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Effect of Rabbit Manure on the Growth and Yield of Groundnut (*Arachis hypogaea* Linnaeus) Grown on Intensely Cultivated Ultisols of South Eastern Nigeria

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Abstract

Groundnut when planted on marginal or infertile soils, seldom performs well, except where appropriate fertilizer or soil amendment materials are applied. Field trials were conducted at the National Cereals Research Institute, Owot Uta substation near Uyo, to examine the effects of rabbit manure on the growth and yield of groundnut. The experiment consisted of three medium maturing groundnut varieties (Samnut, G-153 and Imata). The three groundnut varieties were treated to five rates of rabbit manure (0, 1.5, 3.0, 4.5 and 6.0(tonnes/ha)) in a 3×5 factorial arrangement. The experiment was replicated three times. Results indicated significant positive effects($p<0.05$) *of rabbit manure on growth and yield and yield attributes of groundnut; yield increased with increase in rabbit manure application rate. The highest rabbit manure application rate (6.0 tonnes/ha) consistently produced the best results; it produced the tallest plants (22.32 cm), the highest number of pods/plant (61.00), the highest number of seeds /pod (3.41), and the highest grain yield (2.27 tonnes/ha). Interaction between groundnut varieties and rabbit manure application rates was significant* ($p<0.05$)*; when rabbit manure at the rate of 6.0 tonnes/ha was applied to Samnut, it produced the highest number of pods/plant (66.33), the highest number of seeds/pod (3.63) and the highest seed yield (2.47 tonnes/ha). Samnut and rabbit manure application rate of 6.00 tonnes ha^{-1} were therefore recommended to farmers in the study area.*

Key words: Groundnut, Peanut, Legume, Rabbit manure, Ultisols

1.0 Introduction

Groundnut (*Arachis hypogaea* L.) also known as peanut, is a legume grown mainly for its edible seeds. Its high content of oil and protein makes it an important commodity for both human use and livestock feed. The crop is relatively drought-tolerant and is commonly grown in regions of moderate rainfall in the range of 80 – 130 mm per annum (Remison, 2012). Groundnut provides high quality edible oil (48 - 50%) used in cooking, margarine, salad, and easily digestible protein (26 - 28%) and about half of the 13 essential vitamins and more than 2/3 of the 20 essential minerals necessary for normal human growth and development (Akpan and Okpara, 2020). Groundnut also makes high quality fodder for livestock (Taru *et al.*, 2008).

Nigeria is the largest groundnut producing country in West Africa, accounting for about 40% of production in the region. In most parts of Northern Nigeria, groundnut contributes about 23% of household cash revenue (Aijegbe *et al*., 2014). The main constraints limiting groundnut production in Nigeria are diseases, unpredictable rainfall, drought, low soil fertility and poor agronomic practices (Ekwere *et al.,* 2013,). Although groundnut possesses the unique ability to fix atmospheric nitrogen; reports indicate that the process requires the consumption of large amount of other nutrients, especially phosphorus (Osodeke, 1996).

Agricultural soils of South Eastern Nigeria are generally poorly buffered, acidic, and easily lost fertility on intense cultivation. The soils also have low organic matter contents and therefore cannot, in the absence of fertilizer, support intense crop production. The use of inorganic fertilizer in this environment therefore, may further aggravate soil degradation (Ekwere and Efretuei, 2021; Umoh *et al.,* 2023). The maintenance and sustenance of soil fertility requires the use of alternative sources of plant nutrients such as poultry manure, rabbit manure, cow dung and household wastes. The maintenance of soil fertility through the application of organic manure does not only improve crop yield but also maintains soil health and sustain its productivity (Akpan *et al.,* 2022, Ekwere *et al*., 2022). With the increased interest in groundnut production on the acid tropical soils of South Eastern Nigeria, there is a need to adopt soil fertility management strategy that would enhance soil health and productivity. Udounang *et al*. (2022) stated that marginal soils are converted to fertile farmlands

through effective soil fertility management measures such as the use of organic manures, inorganic fertilizers and relevant soil amendment materials.

Rabbit manure is a valuable by-product of rabbit farming. It is rich in nitrogen because the major food preference of rabbit is forage. According to Minnich (2005), fresh rabbit manure contains 2.4% nitrogen; 1.4% Phosphorous, and 0.6% potassium. It is non-toxic, environmentally friendly, and can be cheaply sourced from rabbit farmers in every community in sufficient quantities (Ekwere *et al*., 2023). Abdrabbo and Farag (2008) reported that rabbit manure has N: P: K at the ratios of 3: 1.5: 0.3. Rabbit manure therefore, may be a suitable alternative to chemical fertilizers, especially in homestead gardens, since it poses minimal risks to the ecosystem (Indabo and Abubakar, 2020). Therefore, this study was conducted to evaluate the effects of rabbit manure on the growth and yield of groundnut varieties grown on intensely cultivated ultisols of South Eastern Nigeria.

2.0 Materials and Methods

Field trials were conducted at the National Cereals Research Institute, Owot Uta substation, near Uyo, Akwa Ibom State. Owot Uta lies on Latitude 4°32' and 05°3N', and Longitude 8°2'E and 07°32'. It receives annual rainfall of about 2600 mm, mean annual temperature of 27 °C and relative humidity, 88% (SLUS-AK, 1989). The rainfall pattern is bimodal; it lasts between March and November, usually with a short break in August (August break) that may last two weeks.

The experiment consisted of three medium maturing groundnut varieties (Samnut, G-153 and Imata). Samnut and G-153 are improved varieties, sourced from the Institute of Agricultural Research and Training (IAR&T), Zaria. Imata on the other hand, was obtained from a local farmer in Obio Akpa, Oruk Anam, Akwa Ibom State. The rabbit manure used for the experiment was sourced from the Department of Animal Science, Akwa Ibom State University, Obio Akpa campus. The experiment was a 3 x5 factorial, laid out in a randomized complete block design and replicated three times. The three groundnut varieties were treated to five rates of rabbit manure (0, 1.5, 3.0, 4.5 and 6.0 tonnes ha^{-1}). The seeds were planted at 50 cm x 30 cm corresponding to 66,667 stands/ha. Each experimental unit measured 1.8 m x 2.0 m and was separated from each other by a paths measuring 0.5 m; the replicates were also separated by alleys measuring 1.0 m wide. . The total experimental area measured 254.40 m^2 (21.2 m × 9.5 m).

2.1 Soil analysis

Particle size distribution was determined by hydrometer method as described by Udo *et al. (*2009). Soil organic carbon was determined by the Walkley – Black dichromate oxidation method (Black, 1965). Soil pH was measured electronically in 1:1.5 soil – water suspension (Mclean, 1982). Phosphorous was determined by the Bray P.1 method (Olsen and Sommers, 1982). Exchangeable cations (K, Ca, Mg) were extracted in 1M NH_4OA_C at pH 7. Ca and Mg were determined on the Atomic absorption spectrophotometer (Model iCE 3500, Thermo Fisher Scientific, USA), while K and Na were determined on the Flame Photometer (Model BWB Soil flame photometer, BWB Technologies Ltd., UK). Effective cation exchange capacity (E C E C) was obtained by the summation of the exchangeable bases and the exchangeable acidity (Udo *et al.,* 2009). Percentage base saturation was then calculated as follows:

$$Percentage\ Base\ Saturation = \frac{Exchangeable\ Bases}{ECEC} x \frac{100}{1} \quad \text{.....Equation 2.1}$$

Five plants per experimental unit were randomly selected and tagged for the purpose of data collection. Data were collected on emergence percentage, plant height, biomass yield, days to 50% flowering, number of pods/plant, number of seeds/pod and pod yield (tonnes ha^{-1}).

3.0 Results

Result of the physical and chemical analysis of the soil of the study area prior to commencement of the experiment is shown in Table 3.1. The soil is sandy loam, and acidic (pH 5.02). Exchangeable Potassium, Calcium, Magnesium and Sodium ions were 0.10, 2.22, 1.10 and 0.05 (cmol kg^{-1}) respectively. Nitrogen content was 0.13% in 2021. There were slight improvement in the soil fertility indices in 2022; exchangeable Potassium, Calcium, Magnesium and Sodium ions were 0.08, 2.25, 1.11 and 0.06 (cmol kg^{-1}) respectively. Nitrogen contents were 0.45%. Generally, results of the soil analysis indicated that the soil was low in fertility, hence the need for the application of manure.

Table 3.1. Physical and Chemical Properties of the Soil Samples taken at 0 – 15 cm Depth of the Experimental Site before Planting

Parameter	2021	2022
Sand (%)	74.89	74.80
Clay (%)	20.61	20.62
Silt (%)	4.50	4.58
Texture Class	Sandy Loam	
pH	5.02	5.46
Organic matter (%)	1.98	1.99
Total Nitrogen (%)	0.13	0.45
Available P (mg kg^{-1})	32.22	32.28
Exchangeable Bases (cmol kg^{-1})		
K	0.10	0.08
Ca	2.22	2.25
Mg	1.10	1.11
Na	0.05	0.06
Exchange Acidity (cmol/kg)	2.50	2.52
Effective Cation exchange capacity (cmol/kg)	6.20	6.23
Bases Saturation (%)	96.29	96.63

Table 3.2. Physical and Chemical Analysis of Rabbit Manure

Soil pH	8.50
Nitrogen (%)	2.36
Phosphorus (%)	2.11
Potassium (%)	3.56
Calcium (%)	3.55
Sulphur (%)	1.26

Table 3.2 shows the percentage nutrient composition of rabbit manure. The rabbit manure was alkaline (pH 8.50) and rich in the major plant nutrients (2.36% N, 2.11% P and 3.56 % K). It was therefore considered suitable for application to the marginal soil as manure.

Result also indicated significant differences ($p<0.05$) in growth among the groundnut varieties (Table 3.3); G-153 were the tallest plants (21.78 cm in 2021, 19.33 cm in 2022). It was closely followed by Samnut (21.50 cm in 2021, and 19.33 cm in 2022). The local variety (Imata) produced the shortest plants (10.07 cm in 2022, and 20.80 cm in 2021).

Rabbit manure application/rates had significant positive effects ($p<0.05$) on the agronomic parameters of groundnut; plant height tended to increase as the rate of application of rabbit manure also increased. The tallest plants (22.32) cm in 2021, and 20.73 cm in 2022) were produced at rabbit manure application rate of 6.0 tonnes/ha. This was followed by 21.90 cm and 20.35cm produced in 2021 and 2022 respectively at the manure application rate of 4.5 tonnes/ha. The shortest plants (20.52 cm in 2021, and 18.97 cm in 2022) however, were produced on the control plots that received no rabbit manure treatment.

There were significant interactive affects ($p<0.05$) of rabbit manure and groundnut varieties on the height of plants (Tables 3.4 & 3.5); when rabbit manure at the rate of 3.0 tonnes/ha was applied to Samut in 2021, it produced the tallest plants (18.85cm) (Table 3.4); In 2022, the tallest plants (22.84 cm) were however produced when rabbit manure at the rate of 6.0 tonnes ha^{-1}. was applied to G-153 (Table 3.5); The shortest plants (16.63in cm) were produced in 2021 on Imata when it received no manure treatments (the control plots).

There were significant differences ($p<0.05$) among the groundnut varieties on yield and yield attributes (Table 3.6); flower initiation occurred much earlier in the local variety (46.39 days in 2021, and 46.35 days in 2022). This variety also produced the least number of pods/plant (36.96 in 2021, and 50.71 in 2022), and the lowest pod yield (1.89 tonnes ha^{-1}). Samnut initiated flowers relatively very late compared to the local variety (47.76 days in 2021, and 57.03 days in 2022). It however produced the highest number of pods per plant (46.75 in 2021, 57.03 in 2022), and the highest pods yield (2.12 tonnes ha^{-1}) in 2021, and 2.04 tonnes ha^{-1} in 2022.

Table 3.3 Effect of rabbit manure on emergence, height and biomass yield of groundnut for 2021 and 2022 experiments

2021

Treatments						
Groundnut varieties	**Emergence (%)**	**Plant height (cm)**				**Biomass yield (g)**
		2WAS	**4WAS**	**6WAS**	**8WAS**	
Imata	90.27	8.22	10.06	16.47	20.80	1175.08
G-153	84.05	8.14	11.74	17.56	21.78	1137.49
Samnut	86.41	8.91	10.64	17.39	21.50	1218.18
$LSD_{0.005}$	NS	0.35	0.18	0.46	0.45	28.50
Rabbit manure rates (t/ ha)						
Control	90.47	7.84	9.04	16.50	20.52	1120.39
1.5	84.30	8.20	10.60	16.61	20.73	1179.73
3.0	86.05	8.25	10.88	17.18	21.33	1190.47
4.5	91.31	8.67	11.03	17.69	21.90	1230.77
6.0	87.53	9.15	11.52	17.73	22.32	1254.56
$LSD_{0.005}$	NS	0.34	0.68	0.46	0.40	18.25

2022

Treatments						
Groundnut varieties	**Emergence (%)**	**Plant height (cm)**				**Biomass yield (g)**
		2WAS	**4WAS**	**6WAS**	**8WAS**	
Imata	90.61	7.59	10.44	17.48	19.07	1162.61
G-153	84.07	7.66	11.12	17.93	19.36	1161.48
Samnut	86.40	8.40	11.45	18.52	19.33	1165.22
$LSD_{0.005}$	NS	0.28	0.44	0.27	0.78	1.68
Rabbit manure rates (t/ ha)						
Control	90.42	7.02	9.71	17.22	18.97	1159.71
1.5	84.30	7.68	10.58	17.76	19.53	1162.43
3.0	86.25	7.81	10.96	18.01	20.02	1164.03
4.0	91.34	8.33	11.63	18.33	20.35	1164.71
6.0	87.58	8.59	12.13	18.56	20.73	1167.70
$LSD_{0.005}$	NS	0.22	0.31	0.25	1.88	1.34

Table 3.4. Interactive effects of rabbit manure and variety on emergence, height and biomass yield of groundnut in 2021

Treatments Groundnut varieties/ RM rates	Emergence (%)	Plant height (cm)				Biomass yield (g)
		2WAS	4WAS	6WAS	8WAS	
Imata + Control	90.42	6.61	8.08	9.29	16.63	1121.49
Imata + RM (1.5 t/ha)	84.29	7.27	8.85	10.15	17.08	1154.72
Imata + RM (3.0 t/ ha)	86.23	7.51	9.22	10.32	17.17	1150.80
Imata + RM (4.5 t/ha)	87.58	8.12	9.51	10.85	18.08	1204.23
Imata + RM (6.0 t/ha)	90.42	8.34	9.67	11.58	18.46	1243.17
G-153 + Control	84.32	6.91	8.38	9.98	17.12	1080.54
G-153+RM (1.5 t/ha)	86.25	7.63	8.82	10.72	17.74	1186.77
G-153+RM (3.0 t/ ha)	91.34	7.61	9.52	11.13	18.02	1178.30
G-153+RM (4.5 t/ ha)	93.14	8.04	9.87	11.71	18.29	1233.02
G-153+RM (6.0 t/ ha)	90.42	8.14	10.21	12.05	18.47	1252.32
Samnut + Control	94.15	7.55	16.44	16.51	17.92	1157.84
Samnut+RM (1.5 t/ ha)	96.56	8.13	16.91	17.04	18.46	1173.96
Samnut+RM (3.0 t/ha)	86.15	8.20	17.32	17.69	18.85	1242.31
Samnut+RM (4.5 t/ ha)	91.32	8.84	17.66	17.71	18.61	1254.85
Samnut+RM (6.0 t/ ha)	89.53	9.30	18.32	18.52	18.76	1268.19
$LSD_{0.05}$	NS	0.15	0.86	0.27	0.18	16.97

NB: RM-rabbit manure, NS- not significant

Table 3.5. Interactive effects of rabbit manure and variety on emergence, height and biomass yield of groundnut in 2022

Treatments						
Groundnut varieties/rabbit manure rates	**Emergence (%)**	**Plant height (cm)**				**Biomass yield (g)**
		2WAS	**4WAS**	**6WAS**	**8WAS**	
Imata + Control	96.41	7.55	9.25	15.42	20.19	1161.11
Imata+RM (1.5 t /ha)	84.26	7.28	9.67	15.70	20.42	1160.48
Imata+RM(3.0 t/ha)	85.23	8.23	9.70	16.58	20.59	1163.58
Imata+RM (4.5 t/ha)	87.68	8.68	9.97	17.48	21.15	1163.54
Imata+RM (6.0 t/ha)	91.32	9.27	11.43	17.58	21.65	1164.09
G-153 + Control	85.62	7.62	10.07	17.51	21.04	1150.71
G-153+RM (1.5 t/ha)	84.23	8.28	11.04	16.63	20.64	1160.28
G-153+RM (3.0 t/ha)	91.54	7.79	12.25	17.56	21.80	1160.74
G-153+RM (4.5 t/ha)	92.11	8.21	12.52	17.87	22.56	1162.93
G-153+RM (6.0 t/ha)	90.52	8.83	12.46	18.24	22.84	1165.05
Samnut + Control	95.15	8.36	10.55	16.55	20.97	1159.63
Samnut+RM (1.5/ha)	97.46	9.05	10.38	10.66	20.49	1161.14
Samnut+RM (3.0 t/ha)	85.13	8.75	10.66	10.72	21.62	1163.27
Samnut+RM (4.5 t/ha)	92.72	9.13	10.70	10.62	21.98	1165.06
Samnut+RM (6.0 t/ha)	87.53	9.27	10.60	10.67	22.46	1173.96
$LSD_{0.05}$	NS	0.31	0.65	0.65	0.57	0.93

NB: RM-rabbit manure, NS- not significant

Similarly, G-153 initiated flowers in 47.01 days in 2021, and 57.03 days in 2022. It yielded 3.11 pods/plant in 2021, and 2.04 pods/plant in 2022, total pod yield per hectare stood at 2.12 (tonnes ha^{-1}) in 2021, 2.0 (tonnes ha^{-1}) in 2022. There were however, no significant differences ($p>0.05$) between Samnut and G-153 in number of seeds per pod and total pod yield.

Rabbit manure had significant positive effects ($p<0.05$) on yield and yield attributes of groundnut (Table 3.6). Pod yield increased with increase in the application rate of rabbit manure. The highest rabbit manure application rate (6.0 tonnes/ha) also produced the highest number of pods/plant (46.15

in 2021, and 61.00 in 2022). The highest number of seeds /pod (3.41 in 2021, and 2.36 in 2022), and the highest pod yield (2.27 tonnes ha^{-1} in 2021 and 2.22 tonnes ha^{-1} in 2022).

There were significant interaction effects ($p<0.05$) of groundnut varieties and rabbit manure on yield and yield attributes (Table 3.7); when rabbit manure at the rate of 6.0 tonnes/ha was applied to Samnut, it produced the highest number of pods/plant (48.63 in 2021and 66.33 in 2022), the highest number of seeds/pod (3.63 in 2021 and 2.47 in 2022) and the highest seed yield (2.29 tonnes ha^{-1} in 2021 and 2.47 tonnes ha^{-1} in 2022).

It was noticed however that most of the yield and yield attributes obtained at rabbit manure application rate of 6.0 tonnes/ha were not significantly different from those obtained at rabbit manure application rate of 4.5 tonnes/ha, suggesting that rabbit manure application rate of 4.5 tons/ha maybe significant for groundnut production in the study area.

4.0 Discussion

The process of atmospheric nitrogen fixation in groundnut consumes large amount of nutrients, especially phosphorous (Osodeke, 1996, Veerami *et al.,* 2012). The maintenance and sustenance of soil fertility for groundnut production therefore require the use of fertilizer and other soil amendment materials. In this experiment, it was observed that the soil of the study area was infertile; exchangeable cations were generally low (Table 3.1). The condition maybe attributable to leaching effects of the heavy rainfall prevalent in the area, it could as well be due to the acidic conditions of the soil of the experimental site. Acid soils promote the solubility and leaching of the basic cations (Ekwere *et al.,* 2022) leading to toxic and unproductive soils.

The taller plants produced in 2022 may be attributable to the slightly higher N and organic matter contents of the soil compared to the 2021 cropping season. Nitrogen is a constituent of protein and hence, the protoplasm of every living cell. It promotes cell division and enhances the accumulation of dry matter in leaves and other vegetative parts of the plant. Udounang *et al.* (2022) reported significant increase in the yield of cocoyam due to the application of nitrogen fertilizer.

Table 3.6. Effects of rabbit manure and groundnut varieties on yield and yield attributes of groundnut

	2021				2022			
Treatments / **Groundnut varieties**	Number of days to 50% flowering	Number of pods/plant	Number of seeds/pod	Pods yield (t/ha)	Number of days to 50% flowering	Number of pods/plant	Number of seeds/pod	Pods yield (t/ha)
Imata	46.39	36.96	2.53	1.93	46.35	50.71	1.90	1.89
G-153	47.01	48.62	3.12	1.97	50.04	53.42	2.13	2.01
Samnut	47.76	46.75	3.11	2.12	57.35	57.03	2.04	2.04
$LSD_{0.005}$	0.49	1.89	0.24	0.08	3.22	3.57	0.11	0.24
Rabbit manure								
Control	46.00	41.81	2.56	1.82	46.01	44.67	1.78	1.74
RM (1.5 t/ha)	46.76	43.07	2.51	1.87	46.45	50.82	1.84	1.73
RM(3.0 t/ha)	47.03	44.51	2.87	1.95	52.43	54.89	1.94	2.00
RM(4.0 t/ha)	47.56	44.80	3.22	2.04	47.04	57.33	2.18	1.98
RM(6.0 t/ha)	47.93	46.15	3.41	2.27	47.16	61.02	2.36	2.22
$LSD_{0.005}$	0.47	2.93	0.22	0.06	3.20	2.89	0.08	0.11

NB: RM-rabbit manure

Table 3.7. Interactive effects of rabbit manure and groundnut varieties on yield and yield attributes of groundnut

	2021				2022			
Treatments	Number of days to 50% flowering	Number of pods/plant	Number of seeds/pod	Grain yield (tonnes/ha)	Number of days to 50% flowering	Number of pods/plant	Number of seeds/pod	Grains yield (tonnes/ha)
Groundnut varieties/Rabbit Manure rates								
Imata + Control	45.13	34.35	2.25	1.88	45.91	36.25	1.73	1.76
Imata+RM (1.5 tonnes/ha)	46.27	35.08	2.12	1.85	46.07	47.68	1.80	1.79
Imata+RM (3.0 tonnes/ha)	46.40	37.18	2.17	2.02	46.28	54.67	1.92	1.88
Imata+RM (4.5 tonnes/ha)	47.05	38.27	2.85	2.07	46.54	55.33	1.98	1.91
Imata+RM (6.0 tonnes/ha)	47.13	39.21	2.94	2.18	46.91	57.61	2.11	1.95
G-153 + Control	46.56	46.67	2.61	1.69	45.63	49.67	1.75	2.15
G-153+RM (1.5 tonnes/ha)	46.99	45.33	2.78	1.72	46.67	50.10	1.85	1.81
G153+RM (3.0 tonnes/ha)	47.04	49.67	3.17	1.75	47.14	53.34	1.89	1.75
G-153+RM (4.5 tonnes/ha)	47.08	48.04	3.36	1.89	47.26	55.67	2.15	1.84
G-153+RM (6.0 tonnes/ha)	47.36	49.90	3.45	2.00	47.24	59.00	2.31	1.93
Samnut + Control	46.31	44.41	2.81	1.75	46.42	46.87	1.87	2.26
Samnut+RM (1.5tonnes/ha)	47.01	45.30	2.64	1.63	46.87	54.36	1.08	1.87
Samnut+RM (3.0 tonnes/ha)	47.65	46.17	2.96	2.25	47.34	57.00	2.37	1.96
Samnut+RM (4.5 tonnes/ha)	48.53	45.36	3.49	2.12	47.29	61.32	2.45	2.11
Samnut+RM (6.0 tonnes/ha)	49.25	48.05	3.67	2.29	47.31	66.33	2.47	2.40
$LSD_{0.05}$	0.43	2.08	0.20	1.27	3.21	2.83	0.005	0.05

NB: RM-Rabbit manure

Rabbit manure is rich in nitrogen and other major nutrients. Its application to groundnut in this experiment indicated significant positive effects on its growth and yield. The plants height, foliar yield as well as the yield of grains increased due to the application of rabbit manure. This result agrees with the findings of Thomas *et al.* (2023) and Akpaninyang *et al*, (2022) who observed increased tuber yield in sweet potato due to the application of nitrogen fertilizer.

5.0 Conclusion and recommendation

In this experiment, it was observed that the groundnut cultivars were different in their growth and yield performances. Cultivar Samnut performed better than G–153 and Imata in biomass and pods yield. Similarly, rabbit manure application rate of 6.0 tonnes/ha consistently presented superior performances in all the growth and yield parameters considered in the experiment. There were significant interaction effects ($p<0.05$) of groundnut varieties and rabbit manure application rates; Samnut and poultry manure application rate of 6.0 tonnes/ha consistently demonstrated superior performance on all the growth and yield parameters and were therefore recommended to farmers in the study area.

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