

East African Journal of Agriculture and Biotechnology

eajab.eanso.org

Volume 9, Issue 1, 2026

p-ISSN: 2707-4293 | e-ISSN: 2707-4307

Title DOI: <https://doi.org/10.37284/2707-4307>



EAST AFRICAN
NATURE &
SCIENCE
ORGANIZATION

Original Article

Effect of Organic Amendments on Growth, Yield, and Nutrient Uptake of Tomatoes

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Article DOI: <https://doi.org/10.37284/eajab.9.1.4337>

Date Published: ABSTRACT

16 January 2026

Keywords:

Organic
Amendments,
Tomato,
Growth,
Yield,
Nutrient Uptake,
Soil Fertility.

This study evaluated the effects of different organic amendments, goat manure, organo yield fertiliser, coffee husks, and their combination on the growth, yield, and nutrient uptake of tomatoes (*Solanum lycopersicum* L.) at NARO–NaCRRI, Wakiso, Uganda. The experiment was laid out in a randomised complete block design (RCBD) with five treatments and three replications. Growth parameters assessed included plant height, number of leaves, and number of branches, while yield parameters considered were number of fruits and fruit weight. Nutrient uptake of nitrogen (N), phosphorus (P), potassium (K), and calcium (Ca) was determined from leaf, stem, and fruit samples. The results indicated that all organic amendments significantly improved tomato growth and yield compared with the control treatment. Goat manure produced the tallest plants, whereas organo yield fertiliser resulted in a higher number of branches. The combined treatment enhanced leaf production. Yield parameters, including fruit number and fruit weight, were higher under goat manure, organo yield fertiliser, and the combined treatments. Nutrient uptake was highest under coffee husks and the combined treatments. Overall, the findings show that the use of organic amendments improves tomato productivity and nutrient availability, highlighting their potential for sustainable tomato production in Uganda.

APA CITATION

Isse, M. A. K., Tinzaara, W. & Ramathani, I. (2026). Effect of Organic Amendments on Growth, Yield, and Nutrient Uptake of Tomatoes. *East African Journal of Agriculture and Biotechnology*, 9(1), 96-107. <https://doi.org/10.37284/eajab.9.1.4337>

CHICAGO CITATION

Isse, Mohamed Abdi Khaliif, William Tinzaara and Idd Ramathani. 2026. "Effect of Organic Amendments on Growth, Yield, and Nutrient Uptake of Tomatoes" *East African Journal of Agriculture and Biotechnology* 9 (1), 96-107. <https://doi.org/10.37284/eajab.9.1.4337>.

HARVARD CITATION

Isse, M. A. K., Tinzaara, W. & Ramathani, I. (2026), "Effect of Organic Amendments on Growth, Yield, and Nutrient Uptake of Tomatoes", *East African Journal of Agriculture and Biotechnology*, 9(1), pp. 96-107. doi: 10.37284/eajab.9.1.4337.

IEEE CITATION

M. A. K. Isse, W. Tinzaara, & I. Ramathani “Effect of Organic Amendments on Growth, Yield, and Nutrient Uptake of Tomatoes”, *EAJAB*, vol. 9, no. 1, pp. 96-107, Jan. 2026.

MLA CITATION

Isse, Mohamed Abdi Khaliif, William Tinzaara & Idd Ramathani. “Effect of Organic Amendments on Growth, Yield, and Nutrient Uptake of Tomatoes”. *East African Journal of Agriculture and Biotechnology*, Vol. 9, no. 1, Jan. 2026, pp. 96-107, doi:10.37284/eajab.9.1.4337

INTRODUCTION

Tomato (*Solanum lycopersicum* L.) is one of the most widely cultivated and economically important horticultural crops globally and in sub-Saharan Africa. It is valued for its high nutritional content, including lycopene, vitamin C, beta-carotene, and other antioxidants that contribute to improved human health (Sianju et al., 2003). Globally, tomato production covered approximately 4.9 million hectares, producing about 177 million tonnes annually (Nikam *et al.*, 2025). highlighting its significance in food systems and agricultural economies.

In Africa, tomato production accounts for about 19.7 million tonnes grown on 1.3 million hectares, providing income, employment, and food security for millions of smallholder farmers (FAOSTAT, 2017). In Uganda, tomatoes are among the most important vegetable crops, particularly for small-scale farmers, with production estimated at 38,234 metric tonnes from 6,485 hectares (FAOSTAT, 2017). Major tomato-producing districts include Mbarara, Kasese, Kabale, Mbale, Mubende, Wakiso, Kapchorwa, Mpigi, and Masaka (Sonko et al., 2005). The crop plays a critical role in household nutrition, livelihoods, and income generation, especially in peri-urban and rural farming systems (Ddamulira *et al.*, 2022).

Despite its importance, tomato productivity in Uganda remains considerably low. Average yields are approximately 4 t ha⁻¹, far below the attainable yield of about 16 t ha⁻¹ for the East African region (Ochilo *et al.*, 2019). This yield gap is attributed to a combination of biotic factors, such as pests and diseases, and abiotic constraints, particularly declining soil fertility and low soil organic matter.

Continuous cropping, soil erosion, land pressure due to population growth, and limited use of soil fertility restoration practices have led to widespread soil degradation in Uganda (FAO, 2008). These challenges threaten sustainable tomato production and undermine national and global development goals, including Sustainable Development Goal 2 on zero hunger and improved well-being.

Soil fertility depletion has become a major concern, with tomato yields declining to about 2.5 kg per plant compared to an achievable yield of 5 kg per plant under optimal soil nutrient conditions (Abejide *et al.*, 2020). While inorganic fertilisers such as NPK, urea, and single superphosphate can improve yields, their high and rising costs limit accessibility for resource-poor farmers. Moreover, excessive reliance on inorganic fertilisers degrades soil health, disrupts soil microbial communities, and reduces long-term productivity due to the absence of organic carbon necessary for soil biological activity (Mukiibi, 2019).

Organic soil amendments, including animal manure, compost, coffee husks, and bio-organic fertilisers, offer a sustainable alternative for restoring soil fertility. These materials improve soil physical structure, nutrient availability, water-holding capacity, and biological activity, thereby enhancing crop growth and yield (Adekiya & Agbede, 2009; Eid *et al.*, 2021). Goat manure, coffee husks, and organo-yield fertilisers are locally available organic resources in Uganda, containing essential nutrients such as nitrogen, phosphorus, and potassium that support tomato growth. Studies have shown that decomposed coffee husks can significantly improve crop yields in maize and pineapple, suggesting their potential in vegetable production systems as well (Sonko *et al.*, 2015).

Although several studies have reported the positive effects of organic amendments on tomato growth and yield parameters, including increased plant height, leaf number, and fruit yield (Atif *et al.*, 2016; Tzortzakakis *et al.*, 2020; Basri *et al.*, 2021), comparative field-based evaluations of goat manure, coffee husks, organo-yield fertiliser, and their combinations are still limited, especially under Ugandan conditions. In addition, limited attention has been given to their effects on nutrient uptake and soil health dynamics, particularly under research station environments such as the National Crops Resources Research Institute (NaCRRI), NARO.

Therefore, this study was conducted to address this knowledge gap by evaluating the effects of goat manure, coffee husks, organo-yield fertiliser, and their combinations on tomato growth, yield, and nutrient uptake under field conditions at NaCRRI, Uganda. The findings are expected to contribute to sustainable soil fertility management strategies, improve tomato productivity, and support food security and livelihoods among smallholder farmers.

Statement of the Problem

Smallholder farmers in Uganda achieve low tomato yields (~2.5 kg/plant) compared to potential yields (~5 kg/plant), mainly due to poor soil fertility, nutrient depletion, and low organic matter (Abejide *et al.*, 2020; Kumari, 2022). Excessive use of chemical fertilisers suppresses microbial activity and causes environmental pollution (Mukiibi, 2019). Combining organic amendments may synergistically improve soil fertility, plant growth, and yield (Rayne & Aula, 2020; Dawid, 2018).

Objectives

General Objective:

This study aimed to evaluate the effects of organic amendments, namely goat manure, organo yield, coffee husks, and their combination, on tomato growth, yield, and nutrient uptake.

Specific Objectives:

- Assess the effect of organic amendments on tomato growth characteristics.
- Evaluate the effect of organic amendments on tomato yield parameters.
- Determine the influence of organic amendments on nutrient uptake by tomato.

Hypotheses

- Organic amendments significantly affect tomato growth characteristics.
- Application of organic amendments significantly influences tomato fruit yield and weight.
- Organic amendments significantly impact nutrient uptake by tomato.

MATERIALS AND METHODS

Study Area

The study was conducted at the National Agricultural Research Organisation (NARO) National Crops Resources Research Institute (NaCRRI), located in Wakiso District, northeast of Kampala, Uganda, at coordinates approximately 0.52500°N and 32.61500°E. Wakiso District is the second most populous district in Uganda, with a population of 2,007,700 according to the 2014 national census and a total land area of 2,807.75 km².

The study area is characterised by shallow seasonal and permanent waterlogged zones that support hydrophilic vegetation, influencing soil drainage patterns. The district experiences a bimodal rainfall pattern, with two main rainy seasons. Surface air temperatures range from a minimum of 11.0°C to a maximum of 33.3°C. Two temperature peaks occur annually: from January to May and July to September, with February recording the highest temperatures and July the lowest.

Initial Soil Characterisation and Chemical Properties

Prior to the establishment of the experiment, soil characterisation was conducted to determine the baseline soil physical and chemical properties, which are critical for interpreting nutrient uptake and treatment effects. Soil sampling was carried out before tomato planting using a transect approach. A total of twelve soil samples were collected from the 0–25 cm soil depth, representing the active root zone of tomato plants. The samples were thoroughly mixed to form a composite sample, air-dried at

room temperature, and passed through a 2-mm sieve following standard procedures.

Soil texture (sand, silt, and clay fractions) was determined using the Bouyoucos hydrometer method. Soil pH was measured using a pH meter, while available phosphorus was extracted using the Bray I method and quantified using an atomic absorption spectrophotometer. Exchangeable potassium, calcium, and magnesium were determined using a flame photometer, while total nitrogen and organic matter content were analysed using the Walkley–Black rapid titration method (Walkley, 2017).

Table 1: Baseline Physico-Chemical Properties of the Soil Before Treatment Application

Season	pH	OM (%)	N (%)	P (ppm)	K (%)	Ca (%)	Mg (%)	Sand (%)	Clay (%)	Silt (%)
First season	6.31	2.6	0.16	2.3	1.3	6.5	0.11	50	44	6
Second season	6.34	2.3	0.12	2.1	1.4	5.8	0.31	48	46	6

The soils at the experimental site were slightly acidic, with low organic matter and nitrogen content, indicating moderate to low inherent soil fertility. Available phosphorus levels were relatively low, while potassium and calcium levels were moderate. The soil texture was predominantly sandy clay, which is suitable for tomato cultivation but requires organic amendments to enhance nutrient retention and biological activity.

Experimental Design and Treatments

A Randomised Complete Block Design (RCBD) was adopted in this study to control field variability and improve the precision of treatment comparisons. The experimental field at NaCRRI is characterised by spatial heterogeneity in soil properties, including variations in fertility status, moisture distribution, and micro-topography, which are common in open-field conditions. Blocking was

therefore necessary to minimise the effects of such extraneous variability by grouping experimental units with similar characteristics into blocks.

Within each block, treatments were randomly assigned to plots to ensure that each treatment had an equal chance of being exposed to environmental conditions, thereby reducing experimental bias. RCBD is widely recommended for agronomic field experiments involving soil fertility management and organic amendments because it enhances the reliability of treatment effects and increases statistical efficiency. Given the limited experimental area and the need to compare multiple organic amendments, RCBD was considered the most appropriate design for this study.

A Randomized Complete Block Design (RCBD) with five treatments and three replications was used.

Treatment	Description
M1	Goat manure (76 t/ha)

Treatment	Description
M2	Organo yield fertiliser (76 t/ha)
M3	Coffee husks (76 t/ha)
M4	Combination (Goat manure + Coffee husks + Organo yield at 76 t/ha)
M5	Control (no amendment)

Plot size: 3.3 m × 3.6 m; 1 m between plots and 1.5 m between blocks.

Five treatments were evaluated in this study to assess the effects of different organic amendments on tomato growth, yield, and nutrient uptake.

M1:Goatmanure(76tha⁻¹)

Goat manure was applied at a total rate of 76 t ha⁻¹ to evaluate its sole effect on soil fertility improvement and tomato performance. Goat manure is widely available in Uganda and is known to supply essential nutrients and organic matter that enhance soil physical and biological properties.

M2:Organo-yieldfertilizer(76tha⁻¹)

Organo-yield fertiliser was applied at 76 t ha⁻¹ as a standalone treatment to assess its effectiveness as a commercial bio-organic fertiliser under field conditions. The rate was selected to ensure comparability with other organic amendments and to meet the nutrient demand of the tomato.

M3:Coffeehusks(76tha⁻¹)

Coffee husks were applied at 76 t ha⁻¹ to evaluate their potential as an agro-industrial organic amendment for improving soil fertility and tomato productivity. Coffee husks are abundant in Uganda and contribute organic matter and nutrients when properly composted.

M4:Combination(Goatmanure+coffeehusks+organo-yieldat76tha⁻¹)

The combination treatment received a total application rate of 76 t ha⁻¹, equally distributed among goat manure, coffee husks, and organo-yield fertiliser (approximately 25.3 t ha⁻¹ each). This approach allowed assessment of the integrated effects of multiple organic amendments while

maintaining a uniform total organic input across treatments.

M5:Control(noamendment)

The control treatment received no organic amendment and served as a baseline for comparison, enabling the determination of treatment effects relative to inherent soil fertility.

The uniform application rate of 76 t ha⁻¹ across treatments was selected based on local agronomic practices, baseline soil fertility status, and the high nutrient demand of tomato. Although not a fixed national standard, this rate falls within the commonly recommended range for organic manure application to vegetable crops in Uganda and similar agro-ecological zones. Using a consistent rate ensured a valid comparison among treatments, with differences in crop performance attributable to amendment type rather than application quantity.

Seedling Raising and Transplanting

Seedlings were raised for 21 days to 15 cm with 5–6 true leaves. Land was cleared, levelled, and amendments incorporated 14 days before transplanting. Seedlings were transplanted early in the morning and watered immediately.

Data Collection

Growth Parameters: Effect of Organic Amendments on Tomato Growth

Growth data were collected on five randomly tagged plants per plant every two weeks from transplantation until physiological maturity over two consecutive seasons. Parameters measured included plant height, number of leaves, and number of branches. Plant height was measured from the soil surface to the tip of the uppermost leaf;

leaves were counted, including those 50% expanded, and branches were recorded by direct counting of all lateral shoots.

Plant height, number of leaves, and number of branches (measured on five tagged plants per plot). Yield Parameters: Number of fruits and fruit weight per plant.

Yield data were collected weekly from five tagged plants per plot from fruiting until physiological maturity over two seasons. Measured parameters included the number of fruits per plant and fruit weight, determined by counting fruits and weighing ripe fruits in grams. Nutrient Uptake: Leaf, stem, and fruit samples analysed for N, P, K, and Ca.

Fresh leaf samples were collected two weeks after transplanting, and stem and fruit samples were taken at later growth stages. Samples were analysed for N, P, K, and Ca using steam distillation and titration (N), colorimetry (P), flame photometry (K), and atomic absorption spectrophotometry (Ca). Plant biomass was measured at final harvest using oven-dried tissues. Nutrient uptake was calculated as:

- Nitrogen: Steam distillation and titration
- Phosphorus: Colorimetric method
- Potassium: Flame photometry
- Calcium: Atomic absorption spectroscopy

Nutrient Uptake (mg/plant) = Nutrient Concentration (mg/g) × Plant Biomass (g/plant)

$$\text{Nutrient Uptake (mg/plant)} = \text{Nutrient Concentration (mg/g)} \times \text{Plant Biomass (g/plant)}$$

This approach quantified the total nutrients absorbed by the plants, reflecting the effect of different organic amendments.

Data Analysis

Data were analysed using ANOVA in GenStat (16th edition). Means were separated using LSD at 5% significance.

RESULTS

Growth Attributes

Tomato growth responded positively to the application of organic amendments (Figure 1). Plants treated with M1 attained the greatest height when compared with the other treatments. The highest number of branches was observed under M2, while M4 produced the highest number of leaves. Although M3 performed better than the control treatment, its growth response was generally lower than that recorded for the other organic amendments.

Yield Parameters

Differences in yield were observed among the treatments (Figure 2). The number of fruits per plant was highest under M1, M2, and M4, and these treatments did not differ significantly from each other. A similar pattern was observed for fruit weight, where M1, M2, and M4 recorded the highest values. Treatment M3 also resulted in a higher fruit weight than the control, although it remained lower than the other amended treatments.

Nutrient Uptake

The uptake of nitrogen, phosphorus, potassium, and calcium varied across the treatments (Figure 3). The highest nutrient uptake was recorded under M3, followed by M4, M2, and M1. All treatments that received organic amendments showed higher nutrient uptake compared to the control, indicating improved nutrient availability under amended conditions.

DISCUSSION

Effect of Organic Amendments on Tomato Growth Parameters

The application of organic amendments significantly enhanced tomato vegetative growth compared to the control, as reflected in increased

plant height, number of leaves, and number of branches. Among the treatments, goat manure (M1) consistently promoted superior vegetative growth, particularly plant height, although its effects were statistically comparable to organo yield and the combined treatment.

The superior performance of goat manure can be attributed to its balanced nutrient composition, especially its relatively high nitrogen (N) content and favourable carbon-to-nitrogen (C:N) ratio. Nitrogen is a key element in chlorophyll formation and vegetative growth, and its availability strongly influences plant height and leaf expansion. Unlike inorganic fertilisers, nutrients in goat manure are largely present in organic forms and are released gradually through microbial mineralisation, providing a steady nutrient supply throughout the growth period. This slow-release nature likely supported sustained vegetative growth rather than short-lived nutrient surges.

Additionally, goat manure improves soil physical properties, including aggregation, aeration, and water-holding capacity, which enhance root development and nutrient uptake efficiency. Enhanced microbial activity associated with animal manures further accelerates nutrient cycling, thereby improving nutrient availability to tomato plants. Similar findings were reported by Sisay and Sisay (2019), who observed improved tomato growth following the application of animal manure due to improved soil fertility and biological activity.

Organo yield and the combined treatment also resulted in significantly higher numbers of branches and leaves compared to the control. The high branching observed under organo yield may reflect its relatively faster nutrient release, particularly nitrogen and phosphorus, which are essential for meristematic activity and lateral growth. In contrast, coffee husks (M3) produced growth responses similar to the control for some parameters, possibly due to their slower decomposition rate and temporary nitrogen immobilisation caused by their higher lignocellulosic content.

Overall, these findings confirm that organic amendments rich in readily mineralizable nutrients, particularly goat manure, are more effective in promoting tomato vegetative growth than amendments with slower nutrient release dynamics.

Effect of Organic Amendments on Tomato Yield Parameters

Tomato yield, measured by the number of fruits per plant and fruit weight, was significantly influenced by organic amendments. Goat manure, organo yield, and their combination produced statistically similar yields, all of which were significantly higher than those obtained from coffee husks and the control treatment.

The improved yield under goat manure and organo yield treatments can be linked to enhanced vegetative growth, which likely increased photosynthetic capacity and assimilate production. Adequate nitrogen availability during early growth stages promotes leaf development, while sufficient phosphorus and potassium support flower initiation, fruit set, and fruit filling. Mowa *et al.* (2017) similarly reported that nutrient-rich animal manures increase tomato fruit weight and yield by improving nutrient supply during critical growth stages.

Although coffee husks resulted in lower overall yield compared to goat manure and organo yield, they still produced significantly higher yields than the control. This suggests that coffee husks contributed positively to soil fertility, albeit less efficiently in supporting fruit production. Rocha *et al.* (2022) also reported that organic residues, including coffee-based composts, enhance tomato yield through gradual improvement of soil nutrient status and organic matter content.

The combined treatment did not significantly outperform sole applications of goat manure or organo yield, suggesting that nutrient balance rather than nutrient quantity alone is critical for optimising tomato yield. This finding aligns with Mulugeta (2020), who emphasised that integrated organic amendments improve soil health and yield

sustainability but may not always result in additive yield effects within a single season.

Effect of Organic Amendments on Nutrient Uptake by Tomato Plants

A key finding of this study was that coffee husk compost (M3) resulted in the highest uptake of nitrogen, phosphorus, potassium, and calcium, despite producing relatively lower vegetative growth and yield compared to goat manure. This apparent contrast highlights an important distinction between nutrient uptake efficiency and growth expression.

Coffee husks are rich in organic matter, potassium, calcium, and lignocellulosic compounds, which improve soil structure, cation exchange capacity, and moisture retention. Improved soil physical conditions enhance root exploration and nutrient absorption, explaining the higher nutrient uptake observed. Additionally, the presence of organic acids and phenolic compounds in coffee husks may increase phosphorus solubility and availability, leading to higher phosphorus uptake.

The high calcium uptake observed under coffee husk treatment may also be linked to the naturally high calcium content of coffee residues, which improves cell wall development and root function. Similar observations were reported by Keter *et al.* (2020), who noted enhanced nutrient uptake following the application of coffee husk compost due to improved soil chemical properties.

However, despite higher nutrient uptake, coffee husks did not translate this advantage into superior growth or yield within the study period. This may be due to slow nutrient mineralisation, temporary nitrogen immobilisation, or delayed nutrient release, limiting nutrient availability during critical growth stages. This finding underscores that nutrient uptake alone does not guarantee high yield, especially when nutrient release timing does not align with crop demand.

Comparison with Previous Studies

Overall, the results of this study are consistent with earlier findings that organic amendments improve tomato growth, yield, and nutrient uptake. Studies by Adnan *et al.* (2021), Sisay and Sisay (2019), and Rocha *et al.* (2022) similarly reported enhanced tomato performance following application of animal manures and organic composts. However, this study uniquely demonstrates that coffee husks can maximise nutrient uptake without necessarily maximising yield, highlighting the importance of amendment selection based on production goals.

Limitations of the Study

Despite the valuable findings, this study had some limitations. First, the experiment was conducted over a single growing season, which may not fully capture the long-term effects of organic amendments on soil fertility and crop performance. Second, soil microbial activity and mineralisation rates were not directly measured, limiting the ability to fully explain nutrient release dynamics. Third, the study did not assess economic costs or labour requirements associated with each amendment, which are important considerations for farmer adoption.

Organic amendments improved growth, yield, and nutrient uptake by enhancing soil fertility and microbial activity. Goat manure promoted vegetative growth due to slow-release nutrients. Organo yield fertiliser enhanced branching. Coffee husks increased nutrient uptake through lignocellulosic decomposition. Combination treatments had synergistic effects. These results are consistent with Adnan *et al.* (2021), Mowa *et al.* (2017), and Rocha *et al.* (2022).

Conclusions

This study evaluated the effects of different organic amendments, goat manure, organo yield, coffee husks, and their combination on tomato growth, yield, and nutrient uptake under field conditions at NARO, Uganda. The findings clearly demonstrate

that organic amendments significantly enhance tomato performance compared to no amendment.

Goat manure was the most effective amendment in promoting vegetative growth, resulting in taller plants with improved canopy development. This performance is attributed to its balanced nutrient composition, favourable C:N ratio, and slow-release nature, which ensured sustained nutrient availability throughout the growth period. Organo yield and the combined treatment produced comparable growth responses, indicating their suitability for supporting tomato vegetative development.

Tomato yield, in terms of number of fruits and fruit weight, was significantly improved by the application of goat manure, organo yield, and their combination. These treatments produced statistically similar yields and consistently outperformed coffee husks and the control. This suggests that organic amendments with relatively faster nutrient release are more effective in meeting the high nutrient demand of tomatoes during the flowering and fruiting stages.

In contrast, coffee husk compost resulted in the highest uptake of nitrogen, phosphorus, potassium, and calcium, despite producing lower growth and yield responses. This indicates that coffee husks enhance nutrient uptake efficiency, likely through improvements in soil physical properties and nutrient retention, but may not synchronise nutrient release with crop demand for maximum yield.

Overall, the study confirms that different organic amendments play distinct and complementary roles in tomato production. Goat manure is more effective for improving growth and yield, while coffee husks are particularly beneficial for enhancing nutrient uptake and soil fertility.

Recommendations

Based on the findings of this study, goat manure is recommended as a primary organic amendment for tomato growers seeking to improve vegetative growth and maximise tomato yield under similar

agro-ecological conditions. Coffee husk compost should also be promoted for enhancing soil fertility and improving nutrient uptake, particularly in soils with low organic matter content or limited nutrient retention capacity. The integrated use of organic amendments, especially the combination of goat manure and coffee husks, is recommended to provide a balance between rapid nutrient supply and long-term improvement of soil fertility, thereby enhancing nutrient use efficiency. In addition, extension services and policymakers are encouraged to promote the use of locally available organic resources such as goat manure and coffee husks as cost-effective and sustainable alternatives to synthetic fertilisers.

CONCLUSION

The results of this study indicate that different organic amendments influence tomato growth and performance in different ways. Goat manure was effective in enhancing plant height and promoting vegetative growth. Organo yield fertiliser mainly improved plant branching, while coffee husks contributed to increased nutrient uptake. The combined application of organic amendments improved overall soil fertility and supported better tomato performance, demonstrating the benefit of integrated organic amendment use.

RECOMMENDATIONS

The application of goat manure, organic yield fertiliser, and coffee husks is recommended to improve tomato growth and yield under similar field conditions. Coffee husks should be prioritised where improvement of nutrient uptake is required. The use of combination treatments is also recommended to enhance overall soil fertility and sustain tomato performance. Regular soil testing should be conducted to guide appropriate amendment application and nutrient management. In addition, further research is recommended to determine optimal application rates, assess long-term effects of organic amendments on soil

properties, and evaluate their interactions with different tomato varieties.

REFERENCES

- Abejide, O., Olatunji, S., & Adedeji, T. (2020). Organic amendments and tomato productivity: A review. *African Journal of Agricultural Research*, 15(7), 450–459.
- Adekiya, A. O., & Agbede, T. M. (2009). Growth and yield of tomato (*Lycopersicon esculentum* Mill) as influenced by poultry manure and NPK fertilizer. *Emirate Journal Food & Agriculture*, 21(1), 10-20.
- Adnan, M., Ali, S., & Khan, R. (2021). Effect of organic and inorganic fertilizers on tomato growth and yield. *Journal of Horticultural Science*, 16(2), 112–120.
- Atif, M. J., Jellani, G., Malik, M. H. A., Saleem, N., Ullah, H., Khan, M. Z., & Ikram, S. (2016). Different growth media effect the germination and growth of tomato seedlings. *Science, Technology and Development*, 35(3), 123-127.
- Basri, A. B., Azis, A., & Iswoyo, H. (2021, July). Application of coffee husk compost and EM4 on growth and yield of chili pepper (*Capsicum Frutescens* L.). In *IOP Conference Series: Earth and Environmental Science* (Vol. 807, No. 4, p. 042040). IOP Publishing. 101853.
- Dawid, J. (2018). Coffee husks as organic amendment in horticulture. *Soil Science and Plant Nutrition*, 64(5), 425–433.
- Ddamulira, G., Isaac, O., Kiryowa, M., Akullo, R., Ajero, M., Logoose, M. & Ramathani, I. (2021). Practices and constraints of tomato production among smallholder farmers in Uganda. *African Journal of Food, Agriculture, Nutrition and Development*, 21(2), 17560-17580.
- Eid, E. M., Shaltout, K. H., Alamri, S. A., Alrumman, S. A., Hussain, A. A., Sewelam, N., & Ragab, G. A. (2021). Monitored Sewage Sludge Application Improves Soil Quality, Enhances Plant Growth, and Provides Evidence for Metal Remediation by Sorghum bicolor L. *Journal of Soil Science and Plant Nutrition*, 21(3), 2325-2338.
- Kumari, P. (2022). Soil fertility constraints in tomato production in East Africa. *International Journal of Agronomy*, 2022, 1–9.
- Mowa, E., Akundabweni, L., Chimwamurombe, P., Oku, E., & Mupambwa, H. A. (2017). The influence of organic manure formulated from goat manure on growth and yield of tomato (*Lycopersicum esculentum*). *African Journal of Agricultural Research*, 12(41), 3061-3067.
- Mukiibi, J. (2019). Environmental effects of chemical fertilizers in Uganda. *Journal of Environmental Studies*, 11(1), 22–31.
- Mulugeta, A. (2020). Effects of Organic Amendments on Soil Fertility and Environmental Quality: A Review DOI: 10.11648/j.jps.20200805.12
- Nikam, Sahebrao Daulatrao. *TOMATO PRODUCTION AND MARKETING*. Ashok Yakkaldevi, 2025.
- Ochilo, W. N., Nyamasyo, G. N., Kilalo, D., Otieno, W., Otipa, M., Chege, F., ... & Lingeera, E. K. (2019). Characteristics and production constraints of smallholder tomato production in Kenya. *Scientific African*, 2, e00014.
- Rayne, D., & Aula, R. (2020). Synergistic effects of combined organic amendments. *Horticultural Reviews*, 48(1), 89–105.
- Rocha, L., Silva, P., & Santos, R. (2022). Comparative study of organic amendments in tomato cultivation. *Journal of Plant Nutrition*, 45(10), 1520–1532.
- Sianju, G., Onyango, C., Were, B., & Mariga, I. K. (2003). Nutritional quality of tomatoes (*Lycopersicon esculentum*) grown in Kenya.

African Journal of Food, Agriculture, Nutrition and Development, 3(1), 1-11.

Sisay, A., and Sisay, T. (2019). The Principal Role of Organic Fertilizer on Soil Properties and Agricultural Productivity -A Review. *Debre Berhan University, College of Agriculture and Natural Resource Sciences*.

Sonko, R., Njue, E., Ssebuliba, J.M. and Jager, A.D. (2005). Pro-Poor Horticulture in East Africa and South East Asia: The Horticultural Sector in Uganda. *Agricultural Economics Research*

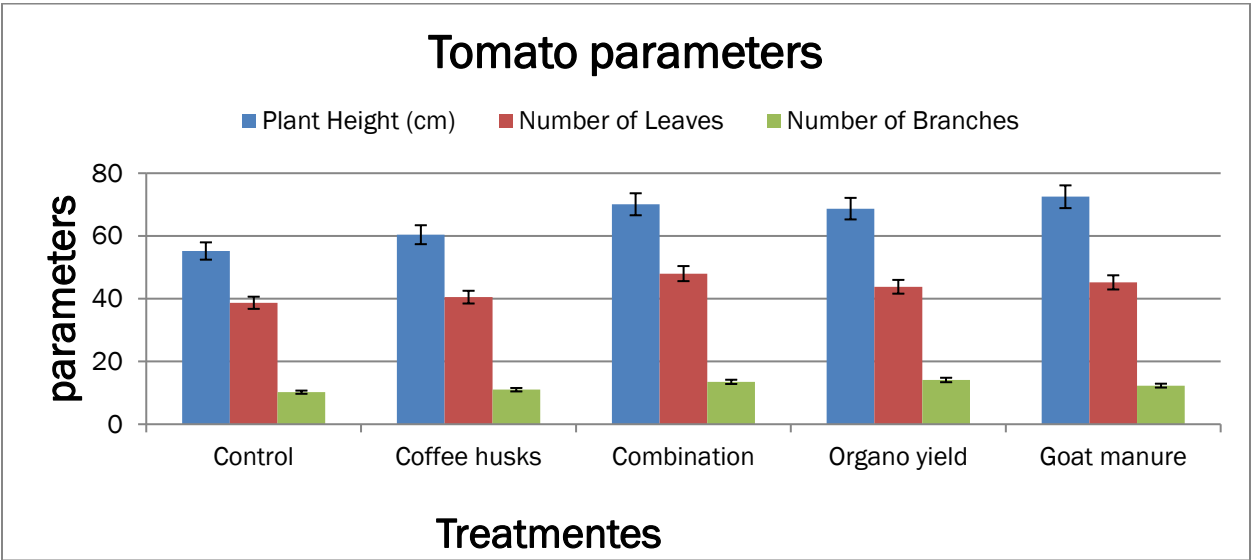
Institute, Wageningen University and Research Centre, Hague.

Tzortzakis, N., Saridakis, C., & Chrysargyris, A. (2020). Treated wastewater and fertigation applied for greenhouse tomato cultivation grown in municipal solid waste compost and soil mixtures. *Sustainability*, 12(10), 4287.

Walkley, A. (2017). A critical examination of a rapid method for determining organic carbon in soil. Effect of variations in digestion conditions and organic soil constituents, *Soil Science Journal* 63, 251-263

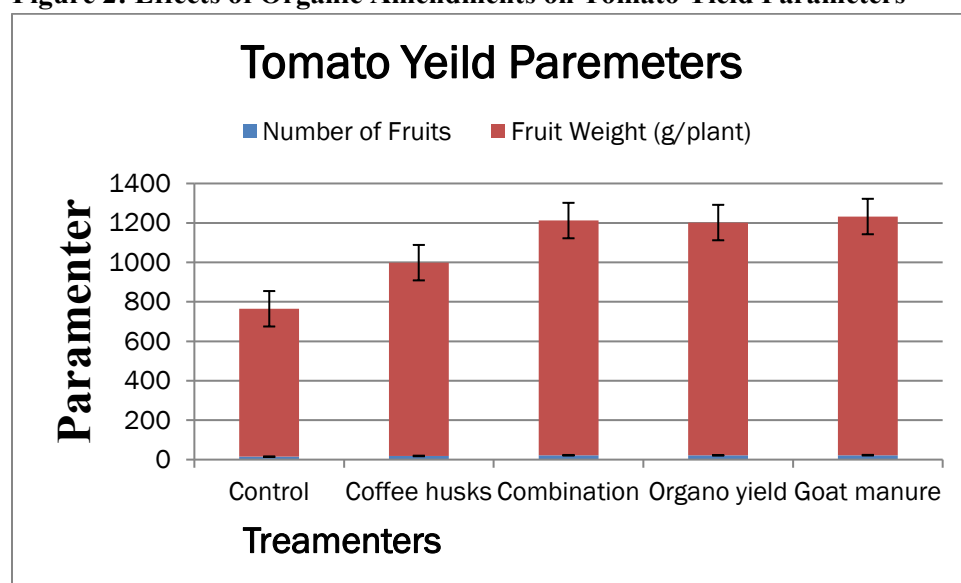
APPENDICES

Figure 1: Effects of Organic Amendments on Tomato Growth Parameters



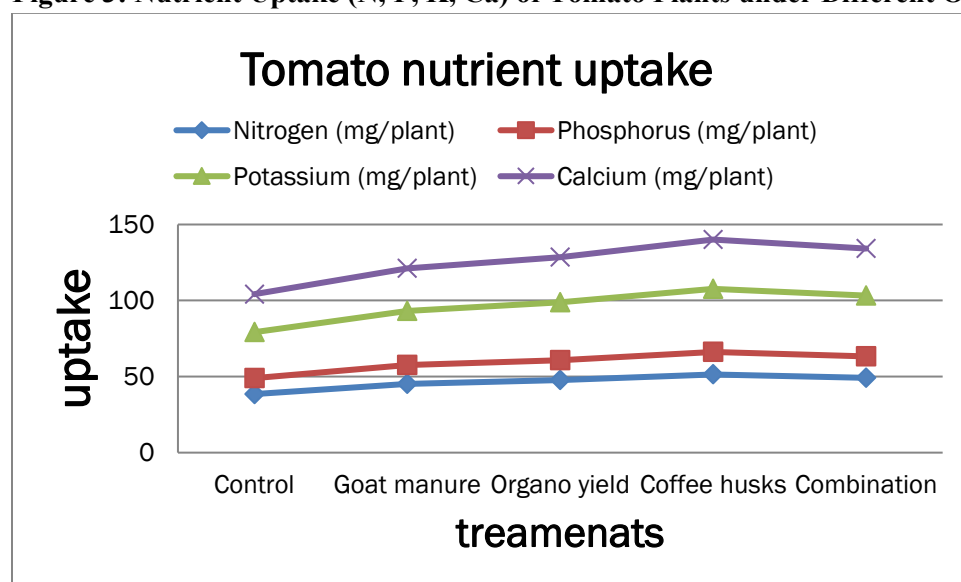
Note. Values are mean ± SE. Means in the same column with different letters are significantly different at $p \leq 0.05$ (LSD test).

Figure 2: Effects of Organic Amendments on Tomato Yield Parameters



Note. Values are mean $\pm$ SE. Means in the same column with different letters are significantly different at $p \leq 0.05$ (LSD test).

Figure 3: Nutrient Uptake (N, P, K, Ca) of Tomato Plants under Different Organic Amendments



Note. Values are mean $\pm$ SE. Means in the same column with different letters are significantly different at $p \leq 0.05$ (LSD test).