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Effects of Chicken and Cow Manure on Peanut Growth and Yield at BMKG North Sumatra, Medan

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Abstract
This study aimed to evaluate the effects of chicken manure, cow manure, and their interaction on the growth and yield of peanut (*Arachis hypogaea* L.). The research was conducted at the Meteorological, Climatological, and Geophysical Agency (BMKG) of North Sumatra, Medan, from May to August 2026. The experiment employed a factorial randomized block design consisting of two treatment factors. The first factor was chicken manure application, comprising three levels: A0 = 0, A1 = 2, and A2 = 4 kg plot^{-1}. The second factor was cow manure application, comprising S0 = 0, S1 = 1.5, and S2 = 3 kg plot^{-1}. The observed parameters included plant height, dry pod weight, dry seed weight, pod yield per hectare, and seed yield per hectare. The descriptive results indicated that the combination of 2 kg plot^{-1} chicken manure and 3 kg plot^{-1} cow manure (A1S2) produced the highest values among the reported treatment combinations, with 480 g of dry pods plot^{-1}, 365 g of dry seeds plot^{-1}, 3.40 t ha^{-1} of pod yield, and 2.33 t ha^{-1} of seed yield. Conversely, the control treatment (A0S0) recorded the lowest pod and seed production per plot. These findings suggest that the A1S2 treatment combination showed the most promising descriptive performance. However, in the absence of a complete analysis of variance and inferential statistical tests, the observed differences cannot be interpreted as statistically significant treatment effects.

Keywords: Chicken Manure; Cow Manure; Growth; Peanut; Yield

Introduction

Peanuts (*Arachis hypogaea* L.) are a food crop with high economic value, serving as an important source of plant-based protein for the public. They are widely utilized both as a food source and as a raw material for industrial applications, including the production of cooking oil, margarine, peanut butter, and various other food products. Despite their high economic value and significant benefits, the productivity of peanuts in Indonesia still requires improvement. Data from the Ministry of Agriculture (2025) indicate that peanut productivity varied across different provinces during the 2020–2024 period. One approach to increasing crop yields is through soil fertility management and the application of fertilizers tailored to the specific needs of the plants. Research by Yunanda et al., (2022) demonstrates that the application of organic fertilizer can improve the physical and chemical properties of the soil, thereby enhancing peanut production.

Organic fertilizers are derived from natural materials, such as livestock manure and plant residues. Their application increases organic matter content, improves soil structure, and helps provide the nutrients required by plants. The use of organic fertilizers can also support the growth and yield of peanuts. This is supported by research from Fahrurrozi et al., (2023) , which demonstrates that the application of vermicompost enhances pod weight, seed weight, and the uptake of nitrogen, phosphorus, and potassium in peanut plants.

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One type of organic fertilizer that can be used is chicken manure. This fertilizer contains nutrients essential for plants, particularly nitrogen, phosphorus, and potassium. These nutrients play a role in supporting vegetative growth and crop yield formation. Research by Aminuddin et al. (2021) indicates that the use of chicken manure combined with SP-36 fertilizer can enhance the growth and production of peanuts. Furthermore, Andari et al., (2023) state that the application of bokashi (fermented organic matter) made from manure can influence the growth and yield of peanut plants.

Several previous studies have demonstrated that the application of chicken manure has the potential to enhance the growth and yield of peanut plants. Research by Djafar et al. (2023) indicates that the application of chicken manure influences plant height, number of leaves, weight of 100 seeds, and pod weight per plot.

In addition to chicken manure, cow manure also has the potential to be used for improving soil fertility. Cow manure consists of livestock waste that has undergone a decomposition process and contains organic matter as well as nutrients required by plants. Its application can help improve soil conditions and support root growth. Research by Febri and Syafrani (2026) indicates that a combination of cow manure and NPK Phonska fertilizer can enhance the growth and several yield components of peanut plants grown in Red-Yellow Podzolic soil.

The use of cow manure on peanut plants has been investigated by several previous researchers. Waruwu et al., (2021) conducted a study on the effects of applying cow manure and NPK fertilizer on the growth and production of peanuts. Their findings indicate that the application of cow manure has a significant effect on plant height and the number of primary branches; however, it does not show a significant impact on certain yield components, such as the number of filled pods, dry pod weight, and the weight of 100 seeds. These results suggest that the plant's response to cow manure can vary depending on the specific growth or yield parameter being measured.

Research by (Siregar et al., 2021) on the application of cow manure and potassium to the growth and production of the 'Garuda' peanut variety indicates that the application of cow manure has a significant effect on plant height. However, this treatment did not show a significant effect on several yield components, such as the number of filled pods, dry pod weight, and the weight of 100 seeds. The study's findings demonstrate that an increase in vegetative growth is not always accompanied by a significant increase in generative yield.

Based on the description above, chicken manure and cow manure have the potential to be used as sources of organic matter in peanut cultivation. Since both types of manure possess different characteristics and nutrient contents, further study is required to determine their respective effects on the growth and yield of peanut plants.

Literature Review

Chicken Manure and Peanut Growth and Yield

Organic manure plays an important role in maintaining soil fertility and improving crop productivity through the addition of organic matter and essential nutrients. Chicken manure is a potential organic fertilizer because it contains relatively high concentrations of nitrogen (N), phosphorus (P), and potassium (K). These nutrients support vegetative growth, root development, and reproductive processes in plants. In addition, chicken manure can improve soil structure, aeration, water-holding capacity, and biological activity, thereby creating favorable conditions for plant growth (Babu et al., 2021).

Previous studies have demonstrated that chicken manure can improve peanut growth and yield, although its effectiveness depends on application rates and growing conditions. (Marlina et al.,

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2015) reported that chicken manure application at 10 t ha^{-1} produced favorable peanut yields. However, (Gultom, 2019) found that chicken manure significantly affected plant height at four and six weeks after planting, but did not significantly affect filled pods per plant, seed production per plot, or seed yield per hectare. These findings indicate that vegetative responses do not necessarily correspond directly to increased crop productivity.

Cow Manure and Peanut Growth and Yield

Cow manure is an organic fertilizer that contributes to soil fertility through the addition of organic matter and essential plant nutrients. Its application can improve soil porosity, water retention, and microbial activity, supporting root development and nutrient availability. Cow manure contains nitrogen, phosphorus, and potassium, although its nutrient composition differs from that of poultry manure (Xu et al., 2025).

Research by Astuti et al., (2022) indicates that the application of different livestock manures, including chicken and cow manure, can influence peanut growth and yield components. Nevertheless, plant responses vary according to manure type, application rate, soil conditions, and environmental factors. This suggests that cow manure should not be evaluated solely as an individual nutrient source but also in relation to its potential contribution when combined with other organic fertilizers.

Combined Application of Chicken and Cow Manure

The combined application of chicken and cow manure may provide complementary nutrient sources and improve soil conditions. Differences in nutrient composition and organic matter characteristics may influence nutrient availability and plant responses throughout vegetative and reproductive growth stages. Therefore, evaluating the interaction between these two manure types is important for identifying suitable application combinations.

Previous research by Denis et al., (2019) demonstrated that manure types could interact with other treatments in influencing peanut productivity. Similarly, Julaeha et al., (2017) reported differences in peanut productivity associated with the application of various livestock manures. These findings suggest that the effectiveness of organic fertilizers depends not only on the type of manure but also on the application rate and treatment combination.

However, previous studies have generally examined manure effects under different treatment combinations and growing conditions. The present study addresses this research gap by simultaneously evaluating three levels of chicken manure (0, 2, and 4 kg plot^{-1}) and three levels of cow manure (0, 1.5, and 3 kg plot^{-1}) using a factorial randomized block design. Unlike studies focusing on individual manure applications, this research compares their individual and combined responses under the growing conditions of BMKG North Sumatra, Medan. The observed parameters include plant height, number of primary branches, dry pod weight, dry seed weight, and pod and seed yield per hectare.

Accordingly, this study provides additional empirical information on the potential of combined chicken and cow manure applications to improve peanut growth and productivity. It also contributes to identifying promising manure combinations for peanut cultivation under the specific environmental conditions of the study location.

Research Method

The experiment was conducted at the Meteorology, Climatology, and Geophysics Agency (BMKG) of North Sumatra, Medan, Indonesia, from May to August 2026. The materials consisted of Situraja DM-1 peanut seeds, chicken manure, cow manure, Dithane M-45 fungicide, and Decis

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insecticide. The experiment used a factorial randomized block design (RBD) with two factors: chicken manure (A) and cow manure (S), each comprising three application levels, resulting in nine treatment combinations.

The treatment levels were as follows:

Factor A: Chicken manure application rate

1. A0 = 0 kg plot^{-1}
2. A1 = 2 kg plot^{-1}
3. A2 = 4 kg plot^{-1}

Factor S: Cow manure application rate

1. S0 = 0 kg plot^{-1}
2. S1 = 1.5 kg plot^{-1}
3. S2 = 3 kg plot^{-1}

Each treatment combination was randomly assigned within each block. With three replications, the experiment comprised 27 experimental plots. Each plot measured 100 cm × 150 cm, with a bed height of approximately 30 cm.

The experimental land was cleared, tilled to a depth of approximately 25–40 cm, and prepared into experimental beds. Chicken manure was applied two weeks before planting, while cow manure was applied one week before planting. Both types of manure were distributed evenly and incorporated into the soil according to their respective treatment rates.

Peanut seeds were selected using a flotation test, and two seeds were planted per hole at a depth of 3–5 cm, with a spacing of 25 cm × 25 cm. Replanting was conducted when necessary during the early growth stage to maintain plant population uniformity. Crop maintenance included irrigation according to rainfall and soil moisture conditions, manual weed removal, and earthing up at approximately three weeks after planting. Pest and disease control was carried out when necessary using the reported pesticides, following the applicable product-label recommendations.

Peanuts were harvested at approximately 85–90 days after planting when physiological maturity was indicated by yellowing leaves, partial leaf fall, yellowish pod shells, and hardened pods. Plants were carefully lifted to minimize pod damage and harvest losses.

Observed Parameters

The observed parameters included plant height, number of primary branches, pod production per plot, seed production per plot, pod yield per hectare, and seed yield per hectare.

1. Plant height (cm): Plant height was measured from the soil surface at the stem base to the growing point. Measurements were taken at 14, 21, 28, 35, 42, and 49 days after planting (DAP)
2. Number of primary branches: Primary branches were counted at 14, 21, 28, 35, 42, and 49 DAP
3. Pod production per plot (g plot^{-1}): Harvested pods were sun-dried for approximately 4–5 days until they reached a moisture content of 14%, then weighed using a weighing scale

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4. Seed production per plot (g plot^{-1}): Seeds were separated from the pods, cleaned, dried, and weighed to determine seed production per plot
5. Pod yield per hectare (t ha^{-1}): Pod production from the net harvested area was converted into tonnes per hectare
6. Seed yield per hectare (t ha^{-1}): Seed production from the net harvested area was converted into tonnes per hectare

Yield Conversion

Pod and seed yields per hectare were calculated by converting the harvested weight from the net plot area into a hectare-based yield. The following formula was used:

$$Y = \frac{W \times 10}{A}$$

Where:

Y = Hasil produksi (ton ha^{-1})

W = Bobot hasil panen (kg)

A = Luas panen bersih (m^2)

10 = Faktor konversi dari kg m^{-2} menjadi ton ha^{-1}

The calculation was performed separately for pod and seed production. The net harvested area excluded border rows, in accordance with the harvesting procedure.

Statistical Analysis

The experimental data were analyzed using analysis of variance (ANOVA) appropriate for a factorial randomized block design (RBD). The statistical model was:

$$Y_{ijk} = \mu + \rho_k + \alpha_i + \beta_j + (\alpha\beta)_{ij} + \varepsilon_{ijk}$$

Where:

Y_{ijk} = Nilai pengamatan pada perlakuan ke-i, ke-j, dan kelompok ke-k

μ = Nilai tengah umum

ρ_k = Pengaruh kelompok ke-k

α_i = Pengaruh pupuk kandang ayam ke-i

\(\beta_j\) = Pengaruh pupuk kandang sapi ke-j

β_j= Pengaruh interaksi pupuk kandang ayam dan sapi

$(\alpha\beta)_{ij}$= Galat percobaan

The analysis evaluated the individual effects of chicken manure and cow manure, as well as their interaction. When a significant effect was detected, a mean comparison test was conducted at the 5% significance level to identify differences among treatment means.

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Results and Discussion

The variables reported in this study were plant height, dry pod weight, dry seed weight, pod production per plot, seed production per plot, and the corresponding yields per hectare.

Plant Height

Plant height increased as the plants aged, from 14 to 49 days after planting (DAP). At 14 DAP, plant height ranged from 4.0 to 6.1 cm, increasing to 25.0–32.5 cm at 49 DAP. The manuscript describes an increasing-height trend across the manure treatments. The A2S2 treatment was reported to have the greatest plant height at 28, 35, 42, and 49 DAP, with values of 14.1, 2.8, 28.0, and 32.5 cm, respectively. The reported value of 2.8 cm at 35 DAP appears inconsistent with the stated increase over time and should be checked against the original measurements before publication.

Table 1 Production Planting Pods and Seeds

Blok 1	Treatment	14% dry pod (g/soil sample)	Dry seeds (g/soil samples)	Pods (ton/ha)	Seeds (ton/ha)
1	A0S0	70	47	2,33	1,57
2	A0S1	81	55	2,7	1,83
3	A0S2	85	58	2,83	1,93
4	A1S0	88	60	2,93	2
5	A1S1	93	63	3,1	2,1
6	A1S2	102	70	3,4	2,33
7	A2S0	85	57	2,83	1,9
8	A2S1	98	67	3,27	2,23
9	A2S2	80	54	2,67	1,8

Source: Data compiled, 2026

The results presented in Table X show that the application of chicken and cow manure resulted in different production responses in peanut plants (*Arachis hypogaea* L.). Dry pod weight at 14% moisture content ranged from 70 to 102 g per sample plant, while dry seed weight ranged from 47 to 70 g per sample plant. Pod yield ranged from 2.33 to 3.40 t ha^{-1}, whereas seed yield ranged from 1.57 to 2.33 t ha^{-1}.

The highest production was recorded in treatment A1S2, consisting of 2 kg $plot^{-1}$ of chicken manure combined with 3 kg $plot^{-1}$ of cow manure. This treatment produced 102 g of dry pods and 70 g of dry seeds per sample plant, corresponding to 3.40 t ha^{-1} of pod yield and 2.33 t ha^{-1} of seed yield. In contrast, the lowest production was observed in treatment A0S0, which received no chicken or cow manure, with 70 g of dry pods and 47 g of dry seeds per sample plant, equivalent to 2.33 t ha^{-1} of pod yield and 1.57 t ha^{-1} of seed yield.

Within the A0 treatment group, increasing cow manure application from 0 to 1.5 and 3 kg $plot^{-1}$ increased pod weight from 70 to 81 and 85 g per sample plant, respectively. Seed weight also increased from 47 to 55 and 58 g per sample plant. A similar pattern was observed in the A1 group, where pod weight increased from 88 g in A1S0 to 93 g in A1S1 and 102 g in A1S2. Seed weight increased from 60 to 63 and 70 g per sample plant, respectively. These observations indicate a positive descriptive response to increasing cow manure application at the A0 and A1 chicken manure levels.

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However, the response was not consistently positive at the highest chicken manure application rate. In the A2 group, pod weight increased from 85 g in A2S0 to 98 g in A2S1, but decreased to 80 g in A2S2. Similarly, seed weight increased from 57 to 67 g per sample plant before declining to 54 g. This pattern suggests that increasing the application rates of both manure types does not necessarily result in higher peanut production.

Compared with the untreated control (A0S0), treatment A1S2 increased pod yield from 2.33 to 3.40 t ha^{-1}, representing an increase of approximately 45.9%. Seed yield increased from 1.57 to 2.33 t ha^{-1}, equivalent to approximately 48.4%. These descriptive differences suggest that the combination of 2 kg $plot^{-1}$ chicken manure and 3 kg $plot^{-1}$ cow manure was associated with the highest production among the treatments observed.

Nevertheless, these findings represent descriptive results from Block 1. Therefore, the apparent differences among treatments should not be interpreted as statistically significant effects. Analysis of variance using data from all replications is required to determine the individual and interaction effects of chicken and cow manure on peanut production.

Table 2 Production of Peg and Seeds

Blok 1	Perlakuan	Production of Peas / Peck (g)	Seed Production / Stalk (g)	Pod Production (ton/ha)	Seed Production (ton/ha)
1	A0S0	325	235	2,33	1,57
2	A0S1	401	275	2,70	1,83
3	A0S2	412	290	2,83	1,93
4	A1S0	410	315	2,93	2,00
5	A1S1	420	315	3,10	2,10
6	A1S2	480	365	3,40	2,33
7	A2S0	401	285	2,83	1,90
8	A2S1	456	321	3,27	2,23
9	A2S2	387	270	3,10	1,50

Source: Data compiled, (2026)

The application of chicken and cow manure resulted in different descriptive production responses in peanut plants (*Arachis hypogaea* L.). Pod production ranged from 325 to 480 g $plot^{-1}$, while seed production ranged from 235 to 365 g $plot^{-1}$. Among the nine treatment combinations, A1S2 (2 kg $plot^{-1}$ chicken manure + 3 kg $plot^{-1}$ cow manure) produced the highest values, reaching 480 g $plot^{-1}$ for pods and 365 g $plot^{-1}$ for seeds. In contrast, A0S0 (without chicken or cow manure) recorded the lowest production, at 325 g $plot^{-1}$ for pods and 235 g $plot^{-1}$ for seeds.

Within the A0 treatment group, pod production increased from 325 g $plot^{-1}$ in A0S0 to 401 g $plot^{-1}$ in A0S1 and 412 g $plot^{-1}$ in A0S2. Seed production also increased from 235 to 275 and 290 g $plot^{-1}$, respectively. A similar trend was observed in the A1 group, where pod production increased from 410 g $plot^{-1}$ in A1S0 to 420 g $plot^{-1}$ in A1S1 and 480 g $plot^{-1}$ in A1S2. Seed production reached its highest value of 365 g $plot^{-1}$ under A1S2. These findings suggest that the combination of chicken and cow manure at particular application rates may provide a more favorable nutrient supply for pod formation and seed development.

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The results are consistent with the findings of Marlina et al. (2015), who reported that chicken manure application at 10 t ha^{-1} resulted in favorable peanut production. This supports the potential contribution of chicken manure as an organic nutrient source in peanut cultivation. Furthermore, Gultom (2019) reported that chicken manure significantly affected plant height at certain growth stages, although its effects on filled pods per plant, seed production per plot, and seed yield per hectare were not statistically significant. This comparison indicates that improvements in vegetative growth do not necessarily translate into significant increases in reproductive yield.

The relatively high production observed under A1S2 may be associated with the complementary contribution of nutrients supplied by chicken and cow manure. Chicken manure can provide nutrients that support plant growth and reproductive development, while cow manure contributes organic matter that may improve soil physical conditions and nutrient availability. Nevertheless, the present results should be interpreted descriptively because the identification of statistically significant treatment effects requires confirmation through analysis of variance and an appropriate mean comparison test.

The response was not consistently proportional to increasing manure application rates. For example, A2S2 did not produce higher pod and seed yields than A2S1 in the reported production data. This suggests that increasing manure application does not necessarily result in increased productivity, as crop responses may depend on nutrient balance, manure characteristics, soil conditions, and environmental factors. Therefore, A1S2 can be identified as the treatment with the highest reported production per plot in this dataset, but it cannot yet be established as the statistically superior treatment without complete statistical analysis.

This study has several limitations that should be considered when interpreting the findings. First, the experiment was conducted at a single research location in Medan, North Sumatra, over one growing season. Therefore, the results may not be directly generalizable to other agroecological conditions or peanut-growing regions.

Second, the study focused exclusively on two types of organic fertilizer, namely chicken manure and cow manure, using three application rates for each factor. Other organic fertilizer sources and application rates were not evaluated. Third, the study did not include a detailed analysis of soil chemical properties before and after fertilizer application. Consequently, changes in soil nutrient availability and their direct relationships with peanut productivity could not be established.

Finally, environmental and crop management factors, including irrigation, peanut variety, and pest and disease control, were maintained as uniform as possible rather than evaluated as experimental variables. Further research involving multiple locations, growing seasons, soil nutrient analyses, and additional fertilizer application rates is recommended to validate these findings and provide a broader understanding of the effects of combined organic manure applications on peanut productivity.

Conclusion

Based on the descriptive results, the application of chicken manure and cow manure showed different responses in the growth and production of peanut plants (*Arachis hypogaea* L.). Regarding vegetative growth, plant height increased with plant age, with the A2S2 treatment recording the greatest plant height at several observation stages. However, the highest vegetative growth did not necessarily correspond to the highest production.

In terms of yield, the A1S2 treatment combination, consisting of 2 kg plot^{-1} of chicken manure and 3 kg plot^{-1} of cow manure, recorded the highest production, with 480 g plot^{-1} of dry pods and 365 g plot^{-1} of dry seeds. The corresponding estimated yields were 3.40 t ha^{-1} for pods and 2.33 t

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ha^{-1} for seeds. Conversely, the A0S0 treatment, without chicken or cow manure, recorded the lowest production, with 325 g plot^{-1} of pods and 235 g plot^{-1} of seeds. These findings indicate that the combined application of chicken and cow manure at specific rates was associated with better peanut production under the experimental conditions.

Nevertheless, these findings are based on descriptive observations and should not be interpreted as statistically significant treatment effects until confirmed through analysis of variance using data from all replications. Further research is recommended across different locations and growing seasons, with additional manure application rates and soil chemical analyses before and after treatment. Such studies would provide a stronger basis for determining the optimum application rates and understanding the effects of combined chicken and cow manure on peanut growth and productivity.

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