EFFECT OF POULTRY MANURE ON THE PERFORMANCE OF LANDRACE SWEET POTATO (*Ipomoea batatas L.)* IN KAFANCHAN, NIGERIA

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ABSTRACT

The growing demand for sustainable agriculture has prompted the use of organic amendments like poultry manure to improve soil fertility and crop productivity. This study examines the effect of poultry manure on the growth and yield of landrace sweet potato (*Ipomoea batatas* L.) at the Research and Teaching Farm of the Faculty of Agriculture, College of Agriculture and Environmental Sciences, Kaduna State University Kafanchan Campus, during the wet season of 2025. The treatments consisted of 4 levels of poultry manure (0, 2, 4 and 6t/ha) and NPK (15:15:15) at 450kg/ha as treated control. The treatments were laid out in a randomized complete block design and replicated three times. Poultry manure and the treated control had no significant influence on growth and yield characters of landrace sweet potato. However, 4t/ha of poultry manure produced the highest yield of 3.80t/ha, corresponding to 54.47% higher than the untreated control. In fact, the tuber yield in the trial is lower than the average yielding of 4t/ha at local farmers' field in Nigeria. Several factors would have been responsible for the low yield; this may include genetic and environmental factors. It is also not unlikely that unimproved local cultivars often lack the capacity to efficiently utilize nutrient resources due to their sink inelasticity, even though some local cultivars are good. In any case, it can be suggested that farmers in Kafanchan may use 4t/ha of poultry manure for the production of sweet potato, even though further trial is recommended here in order to draw reasonable conclusion.

Keywords: Landrace sweet potato, poultry manure, NPK fertilizer and yield

INTRODUCTION

Landrace sweet potato (Ipomoea batatas (L.) Lam) is locally adapted, genetically diverse varieties. It is a dicotyledonous plant belonging to the family Convolvulaceae. These traditional, often high-dry matter, and disease-resistant tubers are crucial for food security and breeding, exhibiting varied skin/flesh colors like pink, purple, and yellow (Anon. 2026a) It is an important economic crop in many countries. In terms of annual production, sweet potato ranks as the fifth most important food crop in the tropics and the seventh in the world food production after wheat, rice, maize, potato, barley, and cassava (FAO 2016). Sweet potato has different names in different countries and regions, in Egypt it is called Mosader, Nigeria, Igbo(nduku ụtọ), Hausa(dankali), Yoruba(ọdunkun dun), Europe Patata. Sweet potato fulfills a number of basic roles in the global food system, all of which have fundamental implications for meeting food requirements, reducing poverty, and increasing food security (El-Sheikha and Ray 2017). It is believed to be in consumption for centuries. Asia is the largest producer, utilizing crops for both food and animal feed. African production is growing rapidly, focusing primarily on human consumption. Global sweet potato production is dominated by China, which produces over 50% of the approximately 89–106 million tonnes grown annually worldwide (Anon. 2026a). As the world's 5th to 7th most important food crop, it is critical for food security in developing nations, with significant growth in African nations like Malawi, Tanzania, and Nigeria. China remains the leading producer (47.8-70.9 million tonnes),

followed by Malawi, Tanzania, Nigeria, Angola, and Ethiopia (Anon. 2026b).

While global production has seen some volatility, it has remained relatively stable in terms of total output over the past few decades, even with declining land area, due to improved yields. While China's production has shown slight decreases, indicating a potential shift, the rise in African production highlights its growing importance for food security. It is a vital, low-cost staple food in developing countries. The United States is a significant producer with high export value. Growth in the processed food sector (e.g., noodles in Asia) and the adoption of high-yield, disease-free planting materials are driving the modern industry. Nigeria is the third-biggest grower of the crop in the world, behind China and Malawi, and the largest producer of sweet potato in Sub-Saharan Africa, with production, which totals over 3.9 million tonnes annually, concentrated mainly in the North-Central and North-Western regions (Magaji and Sodangi (2020). The leading states are Kaduna, Kano, Bauchi, Plateau and Zamfara, which are ideal due to their savannah climate and, in some areas, high-altitude conditions (Anon. 2026b). The market for the product is primarily domestic; potatoes cultivated on farms in the interior are transported to markets in the country's villages, towns, and cities, where they are purchased by final consumers. As the fourth most important root crop in Nigeria (behind yam, cassava, and cocoyam), sweet potatoes fill the starch/carbohydrate needs of a large portion of the country's population. The perennial demand for potatoes has sustained its production; a growing population ensures that this demand will remain high (Anon. 2026b).

Sweet potato is a perennial plant cultivated as an annual crop. Although known for its tolerance to drought and its sensitivity to saturated soil condition, it requires sufficient water and nutrients, to produce good yield (Huaman, 1992). Multiple crops per year can be grown in tropical regions with sufficient rainfall. Optimal rainfall is approximately 50 cm during the growing season. The best soils are sandy loams with permeable sub-soils. Sweet potatoes do not tolerate waterlogged soils well, especially near harvest where roots may rot in the field or in subsequent storage. Depending on the flesh color, sweet potatoes contain high levels of β-carotene, anthocyanins, phenolics, dietary fiber, vitamins, minerals, and other bioactive compounds. The β-carotene in orange-fleshed sweet potatoes can play a significant role as a viable long-term food-based strategy for combating vitamin A deficiency in the world. Studies in Africa demonstrated that increased consumption of orange-fleshed sweet potatoes improved the vitamin A status of children, pregnant women, and lactating mothers (Hotz et al., 2012; Low et al., 2007; Jaarsveld et al., 2005).

In recent times, the production of sweet potato has been on the decrease despite its numerous economic and nutritional values. According to Fawole (2007), yields of 4-7 tons of sweet potato per hectare are obtained by smallholder farmers, and this is just about 20-35 per cent of the crop's potential yield. The Federal Government of Nigeria released a plan in 2015 to improve the productivity of sweet potato in the country from 6 tonnes per hectare to 25 tonnes per hectare, and national production from two to six million tonnes per annum by 2016. There's great opportunity for sweet potato export in Nigeria (Ajetomobi, 2015).

Justification and Objectives of the Study

Sweet potato fulfills a number of basic roles in the global food system, all of which have fundamental implications for meeting food requirements, reducing poverty, and increasing food security (El-Sheikha and Ray 2017). It is the only root and tuber crop that can be grown and harvested within two months in Nigeria. Sweet potato roots have high nutritional value and sensory versatility in terms of taste, texture, and flesh color (white, cream, yellow, orange, purple). Ogbonna et al. (2005) reported that sweet potato is highly adaptable to relatively marginal soils and erratic rainfall, has high productivity per unit of land and labour and guarantees some yield even under the most adverse conditions. Over the years, farmers have recorded rapid yield even without the use of fertilizers. Some local farmer's complain about the tubers being small. This study is therefore being carried with the objective;

1 To assess the effect of poultry manure on the growth and yield of landrace sweet potato
2 To evaluate the influence of poultry manure and NPK fertilizer in the growth and yield of landrace sweet potato.

MATERIALS AND METHODS

A field trial was conducted during the wet season of 2025 at the Research and Teaching farm of the

Faculty of Agriculture, Kaduna State University, Kafanchan. (09°34'N and 08° 18' E) in the southern Guinea savannah of Nigeria. Average annual rain fall in this region is 1540mm, and an average annual temperature of 24.4 °C. The treatments consisted of 4 levels of poultry manure (0, 2, 4 and 6t/ha) and NPK 15:15:15 at 450kg/ha as treated control). The treatments were laid out in a randomized complete block design and replicated three times. The potato vines were planted on 31/07/2025. Vine lengths of 25cm were planted on ridges at a spacing of 75 x 40cm and depth of about 10cm. Compound fertilizer (NPK 15:15:15) was applied at two weeks after planting (WAP) on the treated control plot (F) by dibbling and the fertilizer was applied about 10cm away from the crop and then covered. A mixture of Glyphosate, a post emergence non-selective systemic herbicide at rate of 2.5kg $a.i^{-1}$, and Buterforce as a pre-emergence herbicide at the rate of 1.5kg $a.i\ ha^{-1}$ were applied using knapsack sprayer two days before planting. This was followed by supplementary weeding with hoe as the need arose. There was no serious incidence of pests and diseases observed, therefore, no control measure was employed. Harvesting was done manually when the crop had reached maturity. Crop maturity was depicted by yellowing of leaves, dying of vines and cracking of soil. Harvesting was done manually by digging with hoe.

Data Collection

Growth and yield parameters such as vine length (cm), number of branches, number of leaves, leaf area (m^2) and total tuber yield (t/ha) were taken from five randomly selected and tagged plants at 3, 6, 9 and 12WAP and the results were recorded and expressed as per plant. The data collected was subjected to analysis of variance (ANOVA) using SAS statistical package. Means were separated using LSD

RESULTS

Vine Length (cm)

Table 1 shows the effect of poultry manure on the vine length of landrace sweet potato during the wet season of 2025 at Kafanchan. There was non-significant difference among the treatments throughout the sampling period. However, treatment with 4t/ha produced the highest leaf area at 9 and 12WAP.

Number of Leaves/Plant

The number of leaves per plant as influenced by poultry manure during the wet season of 2025 at Kafanchan is presented in Table 2. The result revealed that poultry manure and the treated control did not have significant effect on number of leaves/plant throughout the sampling period

Table 1: Vine length (cm) of sweet potato as influenced by poultry manure during the 2025 wet season at Kafanchan

	Vine length (cm)			
Treatment Poultry manure (t/ha)	3WAP	6WAP	9WAP	12WAP
0	33.86	152.13b	245.27	335.63
2	35.60	162.13ab	262.63	338.00
4	31.73	195.53ab	299.60	376.93
6	35.03	205.13a	285.80	341.53
NPK 450kg/ha	31.83	170.17ab	265.23	342.90
LSD	6.428	51.281	67.216	75.825

Means carrying the same letter within a column are not significantly different from each other (P= 0.05) using LSD.

Key
WAP = Weeks After Planting

Table 2: Number of leaves/plant of sweet potato as influenced by poultry manure during the 2025 wet season at Kafanchan

	Number of Leaves/Plant			
Treatment				
Poultrymanure (t/ha)	**3 WAP**	**6 WAP**	**9 WAP**	**12 WAP**
0	14.53	100.13	141.6	172.87
2	15.66	117.60	172.3	190.27
4	15.00	132.20	178.5	210.47
6	17.60	148.47	193.1	223.67
NPK 450kg/ha	15.33	110.40	154.2	184.73
LSD	3.357	36.321	64.026	35.013

Means carrying the same letter within a column are not significantly different from each other (P= 0.05) using LSD.

Key
WAP = Weeks After Planting

Number of Branches/Plant

The effect of poultry manure on the number of branches per plant and leaf area of sweet potato during the wet season of 2025 at Kafanchan is presented in Tables 3 and 4. Based on the result, the number of branches per plant remained unchanged throughout the sampling periods. Similarly, the effect of poultry manure on leaf area produced result that is at par for the whole sampling period. However, the application of 4t/ha supported the highest leaf area at 9 and 12WAP.

Shoot Dry Weight (kg) and Total Tuber Yield (t/ha)

The effect of poultry manure on shoot dry weight (kg) and total tuber yield (t/ha) of sweet potato during the wet season of 2025 at Kafanchan is presented in Table 5. According to the result, poultry manure did not have significant influence on both shoot dry weight and tuber yield of landrace sweet potato throughout the sampling period. However, 4t/ha of poultry manure produced the highest sweet potato tubers, followed closely by 6t/ha, 2t/ha, then, the treated control and lastly, the untreated control.

Table 3: Number of branches/plant of sweet potato as influenced by poultry manure during the 2025 wet season of Kafanchan

	Number of Branches/Plant			
Treatment				
Poultry manure (t/ha)	3WAP	6WAP	9WAP	12WAP
0	2.40	7.26	15.66	24.40
2	2.86	7.80	18.26	26.73
4	2.66	9.33	16.53	24.86
6	2.86	9.06	17.86	26.26
NPK 450kg/ha	2.66	8.46	17.66	25.93
LSD	1.881	2.235	2.742	2.571

Means carrying the same letter within a column are not significantly different from each other (P= 0.05) using LSD.
Key
WAP = Weeks After Planting

Table 4: Leaf area (cm^2) of sweet potato as influenced by poultry manure during the 2025 wet season at Kafanchan

	Leaf Area (cm^2)			
Treatment				
Poultry manure (t/ha)	3WAP	6WAP	9WAP	12WAP
0	5.30	15.20	26.50	62.70
2	6.66	15.36	29.43	69.23
4	7.86	17.33	47.67	78.16
6	9.40	18.06	42.70	73.06
NPK 450kg/ha	7.70	17.53	39.67	62.76
LSD	2.762	5.771	28.294	20.641

Means carrying the same letter within a column are not significantly different from each other (P= 0.05) using LSD.
Key

WAP= Weeks After planting

Table 5: Shoot dry weight and yield of sweet potato as influenced by poultry manure during the 2025 wet season at Kafanchan

	Shoot dry weight (kg) and tuber yield (t/ha)	
Treatment	**Dry weight (kg)**	**yield (t/ha)**
Poultry manure (t/ha)	12WAP	12WAP
0	0.15	1.73
2	0.18	2.70
4	0.26	3.80
6	0.24	3.73
NPK 450kg/ha	0.18	1.86
LSD	0.136	4.771

Means carrying the same letter within a column are not significantly different from each other (P= 0.05) using LSD.

Key
WAP = Week After Planting

DISCUSSION

Effect of Poultry Manure on the Growth and yield Characters of Landrace Sweet Potato

Poultry manure did not have significant influence on growth and yield characters of landrace sweet potato. This probably might have been that the inherent nutrient levels of the soil (native soil) would have been sufficient, rendering added manure statistically insignificant. Several studies carried out earlier are in consonance with this assertion. However,

4t/ha of poultry manure produced the highest yield of 3.80t/ha, corresponding to 54.47% higher than the untreated control (Table 5). Research indicates that while poultry manure is generally beneficial for sweet potato growth, certain studies have shown that its application does not always result in a statistically significant increase in yield or that its effects may not differ significantly from control treatments under specific conditions. For instance, Anon. (2026c) reported non-significant difference in the yields of sweet potato varieties TIS 87/0087 and NRSP 05/022 when sown with poultry manure compared to those sown with NPK or without any manure. In addition, Ferreira et al. (2020) noted that while poultry manure was an alternative, there were no differences in agronomic values compared to NPK in certain situations. Furthermore, Anon. (2026c) asserted that while fertilizers generally improved agronomic parameters compared to control, certain treatments—including poultry manure—showed no significant effect on specific measured parameters such as vine length or certain yield components. The non-significant influence of poultry and NPK fertilizer on the yield of sweet potato is in contradiction of several other researchers. For example, Alabi *et al.* (2017) evaluated the effect of poultry manure on the yield and quality of sweet potato and the study revealed that application of poultry manure significantly increased yield and improved the nutritional quality of sweet potato tuber. Kyalo *et al.* (2020) in a study conducted on the effect of poultry manure on sweet potato production found out that sweet potato yields increased significantly with increasing rate of poultry manure application. The researchers suggested that poultry manure can be used as a valuable source of nutrients for sweet potato production. Also, Magaji and Sodangi (2020) reported that fertilizing sweet potato at two weeks after planting is generally a good idea. Fertilizer will provide sweet potato the nutrients it needs to expand vines and root system and produce high tuber yield. Albert *et al*. (2022) argued that on the average, NPK 15-15-15 + Cow dung produced significantly highest responses of root dry matter content. The researchers concluded that 'Integrated application of organic manure and inorganic fertilizers (NPK, 15-15-15) is recommended for improved sweet potato production'.

The ridiculously low yield of sweet potato in this trial might have been due to some factors. Firstly, some plots produced zero tuber yields. Secondly, genetic and environmental factors might have been responsible. Genetically, some sweet potato genotypes may not form tuberous roots in some locations, while they will form tuberous roots in some other locations (Ferreira et al., 2020). Thirdly, it is also not unlikely that unimproved local cultivars often lack the capacity to efficiently utilize nutrient resources due to their sink inelasticity, even though some local cultivars are good. Fourthly, some environmental factors including soil type can make a good sweet potato variety not form tubers or form very small tubers, e g. if there is a hard soil layer closer to the soil surface; the roots won't be able to penetrate and expand laterally to tuberize (Anon. 2026c). The attention in agronomy is shifting towards global environmental issues, with the utilization of organic wastes such as farmyard manure, compost, cow dung, vermin-compost, poultry manure (Anon. 2026a).

SUMMARY AND CONCLUSION

Poultry manure and the treated control did not have significant influence on all growth and yield parameters taken during the trial. However, 4t/ha of poultry manure produced the highest yield of 3.80t/ha, corresponding to 54.47% higher than the untreated control. The tuber yield in the trial is lower than the average yield of 4t/ha at local farmers yield in Nigeria. Several factors would have been responsible for the low yield; this may include genetic and environmental factors. It is also not unlikely that unimproved local cultivars often lack the capacity to efficiently utilize nutrient resources due to their sink inelasticity, even though some local cultivars are good. The ridiculously low yield of sweet potato in this trial needs to be further investigated.

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