Preface

Preface

This present volume contains the proceeding of the 2nd Annual Conference of Science & Technology (Ancoset) 2020. In this year, the 2nd Ancoset was virtually delivered through online platform due to Covid-19 Pandemic on November 28, 2020. This conference was organized by Universitas PGRI Kanjuruhan Malang and co-organized by Rumah Publikasi Indonesia.

Taking the theme of *The Role of Science and Technology Application on Building Community Resilience during New Normal*, we provided intellectual forum for students, researchers, lecturers, and practitioners. There are 221 papers collected which propose an insightful thought on the frontier knowledge about science and technology and its application. This conference opens an opportunity for scientific cooperation as well as international collaboration as it attended by almost two hundreds participants both across Indonesia and Asia.

We really appreciate all support given for the success of the 2nd Ancoset 2020 and thus would like to express our gratitude to everyone who has taken part in this event:

- The scientific reviewers for helping authors come up with a good quality paper,
- The distinguished keynote speakers: **Assoc. Prof. Sudi Dul Aji, M.Pd** (Universitas PGRI Kanjuruhan Malang), **Assoc. Prof. Dr. Massudi Mahmuddin** (Universiti Utara Malaysia), **Prof. Ida Hamidah, M.Si** (Universitas Pendidikan Indonesia), **Prof. Dr. Ade Gafar Abdullah, M.Si** (Universitas Pendidikan Indonesia),
- Co-Host universities: Universitas Al-Ghifari, Universitas Hamzanwadi, Universitas PGRI Semarang, Institut Teknologi Nasional Malang, Universitas Ma Chung, Universitas Bhinneka PGRI, Universitas PGRI Adi Buana Surabaya, IKIP PGRI Jember,
- All presenters and participants, and
- The committee members for the commitment, effort, and hard work in accomplishing the conference and proceeding.

We wish you all a fruitful gathering and see you on the next conference.

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Asst. Prof. Ayu Liskinasih, M.Pd.
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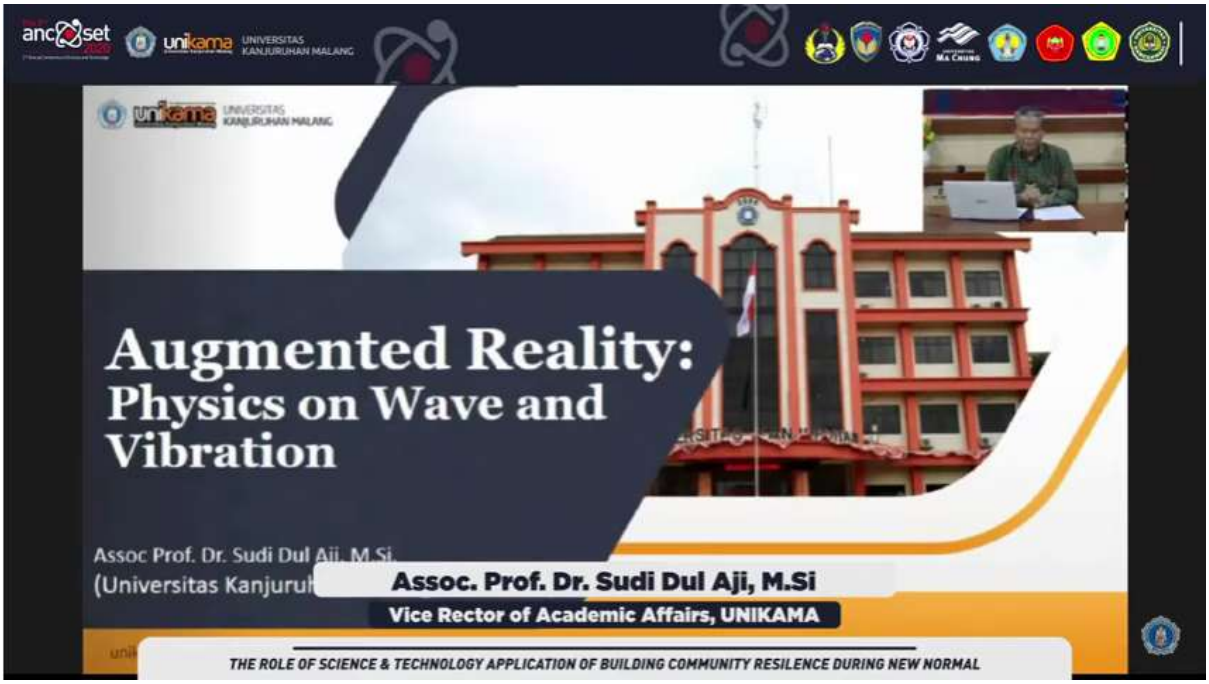
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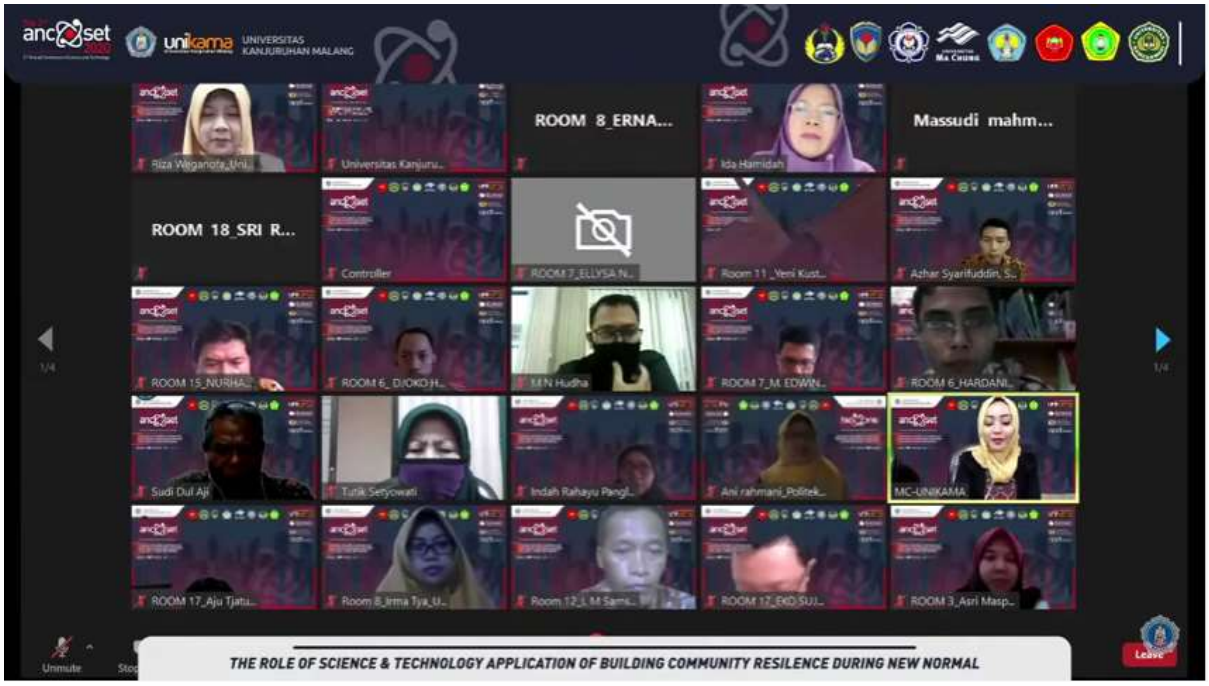
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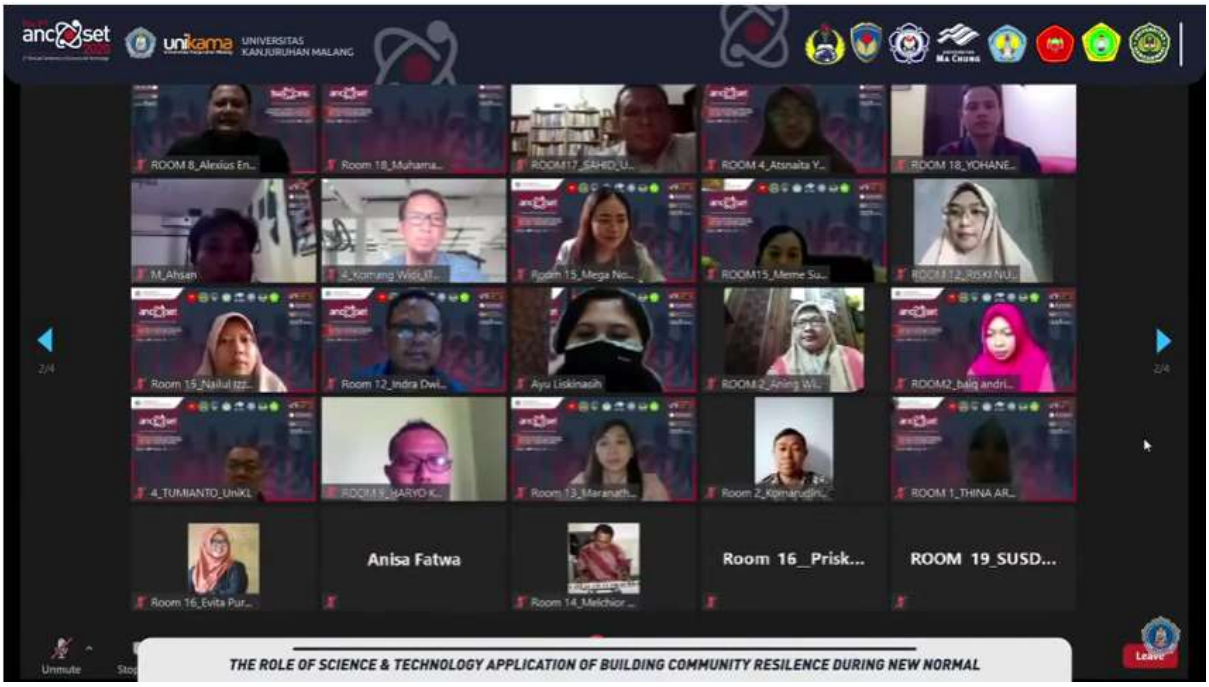
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Peer review declaration

Peer review declaration

All papers published in this volume of Journal of Physics: Conference Series have been peer reviewed through processes administered by the Editors. Reviews were conducted by expert referees to the professional and scientific standards expected of a proceedings journal published by IOP Publishing.

- **Type of peer review: Single-blind / Double-blind / Triple-blind / Open / Other (please describe)**

  A group of reviewers with good reputation of international publication were assigned to review the manuscripts of ANCOSET 2020 using Unikama Conference Submission System. Prior to the review process, all the reviewers were briefed by Prof. Ade Gafar Abdullah on a virtual meeting regarding the reviewing process. As many as 16 reviewers were then eligible in which each was sent 2 – 3 papers through the submission system. They were given two weeks to finish their review process and given a certain amount of incentive once they finish their task. After the deadline, the reviewed manuscripts were sent to the participants (authors) using the system through their personal account. The authors were given two weeks to revise their manuscripts and send them back to the committee using their account. Papers whose revision was in accordance with the reviewers' comments went into final editing process (paper template layout checking, proofreading, etc.) and those which need further revision went into the second round of review process. All the manuscripts and other required data were submitted to IOP after they passed final editing.

- **Conference submission management system:**

  Unikama Conference Submission System

- **Number of submissions received:**
  281

- **Number of submissions sent for review:**
  243

- **Number of submissions accepted:**
  221

- **Acceptance Rate (Number of Submissions Accepted / Number of Submissions Received X 100):**

  221/281 X 100 = 78.6%

- **Average number of reviews per paper:**
  15

- **Total number of reviewers involved:**
  16

- **Any additional info on review process:**
  None

- **Contact person for queries:**
  ade_gaffar@upi.edu

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Utilization of rabbit manure and biochar chicken manure and its effect on the growth and yield of pakchoy plants

Utilization of rabbit manure and biochar chicken manure and its effect on the growth and yield of pakchoy plants

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Abstract. This study aims to determine the effect of rabbit manure, biochar from chicken manure, and its interactions on the growth and yield of pakchoy plants. This study uses a randomized block design (RBD) with factorial patterns (2 factors). The first factor is the dose of rabbit manure which consists of 4 levels (0, 10, 20, and 30 tons ha^{-1}). The second factor is the biochar dose of chicken manure consisting of 4 levels (0, 5, 10, and 15 tons ha^{-1}). The results showed that the treatment of biochar dose of chicken manure and the treatment of interactions between the dose of rabbit manure and the biochar dose of chicken manure had no significant effect on all observed variables. The treatment of rabbit droppings did not significantly affect all observed variables, except that the fresh weight of the roots showed a real effect. Fresh weight of economic results in the application of rabbit manure 30 tons ha^{-1}, gives a higher yield or an increase of 17.08% when compared to without rabbit manure. While the fresh weight of economic results on the application of biochar from chicken manure 30 tons ha^{-1} gave higher yields or increased by 23.86% compared to without biochar.

1. Introduction

Pakchoy (*Brassica rapa* L.) is a group of plants from the Brassica genus used as vegetables in the form of cooking or fresh or fresh vegetables. It tastes good and distinctive and is suitable for a variety of dishes. Pakchoy plant is one of the horticultural commodities that are useful as a source of vitamins, minerals and contain fiber, such as vitamin A, vitamin B, vitamin B6, vitamin C, potassium, phosphorus, copper, magnesium, iron, and protein. The nutritional content causes pakchoy in addition to nutritious food, which is also efficacious for preventing cancer, hypertension, and heart disease. One effort to intensify agriculture that needs to be done to increase agricultural production is by fertilizing. Fertilization is done to meet the needs of nutrients in the soil so that the genetic potential of plants can be achieved to the maximum [1]. Application of cultivation techniques through the provision of organic fertilizers such as compost and biochar from animal manure in soil media can provide increased nutrient supply.

Chicken and rabbit farming on a large scale raises several problems, among others in the problem of handling cage waste, especially feces (solid waste). Cage waste in the form of livestock manure, both feces or leftover food that is scattered is the most dominant source of environmental pollution in the area of livestock. This livestock waste can be processed into organic fertilizer either as fermented compost or as a biochar soil enhancer that is useful for improving soil fertility and agricultural crop yields.

Biochar is black charcoal as a result of the heating process of biomass in a state of limited oxygen or no oxygen. Biochar is an organic material that has stable properties that can be used as soil amelioration in the dry land. The benefits of adding biochar to the soil include increasing plant growth, reducing methane emissions, reducing NO_2 emissions, reducing fertilizer requirements, reducing nutrient leaching, storing carbon in the long run stably, increasing soil pH, soil aggregates, soil water content, cation exchange capacity, and crop yields [2].

Utilization of biochar on a large scale is relatively new, therefore the government has an important role in providing understanding and guidance to the wider community that requires farmers to need biochar as a fixing material to increase agricultural production going forward [3]. Some compost and biochar research results in improving crop yields have been approved and published in various scientific publications. The best results of application dosage of biochar in various types of plants are biochar dose of 10 tons ha^{-1} in maize plants [4-7], biochar dose of 10 tons ha^{-1} in sorghum plants [8], biochar dosage of 10-15 tons ha^{-1} in plants chili peppers [9,10], biochar 9 tons ha^{-1} in spinach plants [11], and biochar doses 6 tons ha^{-1} in kale plants [12] and biochar 10 tons ha^{-1} in pakchoy plants [13], with the best results helping fertilizer 30 kg ha^{-1} in chili plants [14,15], and compost 20 tons ha^{-1} in pakchoy plants [13].

Chicken manure which is burned into biochar charcoal has given the best results to the chili plants [10]. Likewise, rabbit manure fermented into compost has given the best response to chili plants [14], but this may not be responded well to Pakchoy plants. Therefore this research was carried out, to obtain the best response of pakchoy plants in doses of rabbit manure and biochar from chicken manure. The hypothesis proposed in this study is that manure from rabbit manure 20 tons ha^{-1} and biochar from chicken manure 10 tons ha^{-1} and its interactions can increase the growth and yield of pakchoy plants.

2. Materials and methods

This research was conducted at the experimental station of the Faculty of Agriculture, Warmadewa University, Jalan Terompong, Denpasar with a height of 25 meters above sea level. This research activity began from May to June 2019. This research was a factorial experiment (two factors) using a Randomized Block Design. The first factor is the dose of rabbit compost (R) which consists of 4 levels, namely: 0 tons ha^{-1} (R0), 10 tons ha^{-1} (R1), 20 tons ha^{-1} (R2), 30 tons ha^{-1} (R3). The second factor is the biochar dose (B) which consists of 4 levels, namely: 0 tons ha^{-1} (B0), 5 tons ha^{-1} (B1), 10 tons ha^{-1} (B2), and 15 tons ha^{-1} (B3). So there are 16 treatment combinations, each repeated 3 times so there are 48 trial units. The variables observed in this study were: plant height, number of leaves, leaf area, leaf fresh weight, root fresh weight, oven-dry weight, oven-dry weight. The experimental data were analyzed according to the design used. The treatment that was significantly affected was followed by the most significant difference test (LSD) of 5%, whereas to find out the close relationship between the observed variables, correlation analysis was performed.

3. Results

Based on these results and after statistical analysis, the significance of the influence of Rabbit manure (R) and Biochar from chicken manure (B) and its interactions with the observed variables are presented in Table 1.

Table 1. Significance of the effects of rabbit manure (R) and biochar from chicken manure (B), and their interactions (RxB) on all observed variables.

No	Variable	R	B	RxB
1	Plant height (cm)	ns	ns	ns
2	Number of leaves (strand)	ns	ns	ns
3	Leaf area (cm^2)	ns	ns	ns
4	Fresh weight of economic results (g)	ns	ns	ns
5	Root fresh weight of root (g)	*	ns	ns
6	Plant oven-dry weight (g)	ns	ns	ns
7	Root oven-dry weight (g)	ns	ns	ns

Note: ns = not significant effect ($P \geq 0.05$), * = Significantly effect ($P < 0.05$)

The treatment of rabbit manure doses did not significantly affect all observed variables except that the root fresh weight had a significant effect (P<0.05). However, the biochar dose treatment did not significantly affect (P≥0.05) on all observed variables. Likewise, the interaction of rabbit and biochar (RxB) manure treatments had no significant effect (P≥0.05) on all observed variables.

Statistical analysis showed that the treatment of rabbit droppings (R) showed a significant effect (P <0.05), whereas the treatment of biochar dosage (B) and interactions (RxB) had no significant effect (P≥0.05) on fresh root weight. However, the fresh weight variable of economic yield per plant showed that the treatment dose of rabbit manure (R), biochar dose (B), and its interaction (RxB) had no significant effect (P≥0.05) (Table 1). The average of all plant variables observed in the care of rabbits and biochar droppings is presented in Table 2.

Table 2. Average of all variables observed by plants in the treatment of rabbit manure (R) and biochar from chicken manure (B).

Treatment	Plant height (cm)	Number of leaves (strand)	Leaf area (cm^2)	Fresh weight of economic results (g)	Root fresh weight of root (g)	Plant oven-dry weight (g)	Root oven dry weight (g)
Rabbit manure							
0 ton ha^{-1} (R0)	20.87 a	9.50 a	465.96 a	51.63 a	5.16 b	2.43 a	0.65 a
10 ton ha^{-1} (R1)	21.80 a	9.75 a	574.39 a	53.36 a	5.08 b	2.82 a	0.73 a
20 ton ha^{-1} (R2)	21.53 a	9.33 a	521.94 a	56.19 a	6.07 a	2.80 a	1.00 a
30 ton ha^{-1} (R3)	21.38 a	10.33 a	529.14 a	60.45 a	6.41 a	2.93 a	0.95 a
LSD 5%	-	-	-	-	1.00	-	-
Biochar of chicken manure							
0 ton ha^{-1} (B0)	21.18 a	9.17 a	506.08 a	50.50 a	5.47 a	2.62 a	0.98 a
5 ton ha^{-1} (B1)	21.22 a	9.75 a	487.72 a	50.03 a	5.52 a	2.54 a	0.78 a
10 ton ha^{-1} (B2)	21.28 a	9.67 a	501.83 a	58.55 a	5.84 a	2.73 a	0.68 a
15 ton ha^{-1} (B3)	21.90 a	10.33 a	501.83 a	62.55 a	5.89 a	3.09 a	0.88 a
LSD 5%	-	-	-	-	-	-	-

From Table 2 it can be seen that the highest average fresh root weight was obtained in the treatment of rabbit manure dosages of 30 tons ha^{-1} (R3) which is 6.41 g which is very different from the treatment of rabbit manure 10 tons ha^{-1} (R1), which is 5.08 g and without treatment (R0) is 5.16 g, but not significantly different from the treatment of 20 tons ha^{-1} (R2) with a value of 6.07 g. In the treatment of the highest biochar dose tends to be obtained at 15 tons ha^{-1} (B3) which is 6.41 g not significantly different from other biochar treatment doses, while the lowest fresh root weight value without biochar (B0) is 5.47 g.

4. Discussion

The results of statistical analysis showed that the fresh weight of economic results had no significant effect on the treatment of rabbit or biochar manure (Table 1). However, the highest fresh weight of economic results tends to be obtained in the treatment of 30 tons ha^{-1} rabbit manure (R3) at 60.45 g, an increase of 17.08% compared to without rabbit manure (R0) at 51.63 g (Table 2). The close relationship between these variables in the treatment of rabbit droppings can be seen in Table 3.

From Table 3, it can be seen that the high fresh weight of economic results is supported by the number of leaves (r = 0.704**), fresh root weight (r = 0.939**), oven-dry weight per plant (r = 0.801**), and weight oven-dried roots (r = 0.831**).

Table 3. Correlation coefficient values (r) due to the influence of rabbit manure doses.

	Plant height	**Number of leaves**	**Leaf area**	**Fresh weight of Economic results**	**Root fresh weight**	**Plant oven dry weight**
Number of leaves	0.128ns					
Leaf area	0.970**	0.313ns				
Fresh weight of economic results	0.258ns	0.704**	0.274ns			
Root fresh weight of root	0.090ns	0.455ns	0.036ns	0.939**		
Plant oven dry weight	0.782**	0.576*	0.789**	0.801**	0.638**	
Root oven dry weight	0.362ns	0.198ns	0.239ns	0.831**	0.919**	0.722**
	r = (0.05; 14)= 0.497			r = (0.01; 14) = 0.623		

Note: * = significantly effect (P<0.05), ** = very significant effect (P<0.01), ns = not significant effect (P≥0.05)

The results of this study indicate that the treatment of rabbit manure, only the fresh weight variable of the roots gives real results (Table 1). The treatment of rabbit manure 30 tons ha^{-1} (R3) gave the highest yield of fresh root weight of 6.41 g which increased by 24.22% when compared with the lowest yield in the treatment without rabbit manure (R0) which was 5.16 g.

The high fresh root weight in the treatment of rabbit manure doses was supported by the existence of a positive and real correlation on the economic fresh weight variable (r = 0.939 **), and the oven-dry root weight (r = 0.919 **) (Table 3). This can be due to the nutrient content contained in rabbit manure such as N (0.03%), P (55.56 ppm), K (59.91 ppm), and C (0.41%) is quite high. High N, P, and K nutrient content can support the supply and absorption of nutrients by roots in the soil. The nutrient content such as N, P, and K contained in rabbit feces is quite high due to a very active microbial population [16]. This is also reinforced by the statement Novizan which states that nitrogen is the main nutrient for growth, which is generally very necessary for the formation of vegetative parts of plants such as leaves, stems, and roots [17]. While phosphorus plays a role in a variety of physiological processes in plants such as photosynthesis and respiration, so does potassium plays a role in encouraging various enzymes that are essential in photosynthetic reactions

The results of this study also showed that the application of biochar from chicken manure had no significant effect (P≥0.05) on all observed variables. Nevertheless, the highest fresh weight of economic results tends to be obtained in the application of 15 tons ha^{-1} (B3) of 62.55 g or an increase of 23.86% compared to without biochar (B0) of 50.50 g (Table 2). This is due to the improved physical properties of the soil which encourage the movement of nutrients and water, so the plant roots become more active in absorbing nutrients from the soil for growth.

However, the effect of biochar in improving soil fertility takes a long time to get the best growth and crop yields. The stable and difficult to decompose biochar in the soil causes biochar residue to last for a long time in the soil. Therefore, the application of biochar is only done once for several planting seasons.

The reaction of the application of organic fertilizer requires time to be absorbed or utilized by plants because the decomposition process takes place slowly to provide nutrients for plants [18]. Various studies have been carried out showing that biochar is useful for improving soil physical properties by increasing water holding capacity and aggregate stability, improving soil weight, and reducing soil resistance due to its porous structure [19] and improving soil fertility and soil quality [20]. Biochar particles bind to very fine soil fractions of 50 μm [21] and the presence of biochar is restoring soil quality through small clusters of soil particles or aggregates compared to other organic matter [22].

5. Conclusions

The interaction between the treatment dose of rabbit manure and the biochar from chicken manure did not significantly influence all observed variables. The treatment of rabbit manure did not significantly affect all observed variables, except that the fresh weight of the roots showed a real effect. The treatment of rabbit manure 30 tons ha^{-1} gave the highest yield of fresh root weight which increased by 24.22%

from without rabbit manure. The application of rabbit manure 30 tons ha^{-1} gives a higher fresh weight of economic yield or an increase of 17.08% when compared to without rabbit manure. Likewise, the application of biochar from chicken manure 30 tons ha^{-1} yields higher fresh economic results or increased by 23.86% compared without biochar.

Acknowledgments
The author thanks the Head of Experimental Station of the Faculty of Agriculture, Warmadewa University and friends who have helped with this research.

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