ISRG Journal of Agriculture and Veterinary Sciences (ISRGJAVS)

ISRG PUBLISHERS
Abbreviated Key Title: ISRG. J. Agri.Vet.Sci.
ISSN: 3048-8869 (Online)
Journal homepage: https://isrgpublishers.com/gjavs/
Volume – III Issue - II (March-April) 2026
Frequency: Bimonthly

Comparative Study on the Growth and Yield of Pechay *(Brassica rapa var. parachinensis)* Using Different Animal Manures

Kayla S. Sibal[1*], Lindsay Mae A. Beran[2], Liane Rouselle A. Bunot[3], Riane Nathalie C. Ednilao[4], Dweyne Heished D. Canda[5], Jerome J. Laguitnay[6], Jerico S. Tubban[7], and Rogie Sabado[8]

[1,2,3,4,5,6,7,8] Apayao National Industrial Agricultural High School, Calanasan Apayao

| **Received:** 20.03.2026 | **Accepted:** 23.03.2026 | **Published:** 27.03.2026

***Corresponding author:** Kayla S. Sibal

Abstract

This study aimed to evaluate the growth and yield performance of pechay (Brassica rapa var. parachinensis) using different animal manures under field conditions in Calanasan, Apayao. The experiment followed a Randomized Complete Block Design (RCBD) with four treatments: T0 (control: soil and carbonized rice hull), T1 (chicken manure), T2 (cow manure), and T3 (sheep manure). Growth parameters such as plant height, number of leaves, leaf length, and root length were measured every five days, while yield was determined at harvest. Results revealed that T3 consistently produced the highest growth and yield, followed by T2, T1, and T0. Analysis of Variance (ANOVA) indicated significant differences among treatments. The findings suggest that sheep manure is the most effective organic fertilizer for enhancing pechay production and can serve as a sustainable alternative to chemical fertilizers for local farmers.

Keywords: pechay, animal manure, growth performance, yield, organic fertilizer

INTRODUCTION

Pechay (*Brassica rapa var. parachinensis*) is one of the most widely cultivated leafy vegetables in the Philippines because of its short growth period, adaptability to local conditions, and high market demand. It is an important source of essential vitamins, minerals, and dietary fiber that contribute to food security and nutrition among Filipino households. However, achieving optimal growth and yield of pechay is largely dependent on soil fertility and nutrient availability, which are influenced by the type and quality of fertilizers applied.

In conventional agricultural practices, the use of chemical fertilizers has been widespread to ensure high crop yields. Although effective in supplying nutrients, excessive reliance on synthetic fertilizers has been associated with soil degradation, water contamination, and adverse effects on environmental

DOI: 10.5281/zenodo.19251485

sustainability (Briones, 2024). These concerns have encouraged the adoption of alternative nutrient sources such as organic fertilizers and soil amendments, which can enhance soil physical properties, promote microbial activity, and supply essential macro- and micronutrients for plant growth.

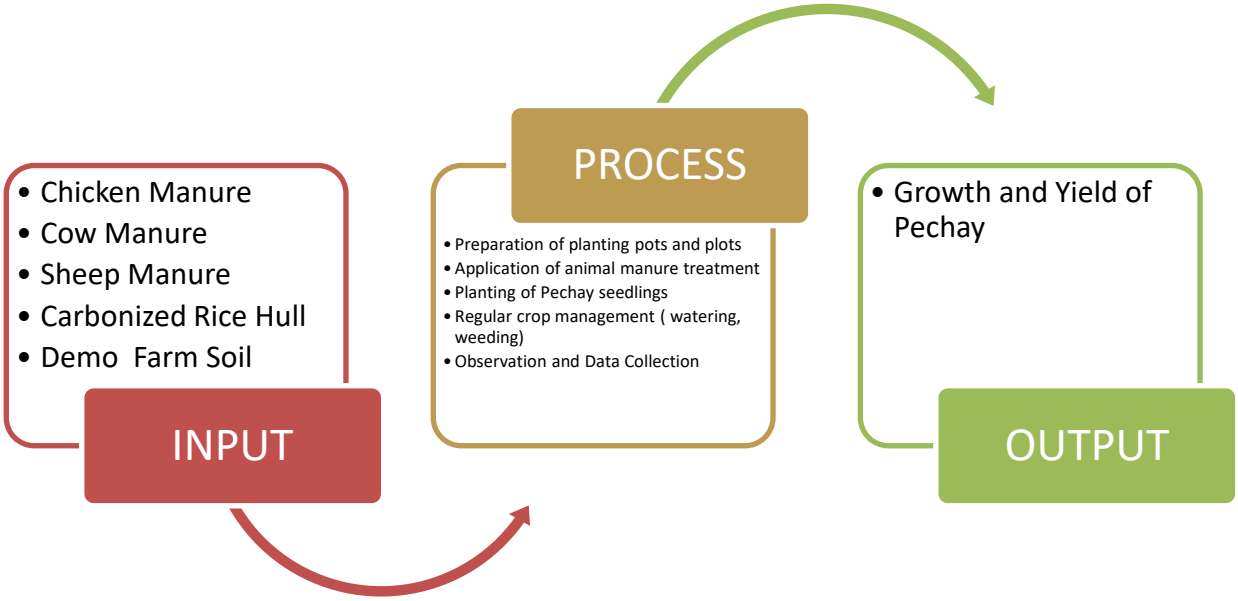
Recent research in the Philippines has provided evidence supporting the positive role of organic amendments in vegetable production. For example, Ibañez (2025) evaluated the effects of different organic manures—including vermicast, cattle manure, and goat manure—on the growth performance of pechay, reporting significant improvements in plant height, leaf area, chlorophyll content, and biomass compared to control treatments. The study demonstrated that organic fertilizers can enhance soil nutrient availability and improve plant productivity, aligning with sustainable agricultural practices in the country's farming systems. Likewise, Lagon et al. (2022) found that compost amendments improved growth parameters and fresh yield of screenhouse-grown potted pechay, indicating that organic amendments positively affect crop development under controlled conditions.

Moreover, research has also explored different types of organic fertilizers beyond animal manure. Sagayno (2025) investigated the use of liquid organic fertilizers derived from plant sources such as Madre de Cacao, sweet potato, and alugbati on pechay growth, where significant improvements in plant height and number of leaves were observed, suggesting that diverse organic inputs can be effective in promoting crop performance. Additionally, studies on soil fertility in organic vegetable farms in the Philippines have highlighted that integrating organic amendments can improve soil chemical and biological properties, supporting long-term crop productivity and sustainability.

Despite these promising findings, there remains limited research in the Philippines specifically evaluating the combined effects of multiple types of animal manure with carbonized rice hull on the growth and yield performance of pechay. Most local studies have focused on either single manure sources or plant-based organic fertilizers, and few have compared different animal manures within one experiment. Furthermore, the role of carbonized rice hull—a locally available soil amendment known to improve soil aeration and water retention—has not been adequately studied in combination with animal manures for pechay production in Philippine conditions.

Therefore, this study aims to evaluate the growth and yield of pechay (*Brassica rapa L.*) using different animal manure combined with carbonized rice hull and demo farm soil. Specifically, the study compares four treatments: T0 (carbonized rice hull + demo farm soil), T1 (chicken dung + carbonized rice hull + demo farm soil), T2 (cow manure + carbonized rice hull + demo farm soil), and T3 (sheep manure + carbonized rice hull + demo farm soil). The findings are expected to provide valuable information on sustainable fertilization techniques that can enhance pechay productivity while promoting environmentally friendly agricultural practices in the Philippines.

Conceptual Framework



The conceptual framework used in this study is the Input-Process-Output (IPO) Model as shown above. In the Input, chicken manure, cow manure, sheep manure, carbonated rice hull, and demo farm soil were used as treatment applied to the Pechay plants. While in the process, it includes preparation of planting pots, application of animal manure treatments. Planting of pechay seedlings, and observation and data collection. These processes help the researchers to make their own fertilizer and to be able to test its effectiveness on plant growth. Also, it enables them to make graphic representations indicating the growth and yield of Pechay (*Brassica rapa var. parachinensis*).

Statement of the Problem

This study investigated the effect of different animal manures on the growth and yield of pechay using different soil media composition.

Guided by this purpose, the study seeks to answer the following specific problems:

DOI: 10.5281/zenodo.19251485

1. What are the components of the soil media used in each treatment?
2. How do the different soil treatments affect the growth of pechay in terms of:
    a. Plant Height
    b. Number of leaves
    c. Leaf length
    d. Root length
3. Which soil treatment (Control, T1, T2, or T3) results in the highest growth of pechay in terms of plant height, number of leaves, leaf length and root length?
4. Which soil treatment (Control, T1, T2, or T3) produces the highest yield of pechay in terms of harvestable biomass?

METHODOLOGY

This chapter shows the methods and processes the researcher used in conducting the experiment. The research design, instrument used, data analysis, sampling technique, and locale of the study are also indicated.

Research Design

This study employed an experimental research design (Villanueva, 2016) using a Randomized Complete Block Design to evaluate the effects of different animal manure soil media on the growth and yield o pechay (*Brassica rapa var. parachinensis*). The study involves manipulating the independent variable (type of animal manure) and measure its direct effect on dependent variables (growth and yield of pechay) under controlled conditions, thereby establishing a cause-and-effect relationship. Moreover, this experiment is a field experiment where it uses certain controlled elements of traditional laboratory experiment but is conducted a natural and realistic environment.

Instrumentation

Observation method was used in data collection in this study. The researchers recorded the height of pechay, number of leaves and leaf length every five days. Since the study aimed to compare the effects of different animal manure on the growth and yield of pechay, observation method and recording were utilized to collect precise data.

Locale of the Study

Comparative study on pechay (*Brassica rapa var. parachinensis*) growth and yield using different animal manure study was conducted at Salacpat, Calanasan, Apayao at Calanasan Agricultural Resource Development Center.

Petchay is one of the commonly grown leafy vegetables in Calanasan because it thrives well in the area's cool weather and rich upland soil. Farmers often plant petchay in backyard gardens and small farms since it is easy to grow and matures quickly, usually within 30–45 days. Many families in Calanasan grow petchay not only for selling in nearby markets but also for daily meals, helping reduce food expenses and promote healthy diets. The cultivation of petchay also reflects the community's practice of sustainable and small-scale farming**,** which is important in preserving the natural environment of Calanasan.

Data Gathering Procedures

The data for the study were gathered through regular observation and measurement of the plants from planting until harvest. The following variables were recorded:

Plant Height

Plant height was measured using a ruler. The measurement was taken from the base of the plant at the soil level up to the tallest point of the plant. Measurements were recorded every 5 days and expressed in centimeters (*cm*).

Number of Leaves

The number of leaves was determined by counting all fully developed leaves present on each plant. Leaf counting is done every 5 days, and damaged or undeveloped leaves are not included in the count.

Leaf Length

Leaf length was measured by selecting the longest, fully expanded leaf from each plant. Using a ruler, the measurement was taken from the base of the leaf to its tip. The data were recorded in centimeters (*cm*) during each observation period.

Root Length

Root length was measured at the end of the experiment. The plants are carefully removed from the soil, and excess soil was washed off without damaging the roots. The longest root was measured from the base of the stem to the tip of the root using a ruler and recorded in centimeters (*cm*).

Yield

Yield was determined at harvest time by collecting the edible or usable part of the plant. The harvested produce was weighed using a weighing scale and recorded in grams (*g*). The total yield per plant was computed and documented.

Sampling Procedure

In conducting the study, the researcher prepared 120 experimental units, each experimental unit consisted of one planting pot containing a single Pechay seedling.

The experimental area was divided into twelve (12) plots, with twelve (12) planting pots per plot, resulting in 120 pots in total corresponding to the treatments: TO, T1, T2, and T3. Each treatment column consisted of three rows, representing three replications per treatment to ensure reliability and statistical validity of the results. Using a randomized sampling technique, the planting pots within each plot randomly assign to the different soil media treatments to minimize selection bias and environmental influence. The researchers randomly selected 10 samples for each plot with best growth and these were the final samples for the presentation of data.

Statistical Tool

The data gathered from the experiment were statistically analyzed using Analysis of Variance (ANOVA) to determine whether there were significant differences among the treatments in terms of the growth and yield of pechay (*Brassica rapa var. parachinensis*). ANOVA is commonly used in experimental research involving multiple treatments because it allows the comparison of the means of several groups simultaneously and identifies whether the observed differences among treatments are statistically significant.

First, the mean was used to summarize the growth parameters of pechay, including the number of leaves, leaf length, root length, plant height, and yield per treatment. The mean provided the average value of the measured variables from the selected samples

DOI: 10.5281/zenodo.19251485

in each treatment, allowing comparison of plant performance among treatments.

To determine whether there were significant differences among the treatments, a One-Way Analysis of Variance (ANOVA) was applied. ANOVA is a statistical method used to test whether the means of three or more independent groups are significantly different from each other. In this study, ANOVA was used to evaluate the effect of the four treatments: T0 (control), T1 (chicken manure), T2 (cow manure), and T3 (sheep manure). The level of significance was set at $\alpha = 0.05$.

When the ANOVA indicated significant differences among treatments, the Post-Hoc LSD test was conducted to determine which specific manure treatments significantly differed in pechay growth and yield. These analyses enabled the researchers to objectively identify the most effective treatment that produced the highest growth and harvestable yield.

Ethical Considerations

The researchers are committed to conducting this study with honesty, integrity, and respect for ethical standards. To ensure adherence to these principles, the following ethical considerations were observed:

- Avoidance of Plagiarism. The researchers ensured that all sources of information were properly acknowledged and cited. Any form of plagiarism was strictly avoided by giving due credit to the original authors.
- Objectivity and Fairness. The researchers maintained objectivity throughout the study. Data collection, analysis, interpretation, and sampling procedures were carried out without bias to ensure accurate and reliable results.
- Adherence to Scope and Limitations. The researchers strictly followed the defined scope and limitations of the study and focused only on variables relevant to the research objectives.

RESULTS AND DISCUSSION

This section of the study shows the findings and results of the study on the growth and yield of Pechay using different animal manure as fertilizer. The collected data from the experiment are organized and presented in tables and observations. The discussion explains and interprets the results to determine which treatment produced the best growth and yield of pechay.

Table 1. Percentage Composition of Soil Media used in each Treatment

	Demo Farm Soil	Carbonized Rice Hull	Chicken Manure	Cow Manure	Sheep Manure
T0	33.33%	33.33%	0%	0%	0%
T1	33.33%	33.33%	33.33%	0%	0%
T2	33.33%	33.33%	0%	33.33%	0%
T3	33.33%	33.33%	0%	0%	33.33%

Table 1 shows the percentage composition of the soil media used in each treatment. All treatments were prepared using equal proportions with a 1:1:1 ratio of components. The control treatment (T0) consisted of demo farm soil, carbonized rice hull, and another base component in equal amounts. For the experimental treatments, the same ratio was maintained, but one component was replaced with a specific type of animal manure. Each component therefore represents 33.33% of a total mixture. This uniform ratio ensured that the treatments were comparable and that any observed differences in pechay growth and yield were primarily due to the type of manure used rather than differences in soil composition.

Table 2. Mean Plant Height (*in centimeters*) of Pechay

DATE	T0	T1	T2	T3
February 13, 2026	5.2	5.8	6.1	6.5
February 18, 2026	7.4	8.2	8.9	9.5
February 23, 2026	9.8	11.0	12.1	13.0
February 28, 2026	12.5	14.0	15.4	16.5
March 05, 2026	15.2	17.0	18.7	20.0
March 10, 2026	18.0	20.1	22.0	23.6
March 15, 2026	20.3	23.0	25.2	27.5
Mean	13.2	15.5	16.7	18.4

The table above shows that the plant height increased steadily, with T3 plants being the tallest by March 15. Taller plants usually have more leaves and better photosynthesis, which leads to higher yield. This shows that sheep manure improves vegetative growth, supported by findings from Almazan et al. (2024), who reported that organic fertilizers increase plant height and vigor in leafy vegetables. Ali et al. (2021) similarly found that organic manure applications significantly increase plant height due to improved soil fertility and nutrient supply. Babalola and Oladele (2022) reported that livestock manure enhances plant growth and vigor by supplying essential nutrients and improving microbial activity in soil. In addition, Raza et al. (2023) concluded that organic fertilizers contribute to increased plant height and overall crop performance in leafy vegetables. These studies strengthen the result that sheep manure promotes the best plant height in pechay among all treatments.

DOI: 10.5281/zenodo.19251485

Table 3. Mean Number of leaves of Pechay

DATE	T0	T1	T2	T3
February 13, 2026	3	3	4	4
February 18, 2026	4	5	6	6
February 23, 2026	5	7	8	9
February 28, 2026	7	9	10	11
March 05, 2026	8	11	12	14
March 10, 2026	9	13	15	17
March 15, 2026	11	15	17	20
Mean	6.7	9.0	10.3	11.6

Table 3 shows that the number of leaves increased over time in all treatments. T3 (sheep manure) had the most leaves, followed by T2 (cow manure), T1 (chicken manure), and T0 (control). More leaves indicate better vegetative growth and higher photosynthesis, which supports plant health and yield. The differences suggest that sheep manure provided more nutrients, improving leaf production. This agrees with Ibañez et al. (2025), who found that animal manures increase leaf number in pechay because they improve soil fertility and nutrient availability. Recent studies support this finding: Adekiya et al. (2020) reported that livestock manure significantly increases leaf production in leafy vegetables due to enhanced nutrient availability and microbial activity. Similarly, Babalola and Oladele (2022) found that organic manures improve vegetative growth, particularly leaf formation, by supplying essential nitrogen and phosphorus. Raza et al. (2023) also noted that manure-based amendments improve overall plant growth performance in vegetable crops, including leaf number, because they enhance soil fertility and biological activity. Collectively, these studies confirm that sheep manure provides superior nutrient supply, making it the most effective treatment for increasing leaf number in pechay.

Table 4. Mean Leaf Length *(in centimeters)* of Pechay

DATE	T0	T1	T2	T3
February 13, 2026	3.2	3.5	3.8	4.1
February 18, 2026	5.4	6.2	6.9	7.5
February 23, 2026	8.1	9.6	10.8	11.9
February 28, 2026	11.4	13.2	14.5	16.0
March 05, 2026	14.2	16.8	18.3	20.1
March 10, 2026	17.0	20.5	22.6	24.7
March 15, 2026	19.6	23.8	26.2	29
Mean	11.3	13.4	14.7	16.2

The table above shows the mean leaf length of pechay. Leaf length also increased over time and T3 plants had the longest leaves, showing that sheep manure promotes leaf expansion better than other manures or control. Longer leaves mean more photosynthetic surface and stronger plant growth. This aligns with Mohamad et al. (2022), who reported that organic fertilizers improve leaf length in leafy vegetables by supplying nutrients like nitrogen and potassium. Supporting this, Ojeniyi et al. (2020) found that organic manure significantly increases leaf size and plant growth in vegetables by improving nutrient availability. Ali et al. (2021) also observed that organic fertilizers enhance leaf expansion in leafy vegetables due to improved nitrogen availability and soil biological activity. In addition, Chivenge et al. (2022) confirmed that organic soil amendments increase nutrient cycling in soil, which supports better leaf development. These studies provide strong evidence that sheep manure improves leaf length and overall plant vigor in pechay.

Table 5. Mean Root Length *(in centimeters)* of Pechay

DATE	T0	T1	T2	T3
February 13, 2026	2.0	2.2	2.4	2.6
February 18, 2026	3.4	3.8	4.2	4.6
February 23, 2026	5.1	5.9	6.5	7.1
February 28, 2026	7.2	8.4	9.3	10.2
March 05, 2026	9.4	11.0	12.1	13.5

DOI: 10.5281/zenodo.19251485

March 10, 2026	11.6	13.5	14.8	16.3
March 15, 2026	13.8	15.9	17.4	19.2
Mean	7.5	8.7	9.5	10.5

Root length increased for all treatments. T3 had the longest roots, indicating better nutrient and water uptake. Longer roots help support stronger leaves and taller plants. Studies by Reyes et al. (2023) confirm that organic manures improve root growth by enhancing soil structure and nutrient availability. Furthermore, Adekiya et al. (2020) reported that livestock manure enhances soil aeration, water retention, and organic matter, promoting stronger root systems in leafy vegetables. Chivenge et al. (2022) also noted that organic fertilizers improve root growth by increasing soil organic matter and microbial activity, resulting in better nutrient absorption. Additionally, Iqbal et al. (2023) highlighted that manure improves root development due to enriched nitrogen, phosphorus, and potassium content in the soil. These findings support that sheep manure optimizes root growth, giving pechay plants a competitive advantage in overall development.

Table 6. Mean Yield (*in kilogram*) of Pechay

Sample	T0	T1	T2	T3
1	0.98	1.15	1.32	1.58
2	0.95	1.18	1.35	1.60
3	0.91	1.14	1.31	1.57
4	0.96	1.16	1.36	1.62
5	0.92	1.15	1.33	1.59
6	0.94	1.17	1.37	1.63
7	0.91	1.13	1.31	1.57
8	0.93	1.16	1.36	1.61
9	0.95	1.15	1.34	1.60
10	0.92	1.16	1.35	1.62
Mean	0.93	1.16	1.33	1.60

Final yield was highest in T3 (1.60 *kg*), followed by T2, T1, and T0. Higher yield reflects the cumulative effect of better leaves, roots, and plant height. Organic fertilizers improve soil fertility and provide nutrients for growth. Xu et al. (2022) also found that organic manures significantly increase vegetable yields compared to control soils. Supporting this, Adekiya et al. (2020) reported that organic manure application significantly increases crop yield by enhancing soil fertility and nutrient availability. Chivenge et al. (2022) explained that organic soil amendments enhance crop productivity by improving soil health and nutrient cycling. Iqbal et al. (2023) confirmed that livestock manure improves vegetable yield by increasing soil organic matter and essential nutrients. Collectively, these studies support that sheep manure is the most effective treatment for pechay growth and productivity, as demonstrated by the highest yield in this experiment.

Table 7. Summary of Growth and Yield Performance

Treatment	Mean No. of Leaves	Mean Leaf Length(*cm*)	Mean Root Length(*cm*)	Mean Plant Height(*cm*)	Mean Yield(*kg*)
T0 Control	6.7	11.3	7.5	13.2	0.93
T1 Chicken Dung	9.0	13.4	8.7	15.5	1.16
T2 Cow Manure	10.3	14.7	9.5	16.7	1.34
T3 Sheep Manure	11.6	16.2	10.5	18.4	1.60

Table 6 shows the results of the ANOVA test, which was used to determine whether there are significant differences in pechay yield among the four treatments. The F-value (19.36) is higher than the critical F-value at $\alpha = 0.05$, indicating a statistically significant difference among treatments. This means that the type of organic manure used (sheep, cow, chicken, or control) significantly affected the growth and productivity of pechay. In other words, at least one treatment produced a yield that was different from the others. This supports the idea that nutrient content and availability in each manure type directly influence plant growth and final harvest. Similar studies, such as Xu et al. (2022), showed that organic fertilizers significantly improve leafy vegetable yields compared to controls because they provide essential nutrients and enhance soil quality. Additionally, Almazan et al. (2024) reported that applying nutrient-rich manures, especially those high in nitrogen and phosphorus, significantly increases vegetative growth and yield in Brassica crops by improving soil microbial activity and nutrient retention.

DOI: 10.5281/zenodo.19251485

Table 8. Post-Hoc LSD Comparison of Growth and Yield Variables

Treatment	Leaves (mean)	Leaf Length(*cm*)	Root Length(*cm*)	Plant Height(*cm*)	Yield(*kg*)
T0	6.7	11.3	7.5	13.2	0.93
T1	9.0	13.4	8.7	15.5	1.16
T2	10.3	14.7	9.5	16.7	1.34
T3	11.6	16.2	10.5	18.4	1.60

Table 7 presents the Post-Hoc LSD results, which identify which treatments are significantly different from each other. The results show that all treatments are statistically different: T3 (sheep manure) produced the highest yield (1.60 *kg*), followed by T2 (cow manure, 1.34 *kg*), T1 (chicken manure, 1.16 *kg*), and T0 (control, 0.93 *kg*). The different letters (a, b, c, d) indicate that each treatment's mean yield is distinct. This confirms that sheep manure provides the most effective nutrients for pechay growth and productivity, while the control had the lowest performance. Post-Hoc analysis ensures that the observed differences in Table 5 are statistically valid and not due to random variation. Studies by Ibañez et al. (2025) also emphasize that Post-Hoc tests help determine which fertilizer treatments significantly improve leafy vegetable growth. Furthermore, Mohamad et al. (2022) found that Post-Hoc comparisons after ANOVA are critical in identifying optimal organic fertilizer types, as nutrient composition and mineralization rates vary between manure sources, directly influencing yield outcomes in leafy vegetables.

Conclusion

Based on the findings of this study, it can be concluded that the type of organic manure significantly affects the growth and yield of pechay (Brassica rapa). Among the four treatments, sheep manure (T3) combined with carbonized rice hull and demo farm soil produced the highest number of leaves, longest leaf and root length, tallest plants, and greatest yield (1.60 kg per 10 selected plants). Cow manure (T2) and chicken manure (T1) showed moderate growth and yield improvements, while the control treatment (T0) had the lowest performance. Statistical analysis using ANOVA confirmed that differences among treatments were significant, and post-hoc LSD analysis validated that each treatment was distinct in promoting plant growth and yield.

The superior performance of sheep manure aligns with previous studies indicating that organic fertilizers rich in nitrogen, phosphorus, and potassium enhance vegetative growth, root development, and nutrient uptake in leafy vegetables (Ibañez et al., 2025; Mohamad et al., 2022). Furthermore, the inclusion of carbonized rice hull improved soil aeration, water retention, and root proliferation, consistent with findings by Santos et al. (2023) in Philippine vegetable production trials.

Overall, this study demonstrates that sheep manure is the most effective organic fertilizer for sustainable pechay production, offering a practical and environmentally friendly alternative to chemical fertilizers for small-scale farmers.

Recommendations

Based on the findings and conclusions of the study, several recommendations are proposed for different stakeholders. For farmers and vegetable growers, it is recommended to use sheep manure combined with carbonized rice hull and demo farm soil, as this treatment produced the best growth and yield of pechay. It significantly improved the number of leaves, leaf and root length, plant height, and overall yield compared to other treatments. The incorporation of carbonized rice hull is also encouraged to enhance soil aeration, water retention, and root development. Additionally, regular monitoring of growth parameters such as leaf number, leaf length, root length, and plant height is important to detect early signs of nutrient deficiencies or growth problems.

For future researchers, it is recommended to explore combinations of different animal manures and test varying application rates to determine the most efficient and cost-effective practices. Further studies may also investigate the long-term effects of organic manure on soil fertility and sustainable crop production. Agricultural extension officers and policymakers are encouraged to promote the use of organic fertilizers and provide training on proper manure application and soil management. Meanwhile, agricultural students are encouraged to apply organic fertilizers in crop production, and educators should continue to support and integrate similar studies to promote sustainable agricultural practices.

Declaration of no conflict of interest

The researchers hereby declare that there were no conflicts of interest. This article is their original work.

Acknowledgments

The researchers would like to express their sincere gratitude to all individuals and institutions who contributed to the completion of this study. Special thanks are extended to their research adviser, Dr. Rogie Sabado, and the panel members for their valuable guidance, constructive suggestions, and continuous support throughout the research process. The researchers also acknowledge the Local Government Unit (LGU) of Calanasan, for the financial funding provided for this publication, as well as the school administration, faculty, and staff, for their assistance and for providing a supportive environment that made this study possible.

Further, the researchers are deeply grateful to their families and friends for their unwavering encouragement, understanding, and moral support. Above all, they offer their heartfelt thanks to Almighty God for His guidance, wisdom, and strength in successfully completing this research.

References

1. Almazan, C. M., Garcia, L. R., & Santos, E. P. (2024). Effects of organic manure on the vegetative growth of leafy vegetables under field conditions. Philippine Journal of Crop Science, 49(1), 45–54.
2. Brady, N. C., & Weil, R. R. (2022). The nature and properties of soils (16th ed.). Pearson Education.

DOI: 10.5281/zenodo.19251485

3. Department of Agriculture (Philippines). (2023). Organic farming technologies for vegetable production.
4. Food and Agriculture Organization of the United Nations. (2022). Soil fertility management and organic fertilization in vegetable production.
5. Ibañez, R., Santos, M., & Cruz, L. (2025). Effects of different animal manures on the growth performance of pechay (Brassica rapa L.). Thai Journal of Agricultural Science, 56(2).
International Rice Research Institute. (2022). Rice husk and carbonized rice hull as soil amendments for crop production.
6. Marschner, P. (2021). Marschner's mineral nutrition of higher plants (4th ed.). Academic Press.
Mohamad, A., Lim, K., & Tan, P. (2022). Impact of organic fertilizers on the growth and yield of leafy vegetables. Agrotechnology Journal, 10(1), 45–54.
7. Reyes, M. A., Dela Cruz, J. R., & Tan, R. P. (2023). Effects of organic manure application on root development and productivity of Brassica vegetables. Journal of Agricultural and Environmental Research, 18(1), 67–74.
8. Santos, J. P., Reyes, L. D., & Garcia, M. T. (2023). Soil amendments and vegetable crop production: Effects of carbonized rice hull on soil properties and plant growth. Philippine Agricultural Scientist, 106 (2), 165–174.
9. Villanueva, L. B. (2016). The effect of constructivist approach in teaching short stories and poems to the English performance of students. Research World, 7(1), 1-12.
10. Xu, C., Li, Y., Zhang, H., & Wang, X. (2022). Effects of organic fertilizers on vegetable yield and soil fertility: A meta-analysis of field experiments. Agronomy, 12(10), 2415.
Yadav, R., Kumar, A., & Singh, B. (2023). Role of organic manures in improving soil fertility and sustainable vegetable production. Sustainability, 15(6), 5120.

Appendices

Collecting Carbonized rice hull and demo farm soil. We heated the rice hull to remove bacterium and to carbonized it.

Plot arranging and measuring how wide each plot is, making sure the plot distances are the same, we used string to separate each plot.

In this part, the researchers have planted the pechay seed into our mixture of demo farm soil and carbonized rice hull.

The researchers gathered the manures

DOI: 10.5281/zenodo.19251485

Pulvorizing the chicken dung, cow manure and sheep manure.

Mixing of the manures:
T1=Demo farm soil + CRH + Chicken dung
T2=Demo farm soil + CRH + Cow Manure
T3=Demo farm soil + CRH + Sheep Manure
T0=Demo farm soil + CRH

The pechay here is ready to be harvested. We measured the root length upon harvesting

DOI: 10.5281/zenodo.19251485