

Research Article

Assessment of Some Organic and a Mineral Fertilizer on the Yield and Profitability of Tomato (*Lycopersicum esculentum* Mill.) in an Oxysol of West Cameroon

Keegoui Gertrude^{1,*} , Zingui Messomo Xavier², Kamseu Mogo Jean Paul³ ,
Egoume Guissana Antoine^{1,2}, Lessa Tchohou Fabrice²

¹Department of Agriculture, University of Dschang, Dschang, Cameroon

²Department of Agriculture, University Institute of Science and Technology of Yaounde, Yaounde, Cameroon

³Multiple Purpose Station, Institute of Agricultural Research for Development (IRAD), Dschang, Cameroun

Abstract

The consumption of market garden products contributes to the food and nutritional security of the world's populations. Among these products, tomato occupies a prominent place. Meanwhile, the excessive use of synthetic fertilizers to produce tomatoes reduces the productive potential of soils. Due to this problem, the present study was conducted in West Cameroon, aiming to reduce the use of chemical inputs for sustainable tomato production through the use of organic input. Thus, five treatments (: T0 = control; T1 = 100% NET EDEN organic fertilizer; T2 = 100% poultry manure; T3 = 50% NET EDEN organic fertilizer + 50% poultry manure; T4 = 100% mineral fertilizer) were arranged in a completely randomized block design (RCBD) with three replications. The study was carried out from March 1 to June 26, 2024. The results revealed that the treatment with mineral fertilizer and the treatment with Net Eden organic fertilizer + chickens manure led to $26.28 \pm 5.50 \text{ t ha}^{-1}$ and $26.10 \pm 3.51 \text{ t ha}^{-1}$ respectively. These yields T4; T3 are significantly different ($P < 0.05$) from the yields obtained with the other treatments. The economic analysis of fertilization using the value-cost ratio (VCR) showed that only the treatment based on mineral fertilizer T4 and the treatment with Net Eden+manure T3 should be popularized among farmers/producers. Thus, the use of organic fertilizers for tomato production has agronomic, ecological, and economic advantages. However, similar studies in other agroecological zones are needed.

Keywords

Tomato, Organic Fertilizer, Organic Input, Chemical Fertilizer, Yield, Profitability

1. Introduction

The consumption of market garden products contributes to the food and nutritional security of the world's populations [1]. Among these products, the tomato occupies a prominent place. It can be consumed as a fresh vegetable salad, processed,

stewed, fried, baked, and can also be used to produce soup, juice, or ketchup [2]. Indeed, regular consumption of tomatoes reduces the incidence of various cancers (prostate, pancreatic, colon, and breast cancers), cardiovascular diseases, metabolic

*Correspondence: Keegoui Gertrude (keegoui@mail.ru)

Received: 25 May 2026; Accepted: 5 June 2026; Published: 11 July 2026



Copyright: © The Author(s), 2026. Published by Science Publishing Group. This is an **Open Access** article, distributed under the terms of the Creative Commons Attribution 4.0 License (<http://creativecommons.org/licenses/by/4.0/>), which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

diseases (diabetes, etc.), and bone diseases (osteoporosis, etc.) [3].

Cameroon is one of the leading tomato producers in the Central African sub-region with nearly 1,248,099.2 tons and yields estimated at 18.23 t ha⁻¹ [4]. Only 1% of the production is exported to neighboring countries, and most of it is consumed locally [5]. Thus, tomato is one of the most important fruits in Cameroon [6]. It is the most widely cultivated fruit and vegetable in Cameroon, across all agro-ecological zones of the country. Tomato production is a primary agricultural activity that provides income to most households in the country. Despite all the numerous benefits of this crop, its production still faces a myriad of challenges, making it unprofitable. Some of these challenges may relate to production, post-harvest, marketing, or a combination of all these challenges [7]. The full potential of the tomato has not yet been reached in Cameroon due to numerous production constraints, including the excessive use of chemical fertilizers [8, 9]; this leads to increased post-harvest losses [8] and reduces the productive potential of the soil [10]. Faced with this problem, more appropriate fertilization strategies need to be studied.

The main environmental concern in cultivation strategies across the world is pollution from the use of chemical fertilizers [11]. For sustainable agriculture, strategies to improve nutrient uptake, crop performance and economic efficiency are mandatory [12]. Producers and researchers must streamline the crop production system and management practices to benefit from environmentally friendly fertilization [11]. Recent studies on sustainable tomato fertilization indicate that the application of organic input and organic fertilizers can sustain, and in some cases enhance, crop yields while mitigating environmental impacts [13, 15]. However, the economic viability of these inputs remains insufficiently investigated and documented. Furthermore, several studies conducted worldwide on organic fertilization practices have obtained interesting results, showing that soil fertility has been sustainably improved and yields comparable to those achieved with chemical fertilizers have been attained (Nyembo et al., 2014).

Some industries have started producing and marketing organic fertilizers. Among these fertilizers is 'Net Eden', an organic biofertiliser containing live microorganisms that helps improve plant growth. It optimizes soil functions and fertility through the action of the microorganisms it contains. Biofertilisers are natural solutions that help achieve a better soil balance, with the aim of improving crop yields in a sustainable way. Net Eden is a range of 100% organic liquid fertilizers produced in Cameroon, making them more accessible to the rural population. These natural fertilizers are enhanced with major nutrients (NPK) and microelements to boost yields while protecting the soil. To overcome this problem, the present study aims to promote sustainable tomato cultivation by reducing reliance on mineral fertilizers and by evaluating the economic benefits associated with the use of organic input and chickens manure.

2. Material and Methods

2.1. Study Area

The study took place from March 1 to June 26, 2024, in the locality of Dschang, located in the West Region of Cameroon. Dschang is located at latitude 05°26.617' North and longitude 10°04.184' East. Dschang is characterized by an annual rainfall that varies from 1800 to 2000 mm annually, with annual temperatures between 13.02 and 26.73 °C, relative humidity of 83% and an altitude is 1400 m [16].

2.2. Material

Plant material

Hybrid varieties, including Raja F1, are the most widely grown varieties in the Western region [8]. Only one tomato variety was used in this trial. This is the hybrid variety Raja F1, with a growth cycle of 65 to 70 days. In addition, its storage and tolerance to bacterial wilt are good.

2.3. Fertilization Equipment, Treatment and Experimental Device

Chicken manure and Net Eden are the two organic fertilizers that were used. Net Eden is a new organic input made from plant residues composed of nitrogen (2.7%), potassium (3.0%), phosphorus (2.6%), calcium (5.2%), and magnesium (2.5%). It is also an insecticide. Net Eden was applied at a dose of 0.58 ml per plant, or 1 l ha⁻¹ for a density of 33334 plants ha⁻¹ (T1) and at a dose of 0.29 ml per plant in combination with chicken manure (T2). Chicken manure was applied at a dose of 0.15 kg per pocket, or 5 t ha⁻¹. The trial consisted of 5 treatments. These 5 treatments were randomized in a randomized complete block design. The treatments were as follows:

- 1) T0: Control (without fertilizer);
- 2) T1: Organic input (1 l /ha⁻¹ of Net eden);
- 3) T2: Chicken manure (5 t /ha⁻¹);
- 4) T3: Chicken manure (2,5 t /ha⁻¹ of manure) + organic input (0.5 l / ha⁻¹ of Net eden);
- 5) T4: Chicken manure (5 t ha⁻¹ of manure) + Chemical fertilizer (150 kg / ha⁻¹ of N₂₀P₁₀K₁₀). The distance between two blocks was 1m.

Each block consisted of five experimental units, spaced 50 cm apart. The experimental units measured 3.30 m × 2.10 m, giving a total area of 6.93 m². Each experimental unit contained 28 plants, spaced 40 cm × 60 cm apart.

Table 1. Chemical composition of chicken manure.

Elements	Content
pHwater	6,80

Elements	Content
pHKCl	6,6
CO (%)	15,93
MO (%)	27,47
N (%)	1,36
C/N	11,72
Ca (meq/100g)	1,14
Mg (meq/100g)	2,80
K (%)	1,71
Na (%)	0,11
S (meq/100g)	5,77
Ptotal (%)	1,01
CE (Ms/cm)	8,47

Results obtained from the laboratory of Soil Analysis and Environmental Chemistry, FASA, Uds.

2.4. Methods

Culture maintenance

One of the main constraints to tomato production in Cameroon is the resurgence of pests and diseases. Therefore, phytosanitary treatment must be regular and consist of approved products applied at the right dose [8, 9]. Tomato protection was carried out using pesticides. Two fungicides and two insecticides were applied to control fungal diseases and insects respectively. The contact fungicide Balear 720SC containing 720 g l⁻¹ of chlorothalonil was applied at 3 l ha⁻¹. Similarly, the contact and systemic fungicide Banko containing 550 g l⁻¹ of chlorothalonil and 100 g l⁻¹ of carbendazine was applied at 2 l ha⁻¹. Doyen insecticide, consisting of 16 g l⁻¹ acetamiprid and 72 g l⁻¹ cypermethrin, was applied at 20 ml per 15 l sprayer. In addition, Cypercot insecticide, with 100 g l⁻¹ cypermethrin as active ingredient, was applied at 20 ml per 15 l sprayer. During periods of high pest damage (fruiting period), the dose was increased by 10 ml per sprayer.

2.5. Data Collection

2.5.1. Soil Parameters

The physicochemical parameters of the soil of the experimental site were determined by analyzing samples taken from a depth of 0 to 20 cm. The analyses were carried out at the soil science laboratory of the University of Dschang. The sandy fraction was obtained by dry sieving. The percentage of silt and clay was determined using a Robinson pipette with sodium hexametaphosphate as a dispersing agent [17]. The pH-H₂O was determined using an electrode in a soil-water suspension (1:2.5) and the pH-KCl in a soil-KCl suspension

(1:2.5) 1 N. The exchangeable acidity was extracted with 1 M KCl solution, then quantified by titration with 1 M KCl solution. The percentage of total organic carbon (TOC%) was determined according to the Walkley and Black method [18] and total nitrogen by the Kjeldahl method [19]. The percentage of organic matter (OM%) was obtained by the relationship OM% = TOC% x 1.724. Exchangeable bases were determined after extraction with a 1N ammonium acetate solution at pH 7; potassium and sodium contained in the ammonium acetate extract were determined by flame photometry, while magnesium and calcium were obtained by complexometry. Available phosphorus was obtained by the Bray 2 method [20].

2.5.2. Yield and Profitability

Four harvests were carried out. Each harvest was separated by one week. This is how the fruit yield (t ha⁻¹) was determined. The average prices of the different inputs in Dschang throughout the cultivation period, and the average price of the sales unit during the marketing period was considered to calculate the rate of return and the value-to-cost ratio. Indeed, 5500 FCFA was the average price of a 20 kg crate of fresh tomatoes, or 275 FCFA per kilogram.

The FAO uses a value-cost ratio (V/C) to assess the profitability of fertilizer use. The V/C ratio compares the value of additional production due to fertilizer to the cost of the fertilizer. This ratio is a key metric used to determine the economic viability of fertilizer application. It's calculated as:

$$V/C \text{ ratio} = \frac{VAP}{CFT}$$

Where VAP = Value of Additional Production (the increased yield or value of the crop due to fertilizer) and CFT = Cost of Fertilizer Treatment (the total cost of the fertilizer used) [21].

2.6. Statistical Analyses

The Analysis of variance (ANOVA) of the collected data was arranged in Microsoft Excel 2016. This data were transferred to Minitab software for analysis of variance, and the means were separate using Tukey's test at a 5% significance level. [22].

3. Results

3.1. Soil Characteristics

The physicochemical characteristics of the soil are shown in Table 1. It shows that the texture was sandy clay loam, the pH-water was slightly acidic (6.1) with a very high organic matter content (10.16%) and a low nitrogen percentage (0.12%). However, the amount of available phosphorus was average (19.38 mg kg⁻¹). In this soil, the C/N ratio is 50, which indicates poor decomposition and N immobilization. Indeed, there was not enough nitrogen to allow the decomposition of carbon. Cation Exchange Capacity (CEC) is an important

measure of soil fertility, as it indicates the capacity of the soil to retain and exchange cations (positive ions) essential for plant nutrition. This soil had a pH 7 a CEC of 20 meq/100g,

which indicates that the soil had a moderate capacity to retain nutrients, which is acceptable for most crops, although the saturation rate in exchangeable bases was low (40%).

Table 2. Results of physicochemical analysis of the soil of the experimental site.

Band	Setting	Content
Texture (%)	Clay	21
	Silt	04
	Sand	75
Soil reaction	pH-water	6.1
	pH-KCl	5.4
	Δ pH	-0.7
Organic matter (%)	CO	5.89
	MO	10.16
	N	0.12
	C/N	50
	That	4.52
Exchangeable cations (meq / 100g)	Mg	3.08
	K	0.14
	N / A	0.24
	SB	8
	CEC	20
Phosphorus (mg kg ⁻¹)	S (%)	40
	P Bray II	19.38

pH: hydrogen potential; pH-KCl: soil pH obtained after adding potassium chloride; CO: organic carbon; MO: organic matter; N: nitrogen; Ca: calcium; Mg: magnesium; K: potassium; Na: sodium; SB: sum of bases; CEC: cation exchange capacity; S (%): base saturation rate.

Source: Laboratory of Soil Analysis and Environmental Chemistry, FASA, UDs, 2024

Table 3. Effects of Net Eden on the physicochemical properties of the soil of the experiment site.

Samples	Before seeding	After seeding
Soil texture		
Clay	21%	26%
Silt	4%	18%
Sand	75%	56%
Texture class	Sandy clay loam	Sandy clay loam
Soil reaction		
pH (water)	6.1	6.3
pH (KCl)	5.4	5.4
pH	-0.7	-0.9

Samples	Before seeding	After seeding
Organic matter		
CO (%)	5.89	6.32
OM (%)	10.16	10.89
Total N (%)	0.12	0.11
C/N	50	58
Exchangeable cations (meq/100g)		
Calcium	4.52	5.96
Magnesium	3.08	3.96
Potassium	0.14	0.19
Sodium	0.24	0.34
Total bases	8	10
Cation Exchange Capacity (meq/100g)		
CEC at pH7	20	22
Saturation (%)	40	47
Available phosphorus		
Bray II (mg/kg)	19.38	17.33

Source: Laboratoire des sols et environnement, FASA, Uds, 2023.

3.2. Growth Parameters

Table 4. Effect of treatments on tomato growth parameters 35 days after reseeding.

Treatments	Plant height	Number of leaves	Number of branches	Diameter at the collar
T0	30,31 ±9,34b	28,29 ±6,19b	7,458 ±0,996c	5,783 ±1,649c
T1	31,20 ±9,44b	31,33 ±6,42b	7,583 ±1,389c	6,075 ±1,820c
T2	67,56 ±7,02a	86,63 ±15,33a	23,792 ±1,269a	12,375 ±1,802ab
T3	66,53 ±6,85a	79,13 ±15,76a	19,625 ±1,718b	11,725 ±1,113b
T4	66,17 ±8,46a	88,33 ±25,94a	20,625 ±1,183b	13,138 ±1,517a
P	0,000	0,000	0,000	0,000

Values followed by the same letter in the same column are not significantly different at the 5% level according to Tukey's test; T0 = control, T1 = organic fertiliser, T2 = chicken manure, T3 = Eden organic fertiliser + chicken manure, T4 = positive control. DAP: days after planting.

3.3. Yield Parameters

Table 5. Effect of different treatment on the yield parameters.

Treatment	Number of fruits per plant	Weight of fruits (g/plant)	Fruity Yield (t/ha) ⁻¹
T0	1,771 ± 0,881c	192,2 ± 123,0d	6,505 ± 4,098

Treatment	Number of fruits per plant	Weight of fruits (g/plant)	Fruity Yield (t/ha) ⁻¹
T1	3,500 ± 0,984b	407,0 ± 122,4c	13, 568 ± 4,079
T2	7,063 ± 1,286a	637,4 ± 125,6b	21,247 ± 4,188
T3	7,885 ± 1,032a	783,1 ± 116,6a	26,107 ± 3,886
T4	7,990 ± 1,503a	788,3 ± 151,3a	26,28 ± 5,04
P	0.000	0,000	

The explained variables are the number of fruits per plant, fruit weight (g/plant), and fruit yield (t/ha). The effect of fertilizer treatments on these parameters was significant, as shown by the results of the analysis of variance at the 5% significance level ($P=0.000$). Table 5 shows that treatment T4 had the highest number of fruits per plant (7,990), the highest average fruit weight (788.3 g/plant), and the highest yield (26.28

t/ha). Treatments T3 and T2 also performed well, with T3 recording 7,885 fruits per plant, 783.1 g/plant, and a yield of 26.107 t/ha, and T2 achieving 7,063 fruits per plant, 637.4 g/plant, and a yield of 21.247 t/ha. Treatment T1, although producing lower fruit numbers per plant (3,500) and less weight per plant (407.0 g/plant), showed an intermediate yield of 13.568 t/ha. The control T0 recorded the lowest results with 1,771 fruits per plant, a fruit weight of 192.2 g/plant, and a yield of 6.505 t/ha.

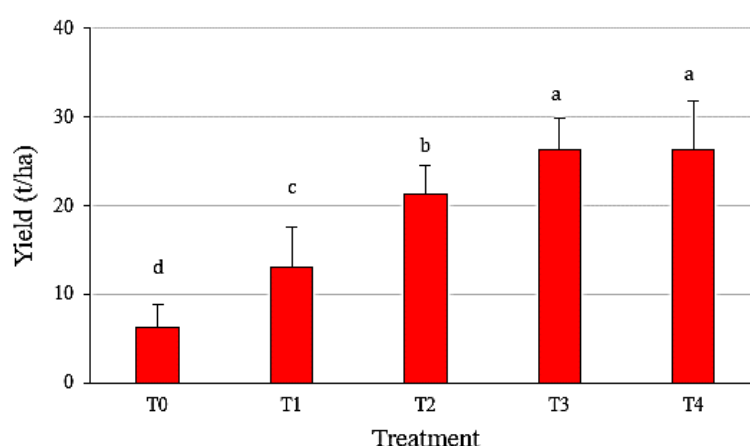


Figure 1. Comparison of the treatment mean at the 0.05 threshold.

Treatments with the same letter are not significantly different at the 5% probability; T0: Control (without fertilizer); T1: Organic input (1 l ha⁻¹ of Net eden); T2: Chicken manure (5 t ha⁻¹); T3: Chicken manure + organic input (2,5 t ha⁻¹ Chicken manure + 0.5 l ha⁻¹ of Net eden); T4: Chicken droppings + Chemical fertilizer (5 t ha⁻¹ Chicken manure + 150 kg/ha⁻¹ of N₂₀P₁₀K₁₀).

Table 6. Analysis of variance of the performances of the treatment.

SV	DF	SS	MS	F value	P > F
Block	2	144.93	72.467	36.847	9.19 ⁻⁵ ***
Treatment	4	926.67	231.667	117.797	3.83x10 ⁻⁷ ***
Error	8	15.73	1.967	/	/
Total	14	1087.33	/	/	/

SV: source of variation; DF: degree of freedom; SS: sum of squares; MS: mean square; P: probability; ***: significant at 0.001; Coefficient of variation = 7.51%.

The result of the analysis of variance is presented in Table 6, and Figure 1 illustrates the comparison of the treatment means at the threshold of 0.05. Mineral fertilizer (T4) and Net Eden organic fertilizer associated with manure (T3) led to $26.28 \pm 5.50 \text{ t ha}^{-1}$ and $26.10 \pm 3.51 \text{ t ha}^{-1}$ respectively. These

yields are significantly different ($P < 0.05$) from the yields obtained with the other treatments. Indeed, by applying manure (T2), the yield is $21.24 \pm 3.21 \text{ t ha}^{-1}$ and the yield obtained by fertilizing with Net Eden organic fertilizer (T1) is $13.56 \pm 4.58 \text{ t ha}^{-1}$.

4. Economic Analysis of the Different Fertilization Used

Table 7. Economic analysis of fertilization.

	T0	T1	T2	T3	T4
Yield	6,505	13,568	21,247	26,107	26,28
AY	/	7,505	14,722	19,602	19,775
CPAY	/	3731200	5842925	7179425	7227000
CT1	/	3012779	3379319	3565201,2	3615491
II	/	27458,37	30755,11	32380,05	32974,47
CT2	/	3040237,37	3410074.11	3547581.25	3608465.47
VCR	/	1,227	1,713	2,023	2,0002
EP %	/	22.7	71.3	102.3	100.2

Yield: yield (t ha^{-1}); AY: Additional yield linked to the application of fertilizers; CPAY: Cost Price of Additional Yield; TC1: Total Cost 1; II: Interest on Investment; TC2: Total Cost 2; VCR: Value Cost Ratio; EP: Economic profitability.

The economic analysis of fertilization is summarized in Table 3 and compares the different treatments. It shows that the value-cost ratio (VCR) of mineral fertilizer (T4) and Net Eden organic fertilizer associated with manure (T3) are similar. These two treatments had better VCRs than those of the other treatments. Furthermore, the profitability of mineral fertilizer (T4) and Net Eden organic fertilizer associated with manure (T3) was 100%.

5. Discussion

The soil of the study has physicochemical characteristics similar to those of the soils of the locality of Dschang [16, 23]. Indeed, the works of many authors [16, 29] have shown results of physicochemical analyses similar to those of the present study. Thus, the soils of the locality of Dschang are predominantly acidic, have moderate CEC and average phosphorus content. The results reveal an overall improvement in soil quality following harvest, particularly through an increase in organic matter (CO from 5.89% to 6.32%, MO from 10.16% to 10.89%) and exchangeable cations such as calcium (from 4.52 to 5.96 meq/100g), magnesium (from 3.08 to 3.96 meq/100g), potassium (from 0.14 to 0.19 meq/100g) and sodium (from 0.24 to 0.34 meq/100g). These changes indicate that cultivation practices have had a positive impact on soil

fertility and structure, improving water retention and nutrient availability [33, 35]. However, the minor decrease in assimilable phosphorus (from 19.38 to 17.33 mg/kg) and the increase in the C/N ratio (from 50 to 58) suggest slower decomposition of organic matter, which may affect nitrogen availability for future crops [36]. Additionally, the soil pH increased significantly (soil pH from 6.1 to 6.3), which may indicate a reduction in acidity that is beneficial for certain crops [24]. The increase in cation exchange capacity (from 20 to 22 meq/100g) and cation saturation (from 40% to 47%) after harvest indicates an improved ability of the soil to retent nutrients, thereby enhancing its general fertility [37].

As Table 4 shows, in terms of plant height, T2 ($67.56 \pm 7.02\text{a}$) is indeed two times higher than T0 ($30.31 \pm 9.34\text{b}$) and higher than T1 ($31.20 \pm 9.44\text{b}$). T3 ($66.53 \pm 6.85\text{a}$) and T4 ($66.17 \pm 8.46\text{a}$) are also high but do not show significant differences from T2. The number of leaves in T2 ($86.63 \pm 15.33\text{a}$) is three times higher than in T0 ($28.29 \pm 6.19\text{b}$) and more than two times higher than in T1 ($31.33 \pm 6.42\text{b}$). T4 ($88.33 \pm 25.94\text{a}$) and T3 ($79.13 \pm 15.76\text{a}$) also show high values, but no significant difference is observed between T2, T3 and T4. As for the number of branches, T2 ($23.792 \pm 1.269\text{a}$) is almost three times higher than T0 ($7.458 \pm 0.996\text{c}$) and T1 ($7.583 \pm 1.389\text{c}$). T4 ($20.625 \pm 1.183\text{b}$) and T3 ($19.625 \pm 1.718\text{b}$) show intermediate values, with no significant difference from T2. Finally, for

the neck diameter, T2 at $12.375 \pm 1.802ab$ is exactly double that of T0 ($5.783 \pm 1.649c$) and greater than T1 ($6.075 \pm 1.820c$). T4 ($13.138 \pm 1.517a$) is also high but does not differ significantly from T2, whilst T3 ($11.725 \pm 1.113b$) is lower than T4 but better than T0 and T1.

Both organic input and chemical fertilizers promoted better tomato yields. This could be explained by the fact that these fertilizers used include beneficial elements such as nitrogen, phosphorus, and potassium. These results corroborate those obtained by [14, 26], who, through their work, proved that organic and mineral fertilizations have a significant effect on tomato yield. The same is true for the work of [27], which shows that the response of tomatoes to organic fertilization is significantly equal to that of mineral fertilization [30].

Recent studies on tomato cultivation [27, 28] have demonstrated that mineral fertilizers provide a yield response, but their exclusive use can compromise soil fertility and biological activity. In contrast, chickens manure and organic inputs such as Net eden release nutrients more gradually yet sustainably, while enhancing soil microbial activity and resilience. The findings of the present study indicate that an integrated approach, combining a reduced dose of mineral fertilizers with bio fertilizer (T4), results in satisfactory and economically viable yields. Nevertheless, further research is required to refine this strategy in order to optimize tomato productivity while ensuring long-term soil sustainability.

The management of all inputs must be based on rational agronomic and economic principles [31]. To this end, FAO stipulates that for an environment where rainfall is not a constraint, all treatments with an RVC ≥ 2 can be popularized among farmers [21]. Given the socio-economic context, the treatment to be popularized among farmers is the one with the highest RVC and the lowest production cost. For this purpose, mineral fertilizer and Net Eden organic fertilizer associated with manure are the two treatments to be popularized. However, the use of Net Eden organic fertilizer associated with manure is the most advantageous treatment because it contains only organic products. These findings are also similar to those of [25], who demonstrated that the use of organic fertilisers provides the highest profit margins and the best value cost ratios in Kenya, Cameroon and the Democratic Republic of the Congo respectively. This result is similar to the result of [26], which showed that growing tomatoes using organic fertilizers is profitable. The treatment based on Net Eden organic fertilizer (T1) and the one based on chicken manure (T1) have the lowest production costs and the lowest profitability. This result is in contrast to those of some authors [32, 34] who found that the lower the production cost, the more profitable the treatments were.

6. Conclusion

This study revealed that mineral fertilizer and organic fertilizer Net Eden associated with chickens manure led to 26.28 ± 5.50 t ha⁻¹ and 26.10 ± 3.51 t ha⁻¹ respectively. These

yields are significantly different ($P < 0.05$) from the yields obtained with the other treatments. With manure application, the yield was 21.24 ± 3.21 t ha⁻¹ and the yield obtained with Net Eden organic fertilizer was 13.56 ± 4.58 t ha⁻¹. The economic analysis of fertilization using the value-cost ratio (VCR) revealed that only the treatment based on mineral fertilizer and the treatment based on organic fertilizer Net Eden associated with manure should be popularized among producers. Thus, the use of organic fertilizers for tomato production has agronomic, ecological, and economic advantages. However, similar studies in other agro ecological zones are needed.

Abbreviations

ANOVA	Analysis of Variance
CEC	Cation Exchange Capacity
CFT	Cost of Fertilizer Treatment
FAO	Food Agricultural Organization
OM	Organic Matter
RVC	Rainfall Value Cost
TOC	Total Organic Carbon
V/C	Value-on- Cost
VAP	Value of Additional Production
VCR	Value-cost Ratio

Acknowledgments

The authors would like to thank Faculty of Agronomy and Agronomic Sciences, University of Dschang, Cameroon, and those who have assisted with fieldwork.

Author Contributions

Keegoui Gertrude: Conceptualization, Funding acquisition, Supervision, Methodology, Writing – review & editing

Zingui Messomo Xavier: Project administration, Resources, Visualization

Kamseu Mogo Jean Paul: Investigation, Validation, Formal analysis

Egoume Guissana Antoine: Software, Writing – original draft

Lessa Tchohou Fabrice: Data curation

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

References

- [1] Soma A. Vegetable farming near the Kossodo industrial estate in Ouagadougou: practices, marketing channels and health risks for city residents 2020; 3: 67–78.
- [2] Dube J, Ddamulira G, Maphosa M. Tomato breeding in sub-Saharan Africa-Challenges and opportunities. A Review, African Crop Science Journal 2020; 28: 131–40.
- [3] Van Breemen RB, Pajkovic N. Multitargeted therapy of cancer by lycopene. Cancer Letters 2008; 269: 339–51. <https://doi.org/10.1016/j.canlet.2008.05.016>
- [4] FAOSTAT n. d. <https://www.fao.org/faostat/fr/#data/QCL> (accessed May 8, 2025).
- [5] Tarla D, Manu I, Tamedjouong Z, Kamga A, Fontem D. Plight of pesticide applicators in Cameroon: case of tomato (*Lycopersicon esculentum* mill.) farmers in Foumbot. Journal of Agriculture and Environmental Sciences 2015; 4: 87–98.
- [6] Djoukeng HG, Tangka JK, Ndaji NT, Wafo CKT, Assoumou WRA, Peyoumea NL. Improving Handling Systems of Tomato (*Solanum lycopersicum*) in Cameroon. Asian Journal of Advances in Agricultural Research 2023; 21: 14–22.
- [7] Tabe-Ojong MP, Molua EL, Nzie JRM, Fuh GL. Production and supply of tomato in Cameroon: Examination of the comparative effect of price and non-price factors. Scientific African 2020; 10. <https://doi.org/10.1016/j.sciaf.2020.e00574>
- [8] Titti RW, Etoga AS, Ntsoli PG, Etame GMK, Chotangui AH, Bikomo RM, et al. Typology of Tomato Cropping Systems and Determinants of Preharvest Losses in Western Cameroon. Scientifica 2024; 2024. <https://doi.org/10.1155/2024/5625648>
- [9] Tsala R, Mounk'áné ZB, Amia GD, Abba M, Tchuenteu LT, Megueni C. Study of tomato growers' cultural practices and risks associated with the unreasoned use of chemical inputs in the Adamawa Region, Cameroon. African and Mediterranean Agricultural Journal - Al Awamia 2024; 243–53. <https://doi.org/10.34874/IMIST.PRSM/AFRIMED-1145.44933>
- [10] Tchaniley L, Kwasi Dzola A, Kodjo Akonta DK. Effect of Combining Organic and Inorganic Fertilisers (NPK 15-15-15 and Urea) on Lettuce (*Lactuca sativa* L.) Yield in Southern Togo. Journal of Applied Biosciences 2020; 151: 15540–9. <https://doi.org/10.35759/jabs.151.3>
- [11] Vâtcă S, Vidican R, Gâdea Ștefania, Horvat M, Vâtcă A, Stoian VA, et al. Blackcurrant Variety Specific Growth and Yield Formation as a Response to Foliar Fertilizers. Agronomy 2020; 10: 2014. <https://doi.org/10.3390/agronomy10122014>
- [12] Mataffo A, Scognamiglio P, Dente A, Strollo D, Colla G, Rouphael Y, et al. Foliar Application of an Amino Acid-Enriched Urea Fertilizer on 'Greco' Grapevines at Full Veraison Increases Berry Yeast-Assimilable Nitrogen Content. Plants 2020; 9: 619. <https://doi.org/10.3390/plants9050619>
- [13] Quintarelli V, Borgatti D, Baretta M, Stazi SR, Allevato E, Pancaldi S, et al. Microbial biofertilizers and algae-based biostimulant affect fruit yield characteristics of organic processing tomato. J Sci Food Agric 2025; 105: 530–9. <https://doi.org/10.1002/jsfa.13851>
- [14] Mounirou MM, Nassourou LM, Tidjani AD, Kadri DIA. Comparative study of the effects of organic and mineral fertilisation on the physico-chemical properties of the soil, and on the yield and quality of the F1 hybrid tomato (Mongol) grown in winter at the Faculty of Agronomy, Abdou Moumouni University, Niamey, Niger. ESI Preprints 2024. <https://doi.org/10.19044/esipreprint.12.2024.p393>
- [15] Muzola B, Nsilulu B, Lukombo L, Bunga L. Comparative study of organic fertilisers on tomato production under the ecological conditions of the rural community of Luozi. International Journal for Multidisciplinary Research 2025; 7: 1–21. <https://doi.org/10.2139/ssrn.5054029>
- [16] ADEID. Dschang Municipal Development Programme. Mairie de Dschang; 2011.
- [17] Kalra Y, Maynard D. Methods manual for forest soil and plant analysis. Northwest Region. Tech. Rep: Information Report NOR-X319; 1991.
- [18] Walkley A, Black IA. An examination of the degtjareff method for determining soil organic matter, and a proposed modification of the chromic acid titration method. Soil Science 1934; 37: 29–38. <https://doi.org/10.1097/00010694-193401000-00003>
- [19] Bremner JM, Mulvaney CS. Nitrogen—Total. 1st ed. Wiley; 1982. <https://doi.org/10.2134/agronmonogr9.2.2ed.c31>
- [20] Jones Jr. Laboratory Guide for Conducting Soil Tests and Plant Analysis. 0 ed. CRC Press; 2001. <https://doi.org/10.1201/9781420025293>
- [21] Kelly VA, Murekezi A. Fertilizer Response and Profitability in Rwanda: A Synthesis of Findings from MINAGRI Studies Conducted by The Food Security Research Project (FSRP) and The FAO Soil Fertility Initiative. AgEcon Search 2000. <https://doi.org/10.22004/AG.ECON.55429>
- [22] R Core Team. R: A Language and Environment for Statistical Computing 2025. <https://www.r-project.org/> (accessed May 23, 2025).
- [23] Temgoua E, Tsafack HN, Ngnikam E, Gouana RT, Dongmo GRZ. Fertilisation of maize (*Zea mays* L.) using sanitised human urine in an oxisol in western Cameroon. International Journal of Biological and Chemical Sciences 2018; 11: 2071. <https://doi.org/10.4314/ijbcs.v11i5.11>
- [24] Beyegue DH, Bedine Boat MA, Egoume Guissana A, Kueptoudji EVE, Mvondo-Awono JP, Tankou C. Response of Congo Grass (*Brachiaria ruziziensis* L. Germain and Evard) to Nitrogen Fertilization on an Oxisol in Western Highlands Agro-ecological Zone of Cameroon. International Journal of Innovative Approaches in Agricultural Research 2023; 7: 325–35. <https://doi.org/10.29329/ijjaar.2023.602.7>
- [25] Sawadogo J, Bassole SD, Savadogo CA, Legma JB. Effects of organic fertilisers on tomato productivity in the semi-arid region of Burkina Faso. Journal of Applied Biosciences 2021; 167: 17375–90.

- [26] Kakabouki I, Roussis I, Krokida M, Mavroeidis A, Stavropoulos P, Karydogianni S, et al. Comparative Study Effect of Different Urea Fertilizers and Tomato Pomace Composts on the Performance and Quality Traits of Processing Tomato (*Lycopersicon esculentum* Mill.). *Plants* 2024; 13: 1852. <https://doi.org/10.3390/plants13131852>
- [27] Li Y, Zhang R, Zhang C, Li Q, Nie L, Wang C, et al. Integrative approaches to nutrient management in tomato cultivation for improved sustainability and productivity. *Front Plant Sci* 2025; 16: 1626136. <https://doi.org/10.3389/fpls.2025.1626136>
- [28] Disciglio G, Tarantino A, Frabboni L. Yield and Fruit Characteristics of Tomato Crops Grown with Mineral Macronutrients: Impact of Organo-Mineral Fertilizers through Foliar or Soil Applications. *Plants* 2024; 13: 1458. <https://doi.org/10.3390/plants13111458>
- [29] Maffia A, Marra F, Canino F, Oliva M, Mallamaci C, Celano G, et al. Comparative Study of Fertilizers in Tomato-Grown Soils: Soil Quality, Sustainability, and Carbon/Water Footprints. *Soil Systems* 2023; 7: 109. <https://doi.org/10.3390/soilsystems7040109>
- [30] Nzuki BF, Kinkwono EK, Sekle BG. Use of guano as a substitute for diammonium phosphate (DAP) in the fertilisation of soybeans and tomatoes in the Democratic Republic of the Congo. *Tropicultura* 2011; 29: 114–20.
- [31] Upite JT, Kitabala Misonga A, Kasongo Mukonzo Lenge E, Nyembo Kimuni L. Effects of domestic compost on soil properties and vegetable crop productivity: The case of tomatoes (*Lycopersicon esculentum* Mill). *International Journal of Biological and Chemical Sciences* 2020; 13: 3411–28. <https://doi.org/10.4314/ijbcs.v13i7.35>
- [32] Alla TK, Bomisso LE, Seydou T, Dick E. Effects of organic fertilisation using plantain peel and chicken manure on the agronomic parameters and financial profitability of the N'drowa aubergine (*Solanum aethiopicum* L.) in Cote d'Ivoire. *Afrique Science* 2021; 18: 25–38.
- [33] Brady, N. C. and Weil, R. R. (2008) *The nature and properties of soil*, 14 ed. Prentice-Hall, Upper Saddle River, New Jersey.
- [34] Lal, R. (2006) Enhancing Crop Yields in the Developing Countries through Restoration of the Soil Organic Carbon Pool in Agricultural Lands. *Land Degradation & Development*, 17, 197-209. <https://doi.org/10.1002/ldr.696>
- [35] Sumner, M. E. and Miller, W. P. (1996) Cation Exchange Capacity and Exchange Coefficients. In: Sparks, D. L., Ed., *Methods of Soil Analysis Part 3: Chemical Methods*, SSSA Book Series 5, Soil Science Society of America, Madison, Wisconsin, 1201-1230.
- [36] Havlin, J. L., Tisdale, S. L., Nelson, W. L., & Beaton, J. D. (2014). *Soil Fertility and Fertilization: An Introduction to Nutrient Management* (8th ed., p. 516).
- [37] F. Kaho, M. Yemefack, P. Teguefouet, J. C. Tchanchaouang. (2011). Combined Effect of *Tithonia diversifolia* leaves and Inorganic Fertilizers on Maize Grain Yield and Soil Properties of a Central Cameroon Acrisol. 29(1): 39-45.