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Effects Of Organic Manure On Seedling Growth Of Selected Trees In Delta State

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Abstract:
Background*: Forests are lungs of the earth and with climate variation which stems from various anthropogenic activities including deforestation, there is need for forest expansion via afforestation. Effect of organic manure on seedling growth of selected trees in Delta State was examined.*
Materials and Methods*: A 4x4 factorial experiment in Randomized Complete Block Design with three replications per treatments (Poultry, Pig, Cowdung manures and control) was adopted for the study. Soil sample of the experimental plot (Teaching and Research Farm of Forestry and Wildlife, Delta State University Abraka) was analyzed using standard procedures. Data on seedlings growth parameters (heights, leaf number, number of branches, collar diameter and leaf area) were obtained fortnightly and analyzed using ANOVA at* $\alpha_{0.05.}$
Results*: Soil sample was characterized as sandy loam with a pH value of 6.05, organic carbon (5.21) and % sand (80.50). Significant difference exist among species for heights, collar diameter and leaf number. Delonix regia produced the best height (130.58±12.40), collar diameter (26.21±3.23) and leaf area (35.84±5.87); while Terminalia mantaly the best number of branches (5.33±0.52) at week 14. Organic manure significantly influenced seedlings height, collar diameter, leaf number, number of branches and leaf area. Pig dropping was best in heights of P. longifolia (47.33±4.48) at week 2; cowdung in collar diameter of P. longifolia (11.86±2.47), pig droppings in leaf number of T. mantaly (65.67±2.66); control in number of branches T. mantaly (7.33±0.75); while Pig droppings in leaf area (46.72±2.75) at week 14 respectively. The interaction effect was significant for collar diameter.*
Conclusion: *Organic manure favoured the growth of seedlings of the trees, thus, agrosilvopastoral system is recommended for adoption by Foresters to allow for mutual benefits between the trees, crops and livestock.*
Key Word: *Afforestation; Organic manure; Sustainability; Tree Species; Urban Environment*.

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I. Introduction

Climate variation has intensified over the years due to deforestation and other anthropogenic activities[1] all geared to meeting man's need[2]. In order to curb the problems of climate change, various approaches have been developed. Sustainable development goals 13 and 15 addressing climate action and life on land is one approach to solving the problem of deforestation. Forests are known as lungs of the earth which purifies polluted air and have positively impacted various climates[3]. Globally, the crusade for afforestation is intense with rapid cultivation of forest trees. Tree growth requires examination of various factors that will enhance their survival. Planting of trees from their aborigine involves either stimulating the growth conditions in a new environment or experimenting new growth pattern for the chosen species[4]. The survival of these species is difficult to project with uncertainty in the environment. This is because of host of stressors such as degraded soils, drought, uncontrolled human actions and emerging pest and diseases may threaten the survival of the species[5].

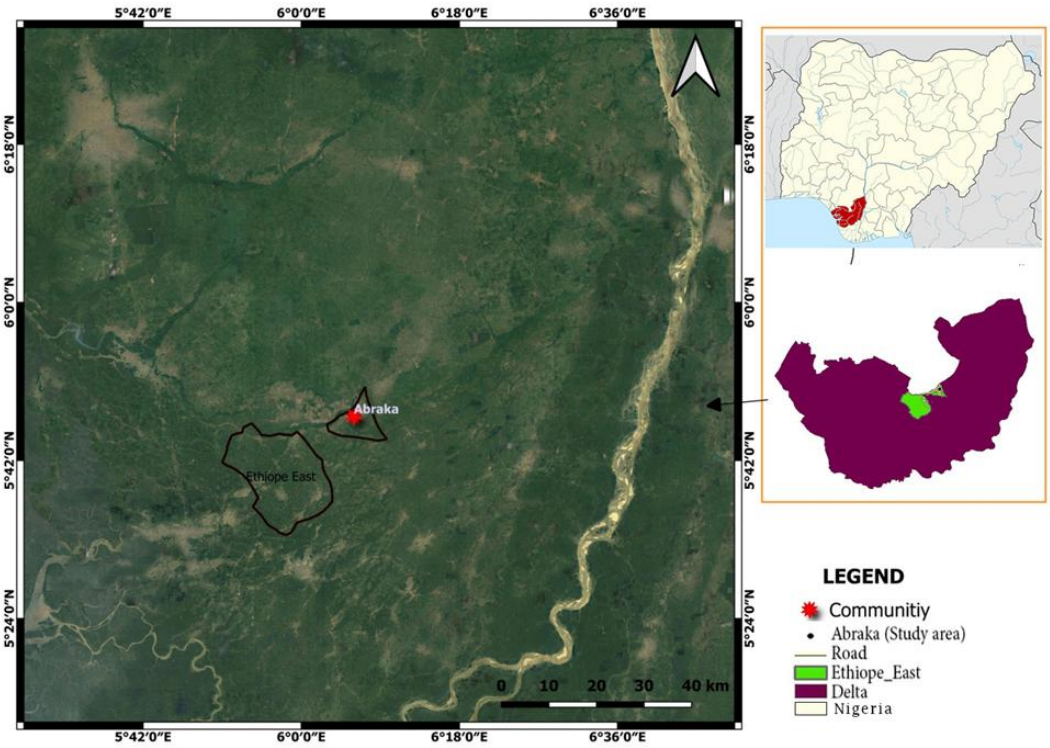
Suitability of soil condition for the early growth of tree seedling is important for their survival. A well-balanced and fertile soil is needed for better growth and yield of trees. Soil amendment is any material added to a soil to improve its physical properties for plant growth[6]. Various materials such as organic and inorganic manure, lime, wood ash, biochar and microbes were used with interesting results[7]. Manure is anything organic that when added to soil increases its fertility and enhances plant growth. Manure application to soil supply benefits such as soil fertility improvements, improve soil structure, water holding capacity, soil organic matter thus minimizing the quantity of synthetic fertilizer required by growing trees[8]. Application of organic fertilizers is gaining prominence among agriculture and forestry sector. Different organic fertilizers were used to hasten the growth of many highly valued slow growing species[9].

Terminalia species is the second largest genus of the family *Combretaceae* comprising 20 genera and about 475 species, of these species about 200 belong to the genus *Terminalia*. The family is distributed throughout the tropical regions of the world[10]. *Terminalia* species range from small and medium sized shrubs to large deciduous forest trees. *Senna siamea* also known as Cassod tree belong to the family of Fabaceae (Pea family). It is a medium size evergreen tree distributed in the tropical, subhumid regions and even in arid zones[11]. *Delonix regia* is a family of Fabaceae and the common name is Flamboyant tree. It is a tropical tree with showy flowers that is wide spread in most West African tropical and sub-tropical areas of the world. It grows in areas with but high and scanty rain fall[1]. *Polyalthia longifolia* is of plant family *Annonaceae*. Its common name is Masquerade tree or Indian mast. It is native to India and thrives in tropics including Nigeria. It is known to grow over 10 – 20m height and has very short tree cover[12].

There is dearth of information on the soil qualities of the departmental farm and use of organic manure on the growth of seedlings of *Terminalia mantaly*, *Senna siamea*, *Delonix regia* and *Polyalthia longifolia* in Delta State. This study supply information on the best organic manure that favoured the early seedling growth of these species.

II. Material And Methods

Department of Forestry and Wildlife Teaching and Research Farm of Delta State University, Abraka, Delta State, Nigeria in Ethiope East Local Government Area was the study area (Figure 1).



Seeds of were purchased Forestry Research Institute (FRIN) Ibadan Oyo State, Nigeria. Twelve weeks seedlings of *Terminalia mantaly*, *Senna siamea*, *Delonix regia* and *Polyalthia longifolia* were planted out in the field and treated with organic manure of Poultry, Cowdung, Pig with a control. The Experiment lasted from 1st September, 2023 to 22nd May 2024.

Study Design: A 4 X 4 factorial experiments in Randomized Complete Block Design was used as shown in equation 1

$$Y_{i,j,k} = Ц + B_i + P_j + M_k + PM_{jk} + e_{i,j,k}$$

Where,
Y_{ijk} = Individual observations
Ц = Overall mean
B_i = Effect of blocks (or replicates)
P_j = Effect of Plants
M_k = Effects of manures
PM_{jk} = Effects of interactions PM

e_{ijk} = Experimental error

Study Location: Department of Forestry and Wildlife Teaching and Research Farm of Delta State University, Abraka, Delta State, Nigeria in Ethiope East Local Government Area, Delta State, Nigeria was the study area.

Study Duration: September 1st 2023 to May 22nd 2024.

Sample size: 576 seedlings.

Sample size calculation: The sample size was estimated on treatment and species basis and number of replication. Four (4) treatments of Poultry, Cowdung, Pig and control; four (4) tree species of *Terminalia mantaly, Senna siamea, Delonix regia* and *Polyalthia longifolia* and three (3) replicates for 12 seedlings for each treatment.

Procedure methodology

Soil analysis was conducted to determine the level of nutrients in the soil. As such, it can only be as accurate as the sample taken in a particular field prior to planting, it is important to perform soil analysis in order to correct any nutrient deficiency[13]. Assessment of soil includes; texture, pH, $CaCo_s$, organic matter, macro nutrients (P, K, Mg etc), electrical conductivity, all these parameters were analyzed in the laboratory. The procedure involved collection of soil samples, air drying of soil samples, grinding and sieving, then chemical analysis of the soil sample which further help in the characterization of the fertility status.

The soil pH was measured with glass electrode after making a 1:1 soil water ratio suspension and was determined electrometrically with a PH meter. The total Nitrogen was determined by semi-micro Kjedhal procedure. Sodium (Na) and potassium (K) were measured by flame photometer and Magnesium (Mg) and Calcium (Ca) was determined by EDTA titration[14]**.**

Topsoil was collected from the Teaching and Research Farm of Delta State University Abraka. 1.5kg of top soil was filled into vases. One thousand one hundred and twenty-five grams (1.125kg) of air-dried poultry manure, cow dung and pig manure treatment were each thoroughly mixed with respective top soil and left to dissolve for two weeks. Then twelve weeks (3 months) old seedlings of each species was planted into the prepared vases treated with (Poultry manure, Cowdung, Pig manure and control), respectively. They were watered regularly. Seedling height, diameter at base, leaf number, number of branches, and leaf area assessment were conducted fortnightly. Growth parameters of the seedlings were measured with instruments in the table below;

Table 1: Growth Parameters of the seedlings treated with varying organic manure

S/N	**Parameters**	**Instruments**
1	Seedling heights	Measuring tape
2.	Leaf number	Visual counting
3	Number of branches	Visual counting
4	Number of Nodes	Visual counting
6	Collar diameter	Vernier caliper
7	Leaf area	Graph

Seedling growth rate was measured within and between the four species.

Statistical analysis

Growth parameters of seedlings was subjected to analysis of variance (ANOVA) using SAS to statistically verify the significant difference of effects of organic manure on the growth of seedlings of selected urban trees. The level $P < 0.05$ was considered as the cutoff value or significance.

III. Result And Discussion

Soil and Organic Manure Analysis

The result of soil analysis is presented in Tables 2. The soil was slightly acidic with a pH value of 6.05, rich in organic carbon (5.21) and % sand (80.50). The soil in the experimental plot is best described as sandy loam. [15]described the soil in the experimental plot before addition of manure as acidic with a pH (H_2O) of 4.9, % fine sand of 22 and coarse sand of 55, thus as sandy loam from the result of the soil analysis. [16] described the soil of the experimental plot as sandy loam with 78.50, 8.50 and 3.00 for % sand, silt and clay respectively. Total Nitrogen, Potassium and Phosphorus of soils in the experimental plots were 0.43%, 0.31 cmol/kg and 21. 20 mg/kg. [9] reported higher value for Nitrogen and lower values for Potassium and Phosporus in topsoil of experimental plot relative to manure treatment.

The nutrient composition of manure utilized for the study presented in Table 2 shows that nutrient composition of the manures was higher than that of the soil. Piggery manure had high pH content, % Total Nitrogen (N), % total Phosphorus (P)% Calcium (Ca), % Magnesium (Mg), % Potassium (K), Manganese (Mn), Iron (Fe), Copper (Cu) and Zinc (Zn) when compared to poultry and cow-dung. However, poultry manure had high Iron concentration of 1875.3mg/kg when compared to the other sources of manure considered for the study. Soil pH increases when manure is added and this is linked to the presence of calcium carbonate and bicarbonate in manure[17]. Increase in Soil pH was detected in soils amended with pig, poultry, rabbit, goat and cow-dung[18]. However, calcium carbonate was higher in pig manure relative to cow manure and this is attributed to their diets[17].

Studies have shown an increase in N when livestock (cattle and poultry) manure were used for soil amendments in Nigeria[19,17], in South Africa[20], and United States[21]. Organic and inorganic P is contained in manure. Plants readily absorb inorganic orthophosphates which makes up 45% to 90% of Phosphorus available in manure[22]. High concentration of P was found in poultry and pig manure as seen in this study and corroborates the reports[17].

Cation exchange capacity (CEC) measures soil's ability to retain positively charged ions on its surface particles[23]. Increasing clay and organic matter content generally increases soil CEC. The result from the manure analysis shows a significant lower level- of Ca and Mg for the studied manures, of potassium for poultry and cow-dung when compared to the soil tested. However, the quantities of Potassium from pig manure and Na from poultry, cow-dung and pig manure were higher than the values in the soil samples.

The Mn, Zn and Cu are micronutrients essential for plant growth and productivity[17]. [24] observed high concentration (1200 mg kg-1) of Zinc in pig manure compared to cow-dung, poultry, compost and biogas manure. Other researchers confirmed that the level of trace elements in livestock dropping is correlated to the trace elements in animal feed[17, 24]. [25]reported increased level of Cu, Mn, Fe and Zn in soils with organic manure application. The sample analysis shows that soil in the experimental plot and treatments were suitable as the necessary nutrients for plant growth were present.

Table 2: Nutrient profile of soil and manures used for soil amendments

Parameters	Topsoil	Cowdung	Poultry	Pig
pH(H_2O)	6.05	8.30	8.20	8.70
% Organic Carbon	5.21			
% Total Nitrogen	0.43	1.79	1.96	2.20
Available Phosphorus	21.20(mg/kg)			
%Total Phosphorus		0.27	0.33	0.38
Exch Acidity (cmol/kg)	0.50			
Exch H+ (cmol/kg)	0.50			
Exch AL+++(cmol/kg)	0.00			
% Ca	2.79 (cmol/kg)	0.202	0.233	0.598
% Mg	1.04 (cmol/kg)	0.101	0.151	0.600
% K	0.31(cmol/kg)	0.099	0.098	0.873
% Na	0.26(cmol/kg)	0.480	0.033	9.101
Mn (mg/kg)	61.00	101.10	89.6	319.4
Fe (mg/kg)	83.00	581.0	1875.3	182.4
Cu (mg/kg)	1.84	6.40	8.50	124.80
Zn (mg/kg)	2.03	39.10	51.40	247.50
% Sand	80.50			
% Silt	8.50			
% Clay	11.00			

Source: Department of Soil Resources Management Faculty of Agriculture and Forestry University of Ibadan

Effects of Organic Manure on Height of the Selected Trees

The result of the effects of varying organic manures on the height of selected trees is presented in Tables 3 and 4. Significant differences ($P < 0.05$) exist in heights of seedlings of tree species across the weeks. *Delonix regia* had the best average heights (cm) of 73.83±8.93, 95.17±7.98, 117.50±8.80 and 130.58±12.40 at weeks 2, 4, 10 and 14 weeks respectively. Seedlings of *Polyalthia longifolia* recorded the lowest mean height of 29.00±8.93, 39.67±7.98, 54.77±8.80and 68.81±12.40 at week 2, 6, 10 and 14 respectively after transplanting. The different livestock manure used as soil amendments also significantly influenced seedling heights of the tree species. Pig droppings significantly ($P < 0.05$) influenced seedlings growth at week 6, 10 and 14 with heights of 85.58±7.98, 108.33±8.80 and 113.67±12.40 respectively (Table 3). The effect of Poultry droppings on seedling heights of the tree species was low relative to the control. The interaction effect of tree species and organic manures application on height was not significant ($P > 0.05$). The effects of organic manure on the

heights of seedlings of each of the selected trees shows that at week 2, the control treatment performed best for *Terminalia mantaly* (60.33±4.48), *Senna siamea* (83.00±4.48) *and Delonix regia* (109.33±4.48) while for seedlings of *Polyalthia longifolia*, Pig droppings performed best with 47.33±4.48. From week 6 to 14, Pig droppings recorded the maximum height growth for all the seedlings expect for *Terminalia mantaly* where control was highest at weeks 6 (67.33±4.08) (Tables 4).

[8]observed significant difference on heights of seedlings of Mulberry (Morus sp.) influenced by different organic manures as also reported in this study. [16] reported that organic manure significantly influenced the heights of seedlings growth of *Cedrela odorata*. At week 2, 4, 6 and 8 after transplanting, [16]observed that seedling height of *Cedrela odorata* was highest in the control. In this study, the control treatment performed best in height of seedlings of the tree species at week 2 while Pig droppings recorded the best performance at weeks 6, 10 and 14 and closely followed by seedlings height in control, which confirms our findings. The better performance in heights of seedlings grown in Pig manure and control observed in this study is at variance with reports of [16]who reported best performance in seedlings heights of *Cedrela odorata* grown in poultry droppings. [24]also reported a better performance of Poultry droppings compared to Cow-dung in seedlings heights of Amaranth in Yobe, Nigeria. [9]observed that poultry droppings when compared with cow-dung and a mixture of both performed best in seedlings heights of *Khaya senegalensis*. [26]observed that seedlings heights of *Araucaria heterophylla* performed better in Poultry manure when compared to cowdung. However, [27]observed the better performance of Cowdung manure in the height of *Entandrophragma angolense* (Welw) C.DC seedlings when compared to poultry manure in Ibadan. [28]further observed better performance in heights of *Xanthosoma sagittifolium* (Cocoyam) treated with pig manure than in the control. [15]reported an increasing positive performance in *Moringa oleifera* seedlings sown in soils amended with increasing levels of Pig manure. The above reports give credence to the various findings in this study.

Table 3: Interaction effects of organic manures on plant heights of seedlings of selected trees

Plants	**Weeks after planting (cm)**			
	2	**6**	**10**	**14**
Polyalthia longifolia	29.00b	39.67d	54.77c	68.81b
Terminalia mantaly	34.97b	50.45bc	66.33bc	73.25b
Senna siamea	47.57b	63.33b	80.88b	78.58b
Delonix regia	73.83a	95.17a	117.50a	130.58a
LSD (0.05)	25.01	22.34	24.64	34.71
Standard Error	8.93	7.98	8.80	12.40
	S	S	S	S
Manure				
Control	68.83a	74.50a	91.33ab	98.17ab
Cowdung	30.38b	51.70b	69.00bc	74.58b
Poultry	21.98b	36.83b	50.82c	64.81b
Pig droppings	64.17a	85.58a	108.33a	113.67a
LSD (0.05)	25.01	22.34	24.64	34.71
Standard error	8.93	7.98	8.80	12.40
	S	S	S	S
Plant X Manure	NS	NS	NS	NS

Table 4: Effects of Organic manure on the mean heights of seedlings of each of the selected trees

Plants	**Treatment**	**Weeks after planting (cm)**			
		2	**6**	**10**	**14**
Polyalthia longifolia	Cowdung	32.67	45.67	57.67	70.67
	Pig	47.33	58.33	76.67	91
	Poultry	13.33	26.33	39.4	57.9
	Control	22.67	28.33	45.33	55.67
Terminalia mantaly	Cowdung	21.2	49.47	64	45
	Pig	41.33	57.67	85.67	105.33
	Poultry	17	27.33	35	45.33
	Control	60.33	67.33	80.67	96.33
Senna siamea	Cowdung	15	33.33	47	59.33
	Pig	66.67	89.67	113.67	91.67
	Poultry	25.6	43.3	55.53	67
	Control	83	87	107.33	96.33
Delonix regia	Cowdung	52.67	78.33	107.33	122.33
	Pig	101.33	136.67	157.33	166.67
	Poultry	32	50.33	73.33	89
	Control	109.33	115.33	132	144.33
LSD(0.05)		12.55	11.41	11.05	10.41
SE		4.48	4.08	3.95	3.72

Effects of Organic Manure on Collar Diameter of the Selected Trees

The effect of varying organic manures on stem diameter (mm) of seedling of selected trees is presented in Tables 5 and 6. Significant difference (P<0.05) was observed in the collar diameter of seedling of the tree species from 2-14 weeks after transplanting. *Delonix regia* recorded the best and increasing collar diameter (mm) (16.67±1.01, 19.27±1.51, 25.46±2.21 and 26.21±3.23) from 2, 6, 10 and 14 weeks after transplanting respectively. Seedling of *Terminalia mantaly* recorded the least collar diameter growth of 3.13±1.01, 4.67±1.51, 8.24±2.21 and 10.96±3.23 at 2, 6, 10 and 14 weeks after transplanting. Significant difference (P < 0.05) was observed among the livestock manure applied to seedlings of the tree species studied. When compared with the control, Pig droppings had the highest seedling collar diameter from 2 (12.80±1.01), 10 (21.19±2.21) and 14 (26.91±3.23) weeks after transplanting expect for week 6 where control performed better with 12.51±1.51. Poultry droppings recorded the least diameter growth (3.74±1.01) at 2 weeks while Cowdung manure recorded the least seedling diameter of 6.99±1.51, 10.79±2.21 and 12.90±3.23 at weeks 6, 10 and 14 after transplanting. Significant differences (P<0.05) exist between the interactions of the tree species and the livestock manures with respect to seedling diameter at 2, 6 and 10 weeks after transplanting. At week 14, the effect of interaction was not significant (Tables 5). Seedlings of *Polyalthia longifolia* planted in Cowdung and Poultry droppings were highest at weeks 10 (11.86±2.47) and 14 (16.13±2.58) respectively. Seedlings of *Terminalia mantaly and Senna siamea* planted in soils amended with Pig droppings performed better from weeks 2 to 14 after transplanting. *Delonix regia* seedlings planted in control was highest at weeks 2 and 6 after transplanting as shown in Tables 6.

Soil amendments influence positively the growth parameters of tree seedlings. From the soil analysis, the soil type of the plot was sandy loam. However, the better performance of seedlings of *Delonix regia* from week 2 to 14 and at week 6 in control compared to other species and organic manure shows that *Delonix regia* performs best in sandy soils as also confirmed by [29]. Also, the better performance in collar diameter of *Polyalthia longifolia, Terminalia mantaly* and *Senna siamea* seedlings was shown in Pig droppings treatment followed by Poultry manure treatment. This supports the findings by [9, 16] who reported a poor diameter performance of *Khaya senegalensis* and *Cedrela odorata* seedlings sown in Cowdung droppings compared to poultry droppings respectively. The best performance in collar diameter of seedlings sown in Pig droppings shows that the soil nutrients improved significantly with application of Pig droppings and these nutrients were rapidly absorbed by these seedlings translating to better growth performance. [15]reported increased soil nutrients and increased stem girth of *Moringa oleifera* seedling sown in soils amended with Pig manure, which corroborates the above assertion.

Tables 5: Interaction effects of organic manures on collar diameter of seedlings of selected trees

	Weeks after planting (mm)			
Plants	**2**	**6**	**10**	**14**
Polyalthia longifolia	4.06c	5.89c	9.44c	12.34b
Terminalia mantaly	3.13c	4.67c	8.24c	10.96b
Senna siamea	8.67b	12.61b	16.93b	22.27a
Delonix regia	16.67a	19.27a	25.46a	26.21a
LSD (0.05)	2.82	4.22	6.19	9.04
Standard Error	1.01	1.51	2.21	3.23
	S	S	S	S
Manure				
Control	11.54a	12.51a	15.26ab	16.42b
Cowdung	4.45b	6.99b	10.79b	12.90b
Poultry	3.74b	7.75b	12.83b	15.55b
Pig droppings	12.80a	15.23a	21.19a	26.91a
LSD (0.05)	2.82	4.22	6.19	9.04
Standard error	1.01	1.51	2.21	3.23
	S	S	S	S
Plant X Manure	S	S	S	NS

Table 6: Effects of Organic Manure on mean collar diameter of the each of the Selected Trees

Plants	**Treatment**	**Weeks after planting (mm)**			
		2	**6**	**10**	**14**
Polyalthia longifolia	Cowdung	4.88	7.34	11.86	14.31
	Pig	7.07	8.11	11.21	13.16
	Poultry	2.16	5.35	9.95	16.13
	Control	2.15	2.76	4.74	5.78
Terminalia mantaly	Cowdung	1.8	3.15	6.25	5.98
	Pig	4.66	6.6	9.89	15.83
	Poultry	1.95	3.87	8.79	12.89
	Control	4.08	5.07	8	9.14
Senna siamea	Cowdung	2.04	5.7	9.33	13.6

	Pig	15.92	20.38	27.25	40
	Poultry	5.8	13.2	17.36	21.42
	Control	10.91	11.16	13.77	14.04
Delonix regia	Cowdung	9.07	11.76	15.74	17.71
	Pig	23.53	25.72	36.39	38.65
	Poultry	5.04	8.58	15.22	11.77
	Control	29.02	31.03	34.51	36.72
LSD(0.05)		7.96	7.13	6.91	7.22
SE		2.84	2.55	2.47	2.58

Effects of Organic Manure on Leaf Number of the Selected Trees

Table 7 and 8 shows the results of effect of organic manures on leaf number of seedlings of trees species studied. At week 2, significant difference (P<0.05) existed in the leaf number of seedlings of the tree species. Seedlings of *Terminalia mantaly* had the best mean leaf number of 23.33±3.91. From week 6, 10 and 14, there were no significant difference (P> 0.05) in the leaf number of the selected tree species. However, seedlings of *Senna siamea* performed best with number of leaves at week 6 (25.92±4.06), week 10 (36.33±4.96) and week 14 (43.83±6.08). The effects of different livestock manures on leaf number of selected tree species was significant (P<0.05) at weeks 2, 6 and 10. At weeks 2 and 6 after transplanting, seedlings sown without any soil amendments had best performance in leaf numbers with values of 31.58±3.91 and 32.59±4.06 respectively. At weeks 10 and 14, the leaf number of seedlings grown with Pig droppings had the highest leaf number of 44.75±4.96 and 53.83±6.08 respectively. Leaf number of seedlings sown in Poultry droppings performed poorly in leaf number (5.58±3.91) at week 2 while seedlings sown in Cowdung had the least mean leaf number at week 6 (12.33±4.06), 10 (20.00±4.96) and 14 (27.50±6.08). The interaction effect among the tree species and manure applied on the seedling growth were not significant (P> 0.05) during the study (Table 7). Seedlings of *Terminalia mantaly*and *Delonix regia* performed best in the soils without amendment from weeks 2 to 14 while for *Polyalthia longifolia* and *Senna siamea* seedlings sown in Pig droppings performed best from week 2 to 14 (Table 8).

The increased number of leaves recorded for *Terminalia mantaly* and the best performance of seedlings sown without soil amendments at week 2 and 6 corroborates the reports of [25]that *Terminalia mantaly* seedlings had best performance in number of leaves seedlings, when grown in garden soil (control).The significant difference observed in the number of leaves of the species with respect to soil amendments application corroborates the reports of [8]who observed significant difference in leaf number of seedlings of Mulberry (Morus sp). [15]Also observed significant difference in the leaf number of *Moringa oleifera* ascensions sown in pig manure which is in agreement with the result of the findings for these species in this study. [9]also reported that seedling of *Khaya senegalensis* sown in Poultry droppings had the highest number of leaves relative to seedlings sown in Cowdung, which is similar to the findings in this study. From the organic manure nutrient assessment by[16], Poultry droppings had the highest nutrient (N, P, K, Ca, Mg, Na) relative to Cow-dung and Pig manure, thus recorded the best growth performance in the seedlings of *Cedrela odorata*, this is also similar to the findings of this study. The pig droppings nutrient assessment in this study had highest nutrient composition amongst the three organic manure utilized, hence better performance of growth parameters (number of leaves) in seedlings of selected trees sown in pig droppings. [30] reported that Pig droppings favour the growth of Zucchini; [28]observed highest number of leaves of *Xanthosoma sagittifolium* (Cocoyam) grown in Pig manure from weeks 2 to 12. The authors also observe that at week 1, the effect of pig manure and control on Cocoyam's leaf number were close as also observed in this study.

Table 7: Interaction effects of organic manures on leaf number of seedlings of selected trees

Plants	**Weeks after planting**			
	2	**6**	**10**	**14**
Polyalthia longifolia	8.67b	12.50b	21.08b	28.50a
Terminalia mantaly	23.33a	25.58a	34.50ab	42.58a
Senna siamea	18.42ab	25.92a	36.33a	43.83a
Delonix regia	21.42a	24.83a	35.50a	43.50a
LSD (0.05)	10.96	11.36	13.90	17.02
Standard Error	3.91	4.06	4.96	6.08
	S	NS	NS	NS
Manure				
Control	31.58a	32.59a	41.83a	48.00a
Cowdung	6.58b	12.33b	20.00b	27.50b
Poultry	5.58b	12.41b	20.83b	29.08b
Pig droppings	28.08a	31.50a	44.75a	53.83a
LSD (0.05)	10.96	11.36	13.90	17.02
Standard error	3.91	4.06	4.96	6.08
	S	S	S	NS
Plant X Manure	NS	NS	NS	NS

Table 8: Effects of Organic Manure on mean Leaf Number on each of the Selected Trees

Plants	Treatment	Weeks after planting			
		2	6	10	14
Polyalthia longifolia	Cowdung	4.33	10.00	16.67	26.67
	Pig	18.67	22.67	34.33	40.33
	Poultry	3.00	9.33	19.00	26.67
	Control	8.67	8.00	14.33	20.33
Terminalia mantaly	Cowdung	8.00	12.33	18.67	21.00
	Pig	32.67	35.33	49.67	63.67
	Poultry	3.00	6.67	12.33	20.00
	Control	49.67	48	57.33	65.67
Senna siamea	Cowdung	4.00	13.33	20.00	28.00
	Pig	31.67	37.67	54.00	63.00
	Poultry	11.00	22.67	31.67	42.00
	Control	27.00	30.00	39.67	42.33
Delonix regia	Cowdung	10.00	13.67	24.67	34.33
	Pig	29.33	30.33	41.00	48.33
	Poultry	5.33	11.00	20.33	27.67
	Control	41.00	44.33	56.00	63.67
LSD (0.05)		10.00	8.16	7.87	7.50
SE		3.57	2.91	2.81	2.66

Effects of Organic Manure on Number of Branches of the Selected Trees

The result of the application of organic manure on the number of branches of seedlings of the tree species studied is presented in Table 9 and 10. No significant difference (P>0.05) was observed among the number of branches of the seedlings of the four trees from weeks 2 to week 14. Seedlings of *Terminalia mantaly* had the highest number of branches of 2.33±0.40, 3.25±0.47, 4.00±0.47 and 5.33±0.52 at week 2, 6, 10 and 14 respectively. There exist significant difference (P<0.05) in the number of branches of seedlings with respect to manure application. Seedlings sown without soil amendments and seedlings sown in Pig droppings had the highest number of branches. At week 2, seedlings sown without soil amendment had the highest (2.50±0.40) number of branches while at week 10, seedlings sown with Pig droppings recorded the highest (4.00±0.47). Number of branches of seedlings sown in Cowdung were least at week 2 (0.58±0.40), 10 (2.17±0.47) while that of Poultry was least at week 14 (2.92±0.52). No significant difference (P>0.05) was observed among the interactions between the number of branches of the four tree species and the treatments (Table 9). Seedlings of *Terminalia mantaly* at week 2 and 14 had the highest (4.33±0.99 and 7.33±0.75) number of branches respectively (Table 10).

The results are in agreement with the findings of [26]who observed significant difference in the number of branches of *Araucaria heterophylla* seedlings sown in organic manures (Cowdung and poultry) in Nasarawa State. The results of this study also agrees with the findings of [8,16]who observed significant difference in growth parameters of Morus sp. and *Cedrela odorata* respectively, treated with various organic manures. The increased performance observed for seedlings grown without soil amendments and pig droppings indicates that sandy loam soil and Pig droppings is best for seedlings growth of *Polyalthia longifolia*, *Terminalia mantaly*, *Senna siamea* and *Delonix regia* which is in line with[25] who observed that *Terminalia mantaly* seedlings performed best in garden soil while [29]also observed enhanced growth performance of *Delonix regia* seedlings grown in sandy soils. [15]observed increased growth of seedlings of *Moringa oleifera* ascensions with increased application of Pig manure. [30] reported that Pig manure favoured the growth of Zucchini (*Cucurbita pepo*). The above findings corroborated the results of this study.

Table 9: Interaction effects of organic manures on number of branches of seedlings of selected trees

Plants	Weeks after planting			
	2	6	10	14
Polyalthia longifolia	0.92b	1.50b	2.17b	3.42b
Terminalia mantaly	2.33a	3.25a	4.00a	5.33a
Senna siamea	1.08b	2.08ab	2.83ab	3.92ab
Delonix regia	1.75ab	2.17ab	3.00ab	4.08ab
LSD (0.05)	1.13	1.32	1.32	1.46
Standard Error	0.40	0.47	0.47	0.52

	NS	NS	NS	NS
Manure				
Control	2.50a	2.92a	3.58a	5.33a
Cowdung	0.58b	1.58b	2.17b	3.17b
Poultry	0.67b	1.58b	2.25b	2.92b
Pig droppings	2.33a	2.92a	4.00a	5.33a
LSD (0.05)	1.13	1.32	1.32	1.46
Standard error	0.40	0.47	0.47	0.52
	S	S	S	S
Plant X Manure	NS	NS	NS	NS

Table 10: Effects of Organic Manure on mean Number of Branches of each Selected Trees

Plants	**Treatment**	**Weeks after planting**			
		2	**6**	**10**	**14**
Polyalthia longifolia	Cowdung	0.33	0.67	1.33	2.33
	Pig	2.00	2.33	3.00	4.67
	Poultry	0.33	1.33	2.00	3.00
	Control	1.00	1.67	2.33	3.67
Terminalia mantaly	Cowdung	1.33	3.00	3.00	4.67
	Pig	3.00	4.33	6.00	7.00
	Poultry	0.67	1.33	1.67	2.33
	Control	4.33	4.33	5.33	7.33
Senna siamea	Cowdung	0.33	1.33	2.00	2.67
	Pig	2.00	2.33	3.33	4.67
	Poultry	0.67	2.33	3.00	3.33
	Control	1.33	2.33	3.00	5.00
Delonix regia	Cowdung	0.33	1.33	2.33	3.00
	Pig	2.33	2.67	3.67	5.00
	Poultry	1.00	1.33	2.33	3.00
	Control	3.33	3.33	3.67	5.33
LSD (0.05)		2.76	2.03	2.02	2.11
SE		0.99	0.72	0.72	0.75

Effects of Organic Manure on Leaf Area of the Selected Trees

The effect of varying organic manures on leaf area (cm^2) of seedling of selected trees is presented in Tables 11 and 12. No significant difference (P>0.05) was observed in the leaf area of seedling of the tree species from 2-14 weeks after transplanting. Seedlings of *Senna siamea* had the highest (11.34±2.23) leaf area at week 2 while *Delonix regia* recorded the highest and increasing leaf area (25.45±4.87, 31.88±6.00 and 35.84±5.87) from 6, 10 and 14 weeks after transplanting respectively. Seedling of *Terminalia mantaly* recorded the least area of 11.89±4.87, 18.38±6.00 and 21.57±5.87 at 6, 10 and 14 weeks after transplanting respectively. Significant difference (P < 0.05) was observed among the livestock manure applied to seedlings of the tree species studied at weeks 2. Leaf area of seedlings sown without soil amendments performed best (14.41±2.23), followed by Pig droppings (10.88±2.23) while Poultry recorded the least (2.37±2.23) at week 2. No significant difference (P>0.05) was observed in the leaf area of seedlings with respect to soil amendments from week 6 to week 14. When compared with the control, Pig droppings had the highest seedling leaf area from 10 (31.39±6.00) and 14 (35.69±5.87) weeks after transplanting expect for week 6 where control performed better with 23.12±4.87. The effect of Poultry droppings on leaf area was least at week 6 (9.13±4.87), week 10 (13.61±6.00) and week 14 (15.63±5.87) after transplanting. There were no significant differences (P>0.05) between the interactions of the tree species and the livestock manures with respect to leaf area 2, 6, 10 and 14 weeks after transplanting (Table 11). Seedlings of *Polyalthia longifolia* (14.87±2.16), *Terminalia mantaly* (12.36±2.16) and *Senna siamea* (24.85±2.16) in control performed best at week 2, however, seedlings of *Delonix regia* sown in Pig droppings performed best at week 2 (10.74±2.16) and 14 (46.72±2.75) (Tables 12).

The above findings are corroborated by[16] who observed a better performance in growth parameters of *Cedrela odorata* grown in top soil without amendments. This was observed in week 2 of this study. The increased performance of growth parameters of seedlings sown in soils amended with Pig droppings can be explained by the increased nutrient content of pig droppings from the nutrient composition analysis (Table 2) which was readily absorbed by seedlings of the tree species. [15]also reported the increased nutrient content of

soils treated with pig waste translated to better performance in growth parameters of ascensions of *Moringa oleifera* seedlings. Confirming the earlier observation of this study, [28] reported better performance of *Xanthosoma sagittifolium* (Cocoyam) sown in soils amended with Pig droppings relative to control. [24]observed that leaf area of Amaranthus was highest in soils with Poultry droppings relative to Cowdung and control. [24]recorded a higher nutrients composition for poultry manure relative to Cowdung. [27]observed that leaf area of *Entandrophragma angolense* (Welw) seedling was least in soils treated with Poultry droppings.

Tables 11: Interaction effects of organic manures on leaf area of seedlings of selected trees

Plants	**Weeks after planting (cm^2)**			
	2	**6**	**10**	**14**
Polyalthia longifolia	9.77a	17.86a	24.58a	27.35a
Terminalia mantaly	6.88a	11.89a	18.38a	21.57a
Senna siamea	11.34a	18.13a	22.29a	25.25a
Delonix regia	6.32a	25.45a	31.88a	35.84a
LSD (0.05)	6.23	13.64	16.81	16.44
Standard Error	2.23	4.87	6.00	5.87
	NS	NS	NS	NS
Manure				
Control	14.41a	23.12a	28.87ab	32.44a
Cowdung	6.64bc	18.60ab	23.25ab	26.26ab
Poultry	2.37c	9.13b	13.61b	15.63b
Pig droppings	10.88ab	22.49ab	31.39a	35.69a
LSD (0.05)	6.23	13.64	16.81	16.44
Standard error	2.23	4.87	6.00	5.87
	S	NS	NS	NS
Plant X Manure	NS	NS	NS	NS

Table 12: Effects of Organic Manure on mean Leaf Area on each of the Selected Trees

Plants	**Treatment**	**Weeks after planting (cm^2)**			
		2	**6**	**10**	**14**
Polyalthia longifolia	Cowdung	9.03	21.07	28.38	31.07
	Pig	13.29	24.2	35.9	40.34
	Poultry	1.88	5.21	8.00	9.72
	Control	14.87	20.96	26.02	28.29
Terminalia mantaly	Cowdung	8.27	12.31	16.92	20.04
	Pig	5.02	10.36	23.42	26.35
	Poultry	1.87	3.95	5.93	7.83
	Control	12.36	20.95	27.24	32.05
Senna siamea	Cowdung	2.21	4.34	6.36	14
	Pig	14.47	22.91	26.42	29.35
	Poultry	3.84	6.66	8.84	7.25
	Control	24.85	38.62	47.52	12
Delonix regia	Cowdung	7.05	36.69	41.35	46.66
	Pig	10.74	32.5	39.83	46.72
	Poultry	1.9	20.68	31.65	32.95
	Control	5.58	11.94	14.68	17.03
LSD(0.05)		6.06	7.34	7.49	6.65
SE		2.16	2.62	2.67	2.75

IV. Conclusion

The positive influence on the growth parameters of seedlings of *Terminalia mantaly, Senna siamea, Delonix regia* and *Polyalthia longifolia* by pig droppings stems from its high nutrient compositions and thus it is good and absorbable organic manure for cultivation of these trees. Since Pig droppings favoured the growth of the seedlings of selected trees, Agrosilvopastoral system is recommended for adoption by Foresters to allow for mutual benefits between the trees, crops and livestock. This will allow for optimal land use in present dispensation of land scarcity.

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