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# Amelioration of Planting Media in Chili Cultivation with Floating System in Lebak Swamp

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**Key Words:** Floating Farming, Chicken Manure Compost, Lime, Chili

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## Abstract

The purpose of this study was to determine the effect of chicken manure compost and agricultural lime on chemical characteristics of planting medium, growth and yield of chili in floating farming system. Three treatments: (1) Control, (2) Agricultural lime, and (3) Chicken manure compost were arranged in a completely randomized design and applied to floating planting media consisting up local vegetation (water mimosa and kiambang). Several soil chemical characteristics: soil pH, contents of organic C, $NH_4^+$, $NO_3^-$, available P, and exchangeable K were observed after a-7 day of incubation, while measurement of plant height and yields of chili were conducted at first harvest (90 days). Results of study showed improvements in soil pH, contents of organic C, $NH_4^+$, $NO_3^-$, available P, and exchangeable K with the application of lime and chicken manure compost to the planting media. Plant height increased from 26.6 cm in the control to 35.8 cm in lime treatment, and to 54.5 cm in chicken manure compost treatment. The highest yield of chili was obtained in the chicken manure treatment. The study results indicate that the use of chicken manure compost is the most effective treatment for enhancing growth and yield in the plant floating farming system in the lebak swamp.

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**Introduction**

Rawa Lebak is an agricultural land agroecosystem in Indonesia which has very specific characteristics so that the agricultural system that develops in the Lebak swamp land has its own characteristics that are different from other agroecosystems. Cultivation activities carried out by farmers in Rawa Land are a form of local wisdom which basically takes advantage of the surrounding natural conditions. Water is the main limiting factor in Swamp Land. However, this is an advantage for farmers who can carry out cultivation activities both during the rainy season and dry season. Farmers in Rawa Lebak can harvest and become the main supplier when the island of Java is entering a lean period (Fatah, 2017).

The development of lowland swamp land for the agricultural sector must be carried out with proper management. Proper management of lowland swamp land includes planning, implementation, monitoring and evaluation tailored to its development potential. Implementation of Lebak Swamp land development activities is an effort made to increase the utilization of land and water resources in Lebak Swamp land. Utilization of lowland swamp land must be carried out in a sustainable manner on an environmental basis so that it can provide long-term benefits for improving community welfare (Alwi, 2017).

Problems faced by farmers in the Lebak swamps include unpredictable depth and irrigation conditions, low soil fertility, drought, unpredictable water availability, various weeds, pests and plant diseases. Treatment options and infrastructure in the Netherlands are still limited. Farming in Rawa Lebak requires special skills in overcoming natural obstacles, especially extreme water conditions which change from year to year due to global climate change. In recent years, many farmers have experienced crop failures and crop failures due to the unpredictable depth and arrival of water. Agricultural land must be used in the long term. Lebak swamp management is not only aimed at increasing agricultural production, but must also be based on sustainability, stability and equity (Nursyamsi *et al.*, 2014).

Floating farming techniques are often used in other regions and even other countries. One country that implements a floating agricultural system is Bangladesh. The floating farming system used for horticultural cultivation has been implemented by farmers in Nazirpur Pirojpurdi, Bangladesh.

The planting medium used in the floating farming program implemented in Bangladesh is called dhep. Dhep is a planting medium made from the weathering of water hyacinth. The Dhep is made on a raft with a thickness of 0.6 m, a width of 1.2 m and a length of 54 m. Generally, vegetables planted in planting media that come from piles of water hyacinth plants or called dhep include beans, eggplant, beets, plabu, tomatoes and pepper (Hasbi *et al.*, 2017).

The local vegetation that is abundant in South Daha District is the water mimosa and kiambang plants which can be used as floating planting media in agricultural activities using floating systems. A farmer in Daha Selatan District has tried using this local vegetation as a floating planting medium in chili cultivation activities and according to personal experience, the farmer said that the use of this planting medium can support success in chili cultivation activities using a floating system during the rainy season (flood). Researchers are interested in adding treatment to this experiment, namely by providing chicken manure drum fertilizer and agricultural lime fertilizer to see the effect on the growth of chili plants and the chemical characteristics of the planting media in the floating agricultural cultivation activities that will be carried out. Chili plants are one of the agricultural commodities whose prices are stable. Floating cultivated chilies can provide greater profits compared to conventional cultivation. Because of this, further research is needed to find out the effect of providing chicken manure drum fertilizer and agricultural lime on the growth of chili plants and on the chemical properties of the planting media in floating agricultural cultivation in South Daha District.

## Materials and methods

*Study site*

This research was carried out on the agricultural land of one of the farmer groups in Daha Selatan District, Hulu Sungai Selatan Regency(Fig. 1). The agricultural land used for agricultural cultivation activities using a floating system is in lowland swamp land. Analysis of chemical characteristics of the nutrient content contained in floating planting media was carried out in the Physics, Chemistry and Biology Laboratory, Soil Department, Faculty of Agriculture, Lambung Mangkurat University.

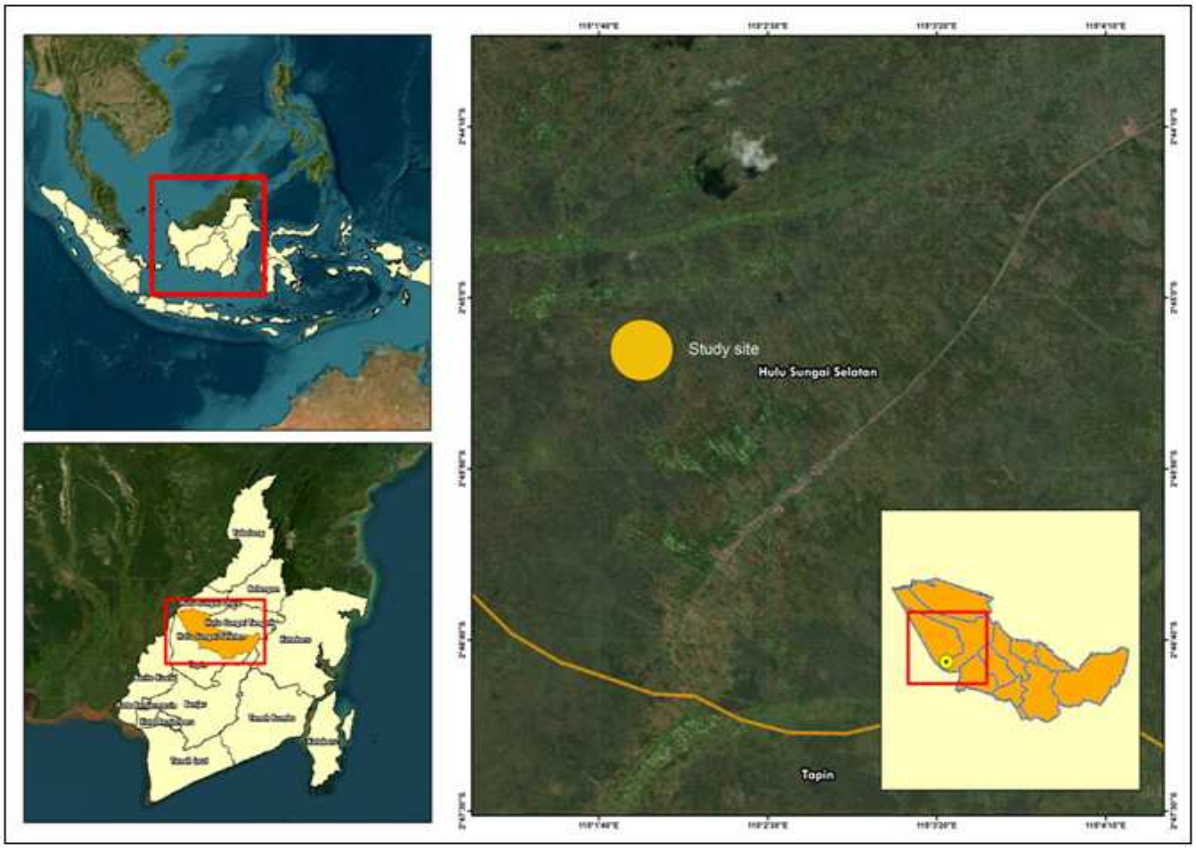


**Fig. 1.** Map of study site.

*Field Experiments*

*Bamboo Floating Raft*

Floating rafts are made from bamboo which are used as floating media for placing planting media and as a place for floating agricultural cultivation. Making a floating raft is done by preparing six bamboo sticks 16 m long, then cutting them into two parts and arranging them alternately and then joining them together using rubber tires so that the bamboo floats. The bamboo that has been put together is then tested for its buoyancy by applying load gradually until it reaches the desired buoyancy.

*Planting Media*

The amelioration treatments tested as planting media in this research include: (1) soil without treatment (control), (2) soil + lime (6 g/plant), and (3) soil + chicken manure compost (500 g/plant). The planting medium is placed on a base where water mimosa plants are cut and rolled to a thickness of 15 cm with a length of 2.3 m and a width of 1.7 m (first layer), the second layer is made by cutting water mimosa plants and rolling them to form a bund with a size of 23 cm and a width of 30 cm with a thickness of 10 cm (3 rows were made for each treatment) with a distance between mounds of 20 cm. The third layer was placed with kiambang plants with a thickness of 10 cm, a length of 23 cm and a width of 30 cm, then the base of the planting medium was left to rest for seven days for the decomposition process to occur. After seven days, an amounts of soils and treatment were placed on the mound and then covered using 250 g of

organic mulch from kiambang plants and left again for 14 days then the planting medium is ready for planting chili seeds.

*Chili Planting*

The chili seeds used in this research were hybrid chilies (F1) of the Pelita variety. Planting of chili seeds was carried out after the chili seeds were 25 days old from the nursery. Chili seeds planted on floating media are healthy chili seeds and have uniform plant height, characterized by the presence of 3-4 leaves. Chili seeds are planted in the part of the soil in the floating planting medium up to the root collar, then the soil around the chili plants is compacted by pressing the soil (Prasetya, 2014). The planting distance used between one chili and another is 60 × 50 cm. The use of this planting distance is in accordance with the results of research from Aminuddin (2017) regarding the response of giving MKP fertilizer and planting distance to the growth and production of cayenne pepper (*Capsicum frustescens* L.) very significant in terms of fruit weight per sample with the best average found at a planting distance of 60 x 50 cm of 25.73 g. This is thought to be an appropriate planting distance that will support the weight of cayenne pepper because there is no competition between plants for nutrients. and sunlight.

*Plant Height Measurement*

Chili plant height is measured every week to provide plant growth data. These measurements were carried out during the three months of the growing season. According to Amalia *et al.* (2018) the height of four plants was measured in three ways using a ruler. Measurements start from the base of the stem which has been previously marked (±1 cm above the base) to the point of shoot growth. Plant height measurements were carried out once a week for three months from the beginning of planting until the last week of observation.

*Calculation of Chili Yield*

Harvest yields are calculated for all chili plants planted. Calculation of harvest yields was carried out by weighing the harvest yields of chili plants in each observation plot. This is done in order to find out the number of harvests obtained in each observation plot. The chili crop yields are then averaged to determine the number of chili harvests per plant.

*Soil Sampling*

Soil samples were taken at the beginning before treatment was given, then after the incubation period of chicken manure and agricultural lime treatment was completed (one week), and at the end of the first harvest. Soil is taken for analysis purposes in the laboratory to measure soil pH, available N ($NH_4^+$ and $NO_3^-$), available P, organic C and exchangeable K supporting data which will be analyzed descriptively.

*Data analysis*

Data from observations of plant height were analyzed first using the Bartlet homogeneity of variance test. If the data obtained is homogeneous then proceed with ANOVA analysis of variance (analysis of variance). If the results of the ANOVA test show results that have a real effect, then proceed with testing using the LSD (Least Significant Difference) method using a confidence level of 95%. Data analysis was carried out using the GenStat 12th application.

**Results**

*Characteristics of Soil, Vegetation Media, Chicken Manure*

Table 1 shown that the organic C content of soil was 5.03%, which is classified as high. The N-$NH_4^+$ content of soil was 18.08 mg/kg with high criteria. Measurement of N-$NO_3^-$ in the laboratory resulted in 13.21 mg/kg. The $P_2O_5$content of soil before treatment was 3.09 mg/kg in the very low category and the exchangeable K content in the soil was 0.04 cmol/kg. The degree of soil acidity or soil pH $H_2O$ obtained from laboratory measurements was 4.73 in the acid category. Table 1 also shown that the organic C content in kiambang was 1.43%, while in mimosa water organic C content was 2.46%. The total N measured in kiambang plants was 0.76% while in water mimosa was 0.95%. Total phosphorus in kiambang was 0.08% and in water mimosa was

0.11%. The total potassium in kiambang is 1.29% and in water mimosa was 1.33%. The degree of acidity in kiambang media was 4.96, while in water mimosa media it is 5.92. The results of this laboratory analysis shownthat the nutrient contents in water mimosa is higher than those in kiambang .Based on nutrients contents these two local vegetations are suitable for planting media for plant growth in floating agricultural cultivation activities. The organic C content in chicken manure was 8.77%, total nitrogen was 2.38%, total P was 3.26%, total K was 1.55% and the pH of chicken manure was 9.10. The results of this analysis shown that chicken manure contains high nutrients, which is suitable for a source of organic material and nutrients to support the growth of chili.

**Table 1.** Characteristics of soil, local vegetation (kiambang and water mimosa), and chicken manure compost.

| Characteristics | Soil | Kiambang | Water Mimosa | Chicken Manure Compost |
|---|---|---|---|---|
| pH $H_2O$ (1:5) | 4.73 | 4.96 | 5.92 | 9.10 |
| Organic C (%) | 5.03 | 1.43 | 2.46 | 8.77 |
| Total N (%) | - | 0.76 | 0.95 | 2.80 |
| Total P (%) | - | 0.08 | 0.11 | 3.48 |
| Total K (%) | - | 1.29 | 1.33 | 1.55 |
| N-$NH_4^+$ (mg/kg) | 18.08 | - | - | - |
| N-$NO_3^-$ (mg/kg) | 13.21 | - | - | - |
| Available P (mg/kg) | 3.09 | - | - | - |
| Exchangeable K (cmol/kg) | 0.04 | - | - | - |

*Chili Plant Height*

The parameters observed and tested statistically in this research were the height of the chili and there was an increase in height of the chili plants in the last week of observation (during the first harvest).

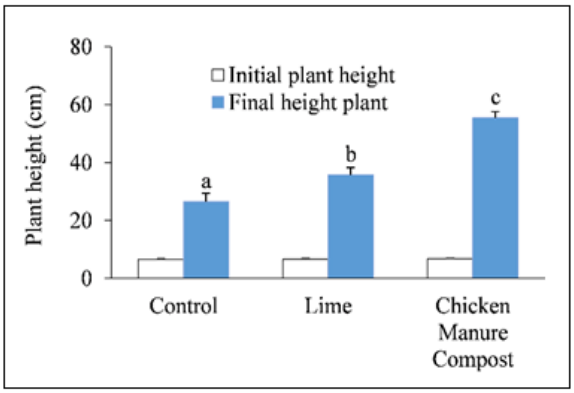


**Fig. 2.** Chili plant height.

Fig.2 shown that plant height is influenced by the treatments. This could be seen by differences in superscript letters presented in each treatment. The height of the chili plants measured in the last week in the control was 26.58 cm, in the lime it was 35.77 cm and in the chicken manure compost was 54.45 cm. So the best treatment for supporting the growth of chili in floating agricultural cultivation was the provision of 500 g chicken manure.

*Changes in Soil pH, Ammonium, Nitrate, Available Phosphorous, and Exchangeable Potassium*

Measuring pH in the laboratory was carried out after incubation of the treatment and after the first harvest. The degree of acidity (pH) in the control treatment after treatment incubation was 5.37 and after harvest was 5.24. Providing 6 g of lime increased the initial soil pH from 4.73 to 7.40 after incubation for 7 days, then the pH decreased after harvest to 6.60. Providing 500 g of chicken manure was able to increase the soil pH before treatment, namely 4.73 to 7.44 after treatment incubation and decreased to 7.35 after harvest (Fig.3).

Fig.4shown that in the control treatment organic C content after treatment incubation was 5.70%, while after harvest it decreased to 5.43%. Organic C content increased from before treatment and before incubation, namely 5.03%. Application of lime increased the initial soil organic C content from 5.03% to 8.02% after treatment incubation and to 6.72% after harvest. Treatment of 500 g of manure on floating farming cultivation media increased the

initial soil organic C content from 5.03% to 10.52% after incubation and decreased to 6.53% after the first chili harvest (Fig.4).

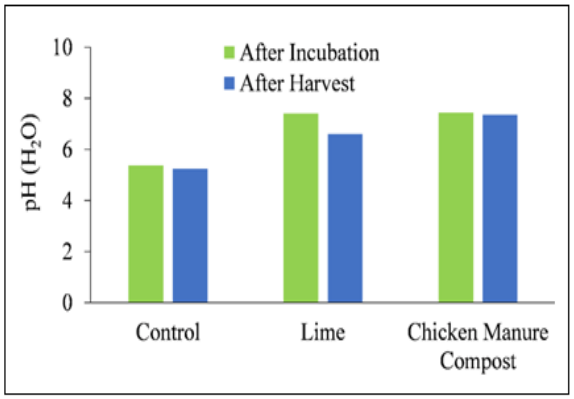


**Fig. 3.** Effect of treatment on changes in pH of planting media.

The ammonium content in the initial soil (soil without treatment) was 18.08 mg/kg. An increase occurred in the control treatment after incubation, namely 25.45 mg/kg and after harvest, it was 25.09 mg/kg. Ammonium content of lime treatment was 30.20 mg/kg after incubation, and then decreased to 27.21 mg/kg after harvest. Chicken manure after incubation had an ammonium of 35.84 mg/kg, and decreased to 27.74 mg/kg after harvest (Fig.5).

Nitrate content in the control after incubation was 13.96 mg/kg, and decreased to 9.70 mg/kg after harvest (Fig.6). The application of lime resulted in an increase in nitrate content to 20.50 mg/kg after incubation and to 15.82 mg/kg after harvest. Chicken manure was able to increase the nitrate content in the planting medium from 13.96 mg/kg to 36.77 mg/kg after incubation and increased from 9.70 mg/kg to 25.61 mg/kg after harvest (Fig.6).

The results of available P measurements showed that the control after incubation was 7.92 mg/kg and 6.25 mg/kg after harvest (Fig.7). Meanwhile, available P in lime and chicken manure treatments were higher compared to those in the control. Available P in lime treatment after incubation was 38.65 mg/kg and 23.85 mg/kg after harvest (Fig.7. Chicken manure application increased available P of planting medium from 3.09 mg/kg before treatment to 55.76 mg/kg after incubation, and then decreased to 40.92 mg/kg after harvest (Fig.7).

The initial exchangeable K content before the planting medium was treated was 0.04 cmol/kg, was not different to that after incubation (0.042 cmol/kg), and then decreased to 0.037 cmol/kg after harvest. Lime treatment had an exchangeable K content of 0.050 cmol/kg after incubation treatment and 0.043 cmol/kg after harvest (Fig.8). Chicken manure application resulted in increased exchangeable potassium content 0.113 cmol/kg after incubation, and then decreased to 0.064 cmol/kg after harvest.

*Chili Yield*

The yield of chili plants in the control, lime and chicken manure treatments was 165 g, 285 g and 1,223 g, respectively (Fig.9). It could be seen form Fig. 8 that the highest yield was obtained in the treatment of chicken manure. Meanwhile, in the control showed the lowest yield because the growth of the chili plants was not optimal due to no additional nutrients provided to support their productivity.

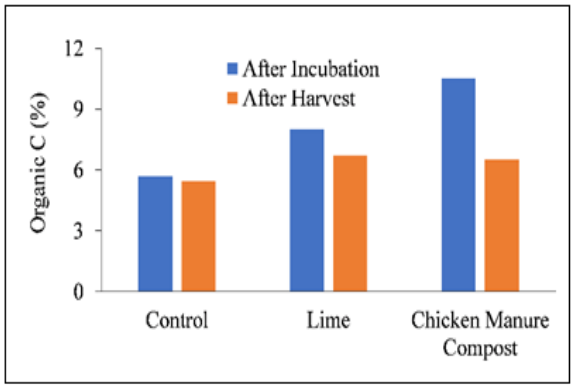


**Fig. 4.** Effect of treatment on changes in organic C contents of planting media.

**Discussion**

*Chili Plant Height*

The treatments of agricultural lime and chicken manure compost were able to increase height of chili from 6.67 cm to 35.76 cm, due to the nutrient contents and compounds of agricultural lime. The agricultural lime treatment given in this study was not optimal in increasing the growth of chili plants compared to the chicken manure treatment. Apart from that, fertilization treatment was able to increase the growth of chili plants from an initial height of 6.77

cm to 55.45 cm. Chicken manure contains many macronutrients. Based on previous research by Budianto and Madauna (2015) who carried out research using the floating farming method by comparing the effect of various doses of chicken manure on the growth and yield of shallot plants, the results of the research stated that the ratio of soil and chicken manure of 6:3 is the best ratio which increased the number of leaves, number of tillers, number of tubers, diameter of tubers, fresh weight of tubers, dry weight, greenness of leaves, fresh weight and furnace dry weight of shallot plants.

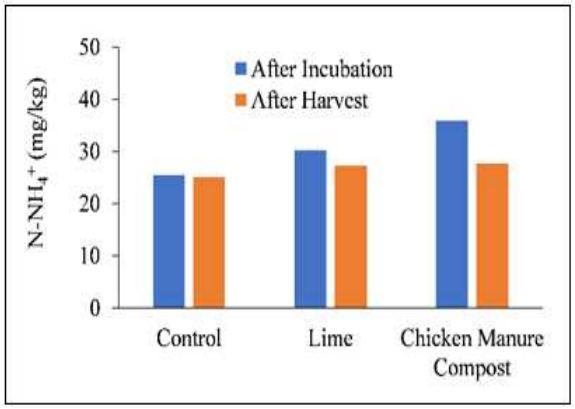


**Fig. 5.** Effect of treatment on changes in ammonium contents of planting media.

Chicken manure is an organic material that is widely used as organic fertilizer which affects the availability of nutrients and improves the structure of soil which is very deficient in organic nutrients and can fertilize plants. Chicken manure affects plants and improves the physical, chemical and biological properties of soil. Increasing the activity of soil microorganisms in the presence of organic material originating from chicken manure increases the availability of soil nutrients, reduce soil acidity and increase pH (Hilwa *et al.*, 2020).

Another research carried out by Susilowati *et al.* (2013) to study the effect of applying chicken manure fertilizer on curly chili plants which was carried out conventionally. The results showed that there was a significant effect on the productivity of curly chili plants which were treated with chicken manure. In another study, *H. verticillate* L. manure and 500 g of chicken manure were applied to cayenne pepper plants to increase plant productivity. This is because H. verticillate is an organic fertilizer that contains micro and macro nutrients which are dominated by chicken manure, so that the nutritional needs of cayenne pepper plants are met and balanced to support cayenne pepper productivity. Crop productivity has always been the most important factor in agricultural cultivation. This can be achieved if the amount and type of soil nutrients available are in accordance with plant needs (Ege and Julung, 2019).

*Changes in Soil pH, Ammonium, Nitrate, Available Phosphorous, and Exchangeable Potassium*

Providing chicken manure treatment increased the content of organic C, ammonium, nitrate, available P, exchangeable K and soil pH in the planting media when compared to other treatments. This increase occurred after the incubation period of treatment. After planting chilies and then entering the harvest period, this parameter was measured again and it turned out to have decreased. The decrease in nutrients after harvest can be caused by various factors, one of which can be caused by nutrient absorption by plants and leaching of nutrients caused by high rainfall. Approaching chili harvest time, monthly rainfall in March increased compared to the previous month, namely 341 mm. Due to heavy rain, nutrients can be washed away, so that the nutrients needed by plants cannot be used properly. Apart from affecting the nutrient content of the soil, high rainfall results in low production. This is influenced by ventilation conditions. Poor air conditions cause soil saturation, resulting in stunted, thin growth and reduced production (Putra *et al.*, 2017). Application chicken manure increased pH of the planting medium when compared to other treatments. The initial soil pH value before treatment was 4.73. In the control treatment, the pH in the soil media after incubation was 5.37 and decreased after harvest, namely 5.24. When compared with agricultural lime and manure treatments, the pH of the planting medium after incubation of the treatment was 7.40 and 7.44 respectively, then after the harvest period the pH of the planting medium decreased to 6.60 and 7.35

respectively. This allows for dynamic changes in pH due to various factors. In general, the degree of soil acidity changes very easily, both due to treatment and other factors such as rainfall. This is in line with Syofiani *et al.* (2020) that stated high rainfall affects soil properties, especially soil chemistry. High intensity rain causes the soil reaction to become acidic, because alkaline cations in the soil are washed away.

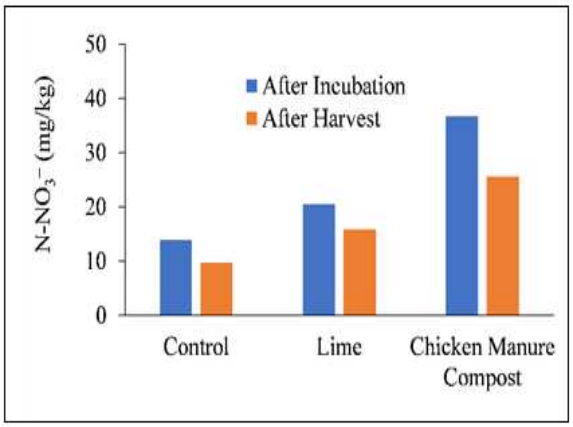


**Fig. 6.** Effect of treatment on changes in nitrate contents of planting media.

Organic C content in the planting medium given agricultural lime when measured after incubation was 8.02% and decreased to 6.72% after harvest. The application of agricultural lime in this research is expected to increase the pH in the planting medium so that microbial activity and soil enzyme function can function optimally so that the decomposition process of organic matter and simple compounds can be absorbed by plants and can increase the organic C content in the soil. This is caused by several factors, such as the influence of interactions with plants and environmental conditions that change after the plants are harvested. As plants grow, the need for nutrients and water increases, so the soil can absorb and process nutrients more effectively. However, after the crop is harvested, soil environmental conditions change and can reduce the activity of microorganisms and soil moisture, resulting in a decrease in organic C content in the soil after harvest. An increase in ammonium ($NH_4^+$) content occurred when agricultural lime and chicken manure were treated. Ammonium in the initial soil before treatment was 8.08 mg/kg. In the control treatment the ammonium content increased to 25.45 mg/kg after incubation and decreased again to 25.09 mg/kg. This happens even though no treatment is given to the control treatment because nitrogen is obtained not only from the application of organic matter or ameliorant but also from the absorption of nitrogen in the air which causes quite a high difference between the initial soil content and the control treatment. The planting medium given agricultural lime had an ammonium content after incubation of 30.20 mg/kg and decreased after harvest to 27.21 mg/kg. In manure, the ammonium content after incubation treatment was the highest compared to control and agricultural lime, namely 35.84 mg/kg and decreased after harvest to 27.74 mg/kg. Chicken manure is the best treatment for increasing ammonium in the planting medium. This happens because chicken manure contains organic material which triggers the activity of microorganisms in the soil, causing the release of nitrogen from the organic material to become ammonium. During incubation, the organic material in manure begins to decompose and produces nitrogen which is then found in the form of ammonium in the soil. As time goes by, microorganisms in the soil will use the ammonium as a source of nitrogen for growth and metabolism, so that the amount of ammonium in the soil will decrease. This is what causes the ammonium content to decrease when measured after harvesting the chili plants.

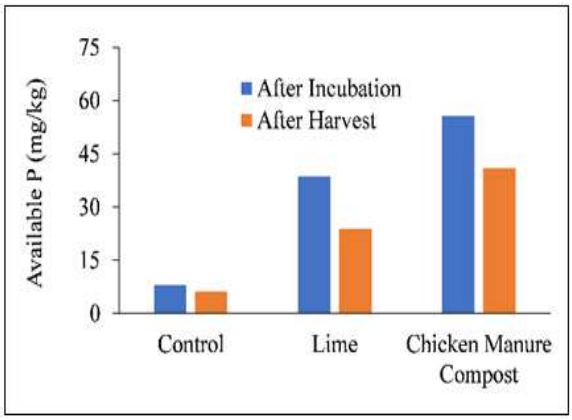


**Fig. 7.** Effect of treatment on changes in availabe P contents of planting media.

Nitrogen is converted to ammonium when present in the soil. Ammonium, as a form of nitrogen, is another

form that plants can utilize optimally. Apart from ammonium, nitrogen can also be used by plants in the form of nitrate. However, nitrogen utilization by plants in the ammonium form is preferable compared to the nitrate form. This is because nitrate is more easily leached and has a greater contribution to the formation of $N_2O$ through the denitrification process (Kombo *et al.*, 2012). Nitrogen in the form of ammonium must first be decomposed by microorganisms so that it can be absorbed by plants, in contrast to nitrate which can be directly absorbed by plants. The denitrification process has undesirable consequences (Sianipar dan Ramijah, 2021). Ammonium ions ($NH_4^+$), which carry a positive charge, are easily absorbed by soil colloids and negatively charged organic matter. This prevents soil leaching caused by rain runoff. On the other hand, nitrate ions ($NO_3$-), which carry a negative charge, cannot be retained by the soil and are therefore susceptible to leaching. As a result, nitrogen can be lost from the soil, thereby reducing soil fertility (Heryanita, 2017).

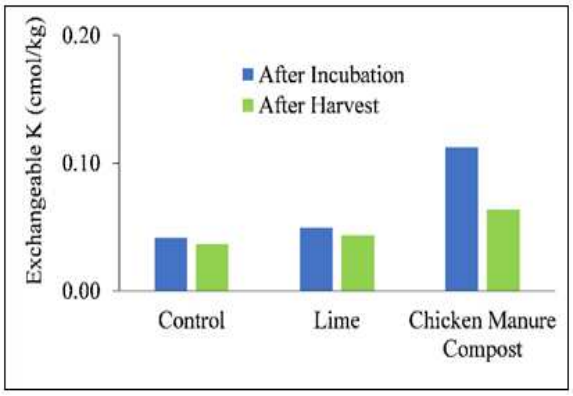


**Fig. 8.** Effect of treatment on changes in exchageable K contents of planting media.

Research conducted by Damayanti *et al.* (2018) states that the concentration of available nitrogen, namely ammonium and nitrate, can influence plant height. This effect is thought to be because ammonium and nitrate are able to influence plant vegetative growth. The correct ratio between ammonium and nitrate in the soil can encourage increased synthesis of leaf chlorophyll in plant tissue so that photosynthetic activity and carbohydrates resulting from photosynthesis also increase. These carbohydrates are then able to increase protein synthesis and increase protoplasm as a building block for cells to encourage vegetative growth, especially plant height.

Chicken manure contains complete nutrients that plants need for growth, such as containing three times more N than other manure. An increase in the soil pH index with the application of chicken manure can occur due to the influence of organic acids produced so that they can chelate ions that cause soil acidity and control $H^+$ secretion from soil reactions and plant roots (Indriani *et al*, 2023). This is in accordance with research conducted by Wijaya and Damanik (2017) that the application of chicken manure has a significant effect on increasing soil pH. This is because chicken manure contains humic and carboxyl acids and phenols which can increase the pH by binding to soil acidity. Nitrate measurement in the initial soil was 3.09 mg/kg. In the control treatment the nitrate content after incubation was 13.95 mg/kg and after harvest it was 9.70 mg/kg. This happens on untreated soil because of the provision of organic mulch in the form of kiambang plants to help prevent the soil from being directly exposed to rainwater splashes which can cause direct leaching of nutrients. Providing 6 g of agricultural lime per planting hole can increase the nitrate content to 20.50 mg/kg after incubation treatment and decrease to 15.82 mg/kg after harvest. In chicken manure, the nitrate content after the incubation period of treatment was 36.77 mg/kg and decreased to 25.61 mg/kg after the chili harvest was carried out. The decrease in nutrient content occurred on the same average in each treatment, namely after harvest. This is strongly suspected to be due to the uptake of nutrients by plants. Nitrate uptake was higher at acidic pH, while ammonium uptake was higher at neutral pH. Nitrate compounds generally move towards the roots via mass flow, while ammonium compounds move via mass flow and diffusion because they are immobile (Irawan *et al.*, 2021).

Nitrogen is a nutrient needed in large quantities for plant growth. Nitrogen plays an important role in the formation of protein compounds in plants. Most of the nitrogen in soil is in the form of soil organic

compounds and is not available to plants. This organic N fixation is around 95% of the total N in the soil. Nitrogen can be absorbed by plants in the form of nitrate ($NO_3$-) and ammonium ($NH_4^+$) ions. Nitrates ($NO_3$-) are formed more in soil conditions that are warm, moist and have good aeration. Nitrate absorption is greater at low pH while ammonium at neutral pH. Nitrate compounds generally move towards the roots due to mass flow, while ammonium compounds via mass flow and diffusion because they do not move (Purnomo *et al.*, 2017).

When chicken manure undergoes a decomposition process, nitrogen is released in the form of $NH_4^+$ (ammonium) cations. The speed of this process depends on the ratio of carbon-nitrogen elements (C/N). The released $NH_4^+$ ions can be directly absorbed by plants and utilized by soil microorganisms or converted into $NO_3$- (nitrate) anions so that in the soil more nitrogen is found in the form of nitrate compared to the form of ammonium which is generally absorbed by plants. more nitrogen in the form of nitrate for the growth process (Panjaitan *et al.*, 2019).

*Chili Yield*

The yield of chili plants in the control treatment was 165 g. This happens because there is no additional organic material given to the planting medium so that the growth of the chili plants is not optimal. Meanwhile, in the agricultural lime treatment, the chili harvest obtained was 285 g and the highest yield was in the chicken manure treatment, namely 1,223 g. This happens that manure is able to support plant growth so that the plants can develop until harvest. One of the reasons why the harvest results are not optimal is the unpredictable weather every day. Rainfall as harvest time approaches increases, namely 341 mm. When compared with the previous month, monthly rainfall in Daha Selatan District is lower compared to March 2023, which is harvest time. Extreme weather makes plants more easily attacked by pests and diseases. The results of field observations show that the pests that attack chili plants are ants and the disease that attacks chili plants is anthracnose, which causes the chili fruit to rot and not produce optimal fruit.

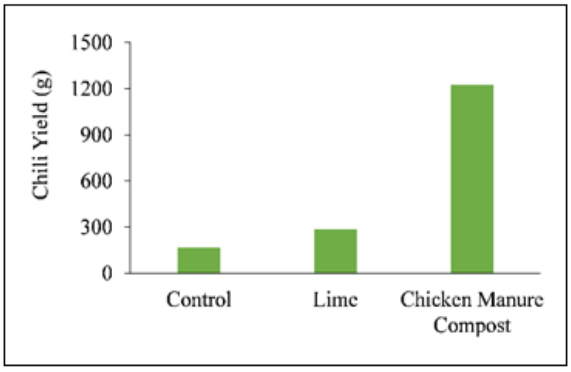


**Fig. 9.** Effect of treatment on chili yield.

Growth and yield of chili are influenced by several factors: availability of nutrients in the soil that can support their growth, environmental conditions such as rainfall, temperature and humidity. The environmental condition factor that plays an important role in the success of chili cultivation is rainfall. Chili plant growth will be produced maximally if the water supply is adequate and not excessive. High rainfall during chili cultivation may cause various diseases attacking chili so that their growth is not optimal (Imtiyaz *et al.*, 2017).

**Conclusion**

The study revealed that chicken manure compost application results in increases in soil pH, contents of organic C, $NH_4^+$, $NO_3$-, available P and exchangeable K. In terms of plant height parameters, chicken manure compost produces the highest plant height compared other treatments. Organic manure from chicken compost also had the highest yield compared to lime treatment and control.

The findings of this study suggest that chicken manure compost is the most effective treatment for enhancing growth and yield in a floating farming system within a lebak swamp.

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**Competing Interest**

The authors declare that they have no competing interests.

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