	1.03		0.57	0.50
Mean	0.79		0.62	0.50

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Point soil sampling

Figure 4 The relationship between period of decomposition green manure crop to changes organic matter in rice soil

Period of Decomposition to Changes in Organic in Clay Particles

The result revealed that clay particle after shuffling in period of 15 days, 30 days and 45 days on average will have to increase by equal to 1.37%, 2.64% and 2.52%, etc. (Table 5) And considering the relationship between duration of decomposition green manure crop to changes clay particle in rice field area (Figure 5) found that when the period of decomposition increased the quantity of clay particle in rice field will tend to decrease.

Soil Sample	After Shuffling 15 Days	After Shuffling 30 Days	After Shuffling 45 Days
	Clay Particle)%(	Clay Particle)%(	Clay Particle)%(
1	0.92	2.28	3.31
2	1.60	3.20	2.60
3	0.57	2.16	2.42
4	1.98	3.22	2.65
5	1.33	3.21	2.11
6	1.03	2.22	2.54
7	2.16	2.43	2.52
8	1.37	2.41	2.07

Mean	1.37	2.64	2.52

Table 5 Period of decomposition to changes in clay particle in soil average 2 years
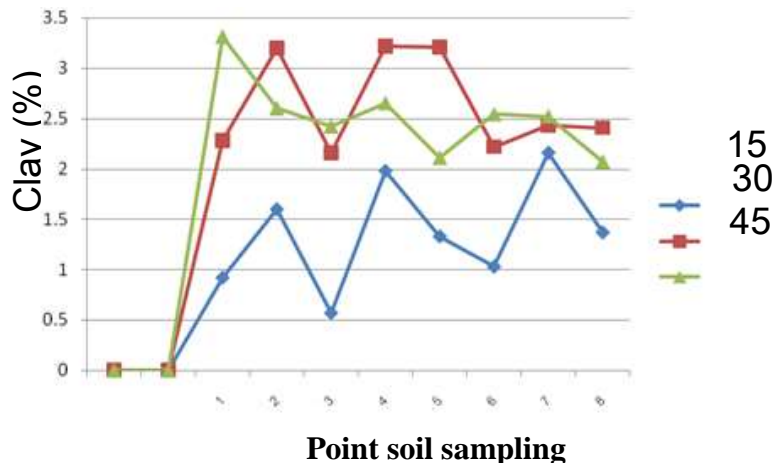

Point soil sampling

Figure 5 The relationship between period of decomposition green manure crop to changes clay particle in rice soil

CONCLUSION AND DISCUSSION

1) The organic matter after shuffling of green manure crop for a period of 15 days was increased. In the 30 days and 45 days, the organic matter content decreased as well when compared before trial. In the part of clay particle found that after shuffling 15 days, 30 days and 45 days of shuffling green manure crop was lower than before trial.

2) The organic matter content was correlated with the amount of clay particles in the positive direction after 15 days, 30 days and 45 days. This may be due to the decomposition of organic matter, causing the clay particle linked compounds "cementing agent" which is the substance that causes the soil particles to adhesive in soil aggregate. As a result, the amount of clay particles increased when organic matter was added to the soil

3) The green manure crop decomposition period increase will likely minimize the amount of organic matter in the soil and found that the decrease in the quantity of clay soil particles tend to rise during 15 days and 30 days. But during 45 days found that will likely decrease, etc.

SUGGESTION

1) In the next study, more soil samples should be collected so that the data will be more accurate and to reduce error in the experiment.

2) It can be store data on relationship between decomposition periods of clay particles with organic matter derived from green manure crop into a database for monitoring change to the next area.

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