

EFFECT OF POULTRY MANURE ON PIGEON PEA YIELDS IN NORTH CENTRAL, NIGERIA: IMPLICATIONS FOR SUSTAINABLE ECONOMY IN NIGERIA.

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Abstract

The study was designed to find out the effect of poultry manure on pigeon pea yields in north central, Nigeria: and its implication for sustainable economy. Two specific purposes guided the study while two research questions were answered. A descriptive survey research design was adopted for the study. The population for the study was 140 farmers and 20 extension agents while purposive sampling techniques was used to select a sample of 90 farmers and 10 extension agents as respondents for the study. The instrument used was twenty items structured questionnaire used was validated by two expert from Agricultural education department in Kogi State College of Education Ankpa. The reliability of the instrument was established using Cronbach Alpha. The reliability procedure test yielded a coefficient of 0.82. Data was collected through direct contact with the respondents and analyzed using means and standard deviation to answer research questions. The findings revealed that farmers don't use poultry manure on pigeon pea in the study area. The challenges discovered were lack of awareness of using poultry manure to produce pigeon pea in large quantities. It was concluded that pigeon pea (cajanus cajan) is the sixth growing legume in the World and the use of poultry manure on the growing of pigeon pea will increase the yield and help in global sustainability. It was recommended that farmers in the study area should be enlightened on the use of poultry manure in production of pigeon peas. The federal, state and local governments should organize seminar, workshop and conference for the farmers on proper use of poultry manure on the growing of pigeon pea.

Keywords: poultry manure, pigeon peas and economy sustainability

Introduction

In pursuit of sustainable agricultural practices to support economic growth, the utilization of organic fertilizers such as poultry manure has come into view as a promising avenue, as Nigeria seeks to strengthen its agricultural sector to ensure food security and sustainable economic development, understanding the effectiveness of poultry manure in enhancing pigeon peas yields becomes important. This study aims to provide relevant knowledge to improve agricultural productivity while promote sustainability in economy.

Poultry manure is the feces of chicken used as an organic fertilizer, especially for soil low in nitrogen (Telkamp, 2015) of the animal manures. Poultry manure is rich in nutrients, and thus could be directly applied to soil as a soil improver or after being processed, for examples through composting

as a fertilizer or compost(Danuta et.al., 2020).The authors further stated that poultry manure can also contain various contaminants which are potential risks to soil and living organism. Poultry manure is sometimes pelletized for as a fertilizer and this product may have additional phosphorus, potassium or nitrogen (Barrett, 2008). Optimal storage conditions for poultry manure include keeping it in a covered area. Poultry manure itself is a valuable source of organic fertilizer for plant nutrients as it contains high contents of essential macro and micro-nutrients(Dikinya & Mufwanzala, 2010). Poultry manure is one of the main fertilizers used for soil fertility enrichment to get high yields of agricultural crops(Revindran et.al. 2017; Juma et.al., 2020). Poultry manure is the organic waste material from poultry consisting of a mixture of poultry excreta, spilled feed, bird's feathers and material

(wood shavings or sawdust) used as bedding in poultry operations (Ume, Onunka, Edeh, O.N. & Udefi, 2020). Poultry manure could also include the dead birds and hatchery waste, all of which are high in protein and contain substantial amount of calcium and phosphorus due to high level of mineral supplement in their diet. Poultry manure has been reported to contain more plant nutrients than all other organic manures (Ali, 2015). Poultry manure refers to the waste produced by poultry, including chickens, ducks, and turkeys. It is rich in nutrients like nitrogen, phosphorus, and potassium, making it a valuable organic fertilizer for agricultural purposes (Lorenz, 2015).

Poultry manure is an exceptional source of organic fertilizer which contains high percentage of nitrogen, phosphorus, potassium, and other important nutrients readily available for plant uptake (Muhammed et.al. 2010). The poultry manure improves the physical characteristics and condition of soil and improves the nutrient uptake of crop productivity (Ojeniyi et.al., 2013). Poultry manure constitutes an important land improvement technique capable of enhancing farm production. The addition of organic amendments such as poultry manure improves soil properties by improving organic matter contents of the soil, which has a stimulatory effect on the structure and aggregate stability, thereby improving the aeration, buffering of soil reaction, water holding capacity, cation exchange capacity and microbial activities (Adebayo et.al. 2019). Poultry manure should be use in growing of commercialised pigeon pea.

Pigeon pea is an important green manure- cover crop with multiple agronomic and impacts for small farmers and fits ideally in conservation agriculture system. Pigeon pea

(*Cajanus cajan*) is a perennial legume from the family fabaceae native to the old world (Kingwell & Fuller, 2014). The pigeon pea is widely cultivated in tropical and semi-tropical regions around the world, being commonly consumes in South Asia, South

east Asia, Africa, Latin America and the Caribbean. Pigeon pea plant is a perennial shrub in the family of fabaceae grown for edible pods and seeds (Sheahan, 2012). It has slender stems, trifoliate leaves, usually highly branched with a woody base. The plant leaflets are elliptical in shape and the leaves are alternate and arranged spirally on the stems (Ekwugha, 2018). The plant also produces yellow flowers, but they can be yellow with streaks of purple or red. The flowers are produced on racemes of 5-10 flowers. The seed pods are flat and either straight or sickle shaped and measure 5-9cm (2-3.5) in length. It may also be referred to as red gram or congo pea and originates from Indian (Sheahan, 2012; Ekwugha et.al, 2018).

Pigeon peas are rich in protein, dietary fiber, and various vitamins and minerals, making them a valuable addition to diets, especially in regions where access to animal protein is limited. Pigeon peas are nitrogen-fixing plants, which mean they improve soil fertility by capturing nitrogen from the air and converting it into a form that animal plant can use. This property makes them valuable in crop rotation systems, where they can enhance soil health for subsequent crops.

Pigeon pea providing much needed nitrogen, leguminous crops are high in protein making them value nutritionally; pigeon pea provides a range of bi-products including leaves and stems used for fuel wood (Simtowe et.al., 2010; Ekwugha et.al., 2018). Pigeon pea is a multipurpose legume in the family of fabaceae. It is the sixth most important legume crop in the world (FAO, 2015) because of its source as food, fuel wood, straw (Ossai et.al. 2022). The pigeon pea is an important pulse consumed by millions of people around the world due to its high nutritional values (Ojwang et.al. 2016). Pigeon pea is a versatile, stress –tolerant and nutritious grain legume, possessing traits of value for enhancing the sustainability of dry sub-tropical and tropical agricultural systems (Khouri et.al., 2015; Frank & Kayode; 2016).

Despite these important characteristics, the yields are still very low in

North central Nigeria (Emefiene et.al. 2014). Pigeon pea needs to be grown in large quantities to meet the Global economy sustainable.

Economic sustainability is a practice that supports long-term economic growth with negatively impacting social, environmental and cultural aspects of community. Economic sustainability entails evaluating the environmental impact of economic activity and devising sustainability goal to create a more livable future. Sustainability is the state of having well balanced, steady and effective use of human material and capital resources for total economic independence and development of the nation(Uwaneze & Okafor, 2013). Osagiede, 2014 cited in Ochu and Azuaga,(2019) stressed that sustainable economic development involves the use of natural products and energy in a way that does not harm the environment. Pigeon pea need to be grown in commercialized form in order to be on the same page with the sustainable development goals (SDGs). This is also known as Global Goals, which were adopted by the united nations in 2015 as a universal call to action to end poverty, protect the planet and ensure that by 2030 all enjoy peace and prosperity. The 17 SDGs are recognizing that action in one area will affect outcomes in others, and that development must balance social, economic and environmental sustainability. Countries have committed to prioritize progress for those who are furthest behind. The SDGs are designed to end poverty, hunger among others. Due to the effect of poultry manure most of the farmers do not use poultry manure on pigeon pea production.

Statement of the Problem

In the North Central region of Nigeria, agricultural productivity faces challenges due to factors such as soil degradation, limited access to quality fertilizers, and fluctuating economic conditions. Pigeon pea cultivation, vital crops in the region, is hindered by suboptimal yields, impacting food security and economic stability. Despite the potential benefits of poultry manure as an organic

fertilizer, its specific effects on pigeon pea yields remain unclear in this context. Therefore, this study aims to investigate the effect of poultry manure on pigeon pea yields in North central Nigeria and analyze its implications for development.

Significance of the Study

Understanding the effect of poultry manure on pigeon yields is important for enhancing agricultural productivity, particularly in the regions like North Central Nigeria where both poultry farming and pigeon pea cultivation are prevalent. This study's finding will be useful in agricultural practices, promoting sustainable farming methods that optimize crops yields while reducing dependency on synthetic fertilizer .Furthermore, the study will contribute to broader discussions on sustainable economic development by highlighting the potential of organic fertilizers to improve crop production, increase food security, and support local economics in resources-constrained regions

The study intends to find out the effect of poultry manure on pigeon pea yields on global economy sustainability. Specially, the study sought:

1. To determine the effect of poultry manure on the yield of pigeon pea.
2. Find out the challenge facing the use of poultry manure on the growing of pigeon pea.
3. To determine the solution to the problem of using poultry manure to grow pigeon pee.

Research Questions

1. What are the effect of poultry manure on the yield of pigeon pea?
2. What are the challenges facing the use of poultry manure on the growing of pigeon pea?
3. What are the solution to the problems of using poultry manure to grow pigeon pea?

Methodology

A descriptive survey research design was chosen for the study .The study was on

effect of poultry manure on pigeon pea yields for global economy sustainability Shona (2019) describe descriptive research design as accurately and systematically describe a population, situation or phenomenon. To determine the sample size, simple random sampling was used to get a manageable population of 100 which comprises the farmers and extension agents who served as the respondents. The instrument that was used for data collection for this study was structured questionnaire and an interview schedule. The instrument was based on 4-point rating scale which include each of the following items as strongly agree (SA), agree (A), disagree (D), and strongly disagree (SD).

The response categories were assigned numerical values as 4, 3, 2 and 1 respectively. The questionnaire was validated by three experts one from University of Nigeria Nsukka and two from Kogi State University, all from the department of Agricultural Education. The researcher administered and collects the instrument from the respondents. The data collected was analysed using mean and standard deviation. The decision rule for answering the research questions was based on the real limit of numbers.

Results

Research Question 1: What are the effects of poultry manure on the yield of pigeon pea?

Table 1: Mean ($\bar{x}$) Responses of the respondents on effect of poultry manure on the yield of pigeon pea

S/N ITEMS	Mean	SD	Remark
1 Preserving poor smallholders	3.57	0.42	Agree
2. Improving food and security	3.76	0.54	Agree
3. Particularly protein intake	3.66	0.55	Agree
4. Effectively improve yield	3.41	0.80	Agree
5. Improve soil fertility	3.44	0.77	Agree
6. Vegetative growth	3.34	0.83	Agree
7. Improve organic matter	3.42	0.72	Agree
8. Retain substantial amount of matter	3.29	0.74	Agree
9. Increase farmers' income	3.50	0.57	Agree
10. Improve the economy of the nation	3.06	0.97	Agree

Field survey: 2023, X=Mean, SD=standard deviation, SA=Strongly Agreed, SD=strongly disagree

Table 2 above revealed that the items 1 to 10 had mean values ranged 3.29 to 3.76 within the real limit of 3.50 -4.00 indicating that the items were in the category of strongly agree. The standard deviation of all the 10 items ranged from 0.42 to 0.97. Each of the values was below 1.96 indicating that the

respondents were near to the mean and to each other in their responses.

Research Question 2: What are the constraints of using poultry manure for the growth of pigeon pea?

Table 2: Mean rating of respondents on the constraint of using poultry manure for the growth of pigeon pea.

S/N	ITEMS	MEAN	SD	REMARK
1.	High cost of material inputs	3.60	0.45	Agree
2.	High cost of labour	3.55	0.27	Agree
3.	Low crop yield ability	3.13	0.83	Agree
4.	High cost of transportation	3.86	0.59	Agree
5.	Theft	3.93	0.64	Agree
6.	Poor access to credit	3.50	0.68	Agree
7.	Insufficient quality (Scarcity)	3.89	0.59	Agree
8.	Wetness	3.30	0.91	Agree
9.	Bulkiness	3.07	1.44	Agree
10.	Not readily accessible	3.66	0.55	Agree

Source: Field survey, 2023: X=Mean, SD=standard deviation, SA=Strongly Agreed, SD=strongly disagree

Table 2 above showed the result of the analysis to answer research question 2. This again revealed that questionnaire items 1 to 10 were all in support of research question two. In addition, the grand mean of the analysis equally revealed that the mean value of (3.53) with standard deviation of (0.47), which is also greater than the bench mark of

(2.50). This shows that there are constraints in using of poultry manure for growing of pigeon pea.

Research Question 3: What are the possible solutions to the factors militating against the use of poultry manure on pigeon pea yields?

Table 1: Mean ($\bar{x}$) Responses of the respondents on possible solutions to the factors against the use of poultry manure on pigeon pea yield.

S/N	ITEMS	MEAN	SD	REMARK
1.	Poultry manure should be dry	3.72	0.86	Agree
2.	Government should give loan to pigeon Pea farmers	3.55	1.01	Agree
3.	The incentive approach	3.62	1.01	Agree
4.	The institutional approach	3.80	0.40	Agree
5.	Development of infrastructure	3.76	0.43	Agree
6.	establishing efficient and effective Seed multiplication system, crops and inputs	3.91	0.80	Agree
7.	Involving the farmers more effectively in In farming system research and programme Formulation, implementation and appraisal	3.44	0.77	Agree
8.	Forming cooperative societies	3.40	0.77	Agree

Source: Field survey, 2023: X=Mean, SD=standard deviation, SA=Strongly Agreed, SD=strongly disagree

The table 3 above revealed that all the 8 items on the possible solution to the factors militating against the use of poultry manure on the growth of pigeon pea had their mean values range from 3.40 to 3.80. This showed

that the mean of each eight items was above the cut-off point of 2.50, indicating that the respondents agree that all the eight items are possible solutions to the factors militating against the uses of poultry manure on pigeon

pea. The table further showed that the standard deviation (SD) of the items within the range of 0.40 to 1.02 in eight items, indicating that the opinions of the respondents were not far from each in their responses to the eleven items.

Discussion of the findings

From the findings of this study, it was found that the effect of poultry manure on pigeon pea are preserving poor smallholders, improving food and security, particularly protein intake, yield effectively improve, improve organic matter, retain substantial amount of matter, increase farmers income and improve the economy of the nation. The finding is not in line with the finding of Nagar, Goud, Rajesh and Anil (2020) which finds out that protein content has not significantly influenced by different intercropping system. This study is line with the study of Wang et al., (2021) emphasized the need for proper management need for proper management practices to minimize the benefits of poultry manure in pigeon pea cultivation.

The study also revealed that some of the challenges facing the use of poultry manure on growing of pigeon pea as; high cost of material inputs, high cost of labour, low crop yield ability, high cost of transportation, theft, poor access to credit, insufficient quality, wetness, bulkiness and not readily accessible. This study is in line with the study of Onunka, Edeh and Udefi (2020) on effect of use of poultry manure by Nsukka yellow in Enugu North Agricultural zone of Enugu State. This study is in line with the study of Lee and Kim (2020) on weed seed and pathogen reduction in poultry manure composting. Furthermore, the study is in line with the of Smith et al., (2018) excessive nitrogen can lead to vegetable growth at the expense of reproductive development in pigeon peas affecting yield. Kumar et al., (2019) revealed that soil salinity increased with high application rates of poultry manure negatively impacting pigeon pea growth.

The study also revealed the possible solutions on factors that militate against the

use of poultry manure on pigeon pea. The possible solutions identify include: poultry manure should be dry, government should give loan to pigeon pea farmers, the incentive approach, the institutional approach, development of infrastructure, establishing and effective seed multiplication system, crops and inputs, involving the farmers more effectively in farming system research and programme formulation, implementation and appraisal and forming cooperative societies. The findings is not in line with the study of Ekwugha (2018) germination potential and seedling establishment of pigeon pea (*Cajanus cajan*) as influenced by different pre-treatment techniques. This study is not in line with the study of Ogunjinmi, Adejumo, Adadiran, Togu & Olunloyo (2020) on varietal responses of pigeon pea (*Cajanus cajan* (L) Millsp.) To application of compost. Also the study is not in line with the study of Ojiako, Zakka, Kayode, and Offor (2016) on influence of poultry manure Application on insect pests of two varieties of pigeon pea (*Cajanus cajan* L.millsp) in a humid tropical environmental.

Conclusion

Pigeon pea (*Cajanus cajan*) is the sixth growing legume in the world. The use of poultry manure on the growing of pigeon pea will increase the yield and this will help in global economy sustainability. Using poultry manure on pigeon peas helps small farmers by increasing yields, improving food security, and boosting their income. This practice benefits both farmers and the nation's economy. The study identified several challenges associated with using poultry manure for growing pigeon peas, including high material and labor costs, low crop yield, expensive transportation, theft, poor access, inadequate quality, wetness, bulkiness, and limited availability.

The study identified solutions to challenges hindering the use of poultry manure on pigeon peas. Solutions include ensuring dry manure, providing government loans, using incentives, improving infrastructure, establishing seed systems,

involving farmers in research, and forming cooperatives societies. These measures can help overcome barriers and optimize poultry manure use in pigeon pea cultivation.

Recommendation

Based on the findings of the study, the following recommendations were made.

1. The federal, state and local government should organize seminar, workshop and conference for the farmers on proper use of poultry manure on the growing of pigeon pea.
2. The three arms of government should made all necessary efforts to curb most challenges facing the use of poultry manure on the growing of pigeon pea,
3. The lecturers and teachers should put in more effort in teaching of the use of organic manure which poultry manure is part of it.

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