



Economics of Poultry Manure Use as Fertilizer in Imo State

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KEYWORDS

Evaluation,
Imo state
Manure generation,
Poultry manure,
Sustainable development,

ABSTRACT

The study was carried out in three agricultural zones notably Owerri, Okigwe and Orlu to evaluate the economics of poultry manure use as fertilizer in Imo State, Nigeria. A total of 240 respondents were randomly selected and interviewed from twelve local government areas drawn from the three zones. Data collected were on socio-economic characteristics, stock size and manure generation, poultry manure and environmental pollution and economic consideration of recycling poultry droppings. Structured questionnaires were used for data collection. Analytical tools used were descriptive statistics such as mean, frequency distribution and percentages. The result of the survey revealed that the dominant players in the poultry industry are those between the ages of 41-50 years implying that in future, there will be decline in productivity since youths are not actively participating in the business. The survey observed that 78.33% of poultry farmers in the state stores poultry manure within the farm premises which directly contributes to environmental pollution. Result also shows that 70.83% of poultry farmers recycle poultry manure into vegetable production while those with larger output sell the excess to crop farmers. The economic benefit of recycling poultry manure by farmers for economic prosperity is high (90.83%) and this is traced from its role in conservation agriculture and soil enrichment. The study therefore recommends the use of poultry manure by all farmers as Nigeria can conserve its foreign exchange by reducing its fertilizer importation up to 50%.

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INTRODUCTION

Agriculture is the world's oldest and largest primary industry and its role in the economic life of virtually all nations regardless of their state of development cannot be underscored (Brueno, 2020). One of the most important aspect of African or Tropical Agriculture is farm animal production which according to International Institute of Rural Reconstruction (IIRR) and African Conservation Tillage (ACT) provides power, manure, hides, milk and meat to improve the standard of living of the human populace (IIRR and ACT, 2005).

Livestock with particular reference to poultry production generates waste products which directly or indirectly not utilized constitutes environmental pollution. In the poultry industry, two main types of waste are produced depending on the rearing system adopted in the farm. They are waste from the deep litter

systems and cage layer waste (Shibi Thomas *et al.*, 2020). In developing countries like Nigeria, the technology for converting poultry waste into biogas or biofuel is yet to be developed hence the recycling as manure and landfill disposal.

Poultry manure (excreta) which is obtained from poultry or bird droppings is one of the best organic manures. Poultry manure is composed of poultry beads, feathers, water droplets, poultry feed and straws of rice husks which can be utilized to generate renewable energy (Agblevor *et al.*, 2010). Yousaf *et al.* (2022) reported that animal manure has considerable potential as soil conditioners and fertilizers for the home gardeners, florists, crop farmers and nursery operators. Animal waste is therefore a valuable resource because it is high in salts, micro and macro elements. It contains thirteen (13) essential plant nutrients that are used by plants which include nitrogen, phosphorous, potassium, calcium, Magnesium, Sulphur, manganese, copper, zinc, chlorine, boron, iron and molybdenum (Shibi Thomas *et al.*, 2020). Suffice it to say that using poultry manure as fertilizer provides both macro and micro nutrients to crops and plants for their growth and productivity.

European countries had achieved a milestone of 20% renewable energy in which biomass energy had major portion (Eurostat, 2019; World Bank, 2021), and these countries have set a target to achieve 30% of total electricity from renewable energy resources by 2030 (Agency, 2018). Sub-Saharan Africa and Nigeria in particular, the African giant is yet to acquire this modern technology of thermal conversion method (Pyrolysis) hence the resort to the application on agricultural land as fertilizer and landfills.

Sustainable agriculture ensures resource efficiency by integrating biochemical, economic and physical sciences to develop new practices that are safe, cost effective and environmentally friendly. However, such a system must support an ecosystem that accommodates and provides for the development of all classes of plants and animals (Si Ho Han *et al.*, 2016).

Poultry manure fertilizer as a soil amendment to sustain crop yields in developing countries and the world all over has been found effective for major crops and also increases the soil's water infiltration rates directly proving the structure (Adeleye *et al.*, 2010; Aniefo *et al.*, 2013; Ishieze *et al.*, 2019.)

A chicken will produce approximately 0.23 kilogramme of fresh manure from a kilogramme of feed consumed with a moisture content of about 75 percent (University of Georgia Extension News, 2022). The manure produced by poultry usually loses water due to evaporation, resulting to a final product of 20-40% moisture content depending on bedding type and quantity, birds' concentration, watering equipment and ventilation system.

Hamma *et al.* (2017) observed that 12t/ha poultry manure produced higher mean values of vine length, number of leaves, leaf area, fruit weight, girth and commutative yield of cucumber (*Cucumis sativum*) while Eze and Baiyeri, (2019) reported higher fruit yield/ha at the rate of 10t/ha but however, recorded decreased yield at a rate above 10t/ha. Ayeni *et al.* (2008) reported 30 and 43 percent increase on immediate basis, 73 and 93 percent on residual basis for poultry manure at 5t and 10t/ha on the production of crops. The impact of poultry manure on crop productivity was also measured by Ikeh *et al.* (2012) who observed significant impact on the application of 10t/ha compared than 0 and 4t/ha on plant height, number of leaves, branches and number of fruits.

Atusa (2018) recommended that 20t/ha should be adopted for the cultivation of *Occimum gratissium*. Furthermore, reiterated that plants that received different levels of 15t/ha, 20t/ha, 25t/ha and 30t/ha were not significantly different in the number of leaves, branches, total leaf area, weights of harvested leaves and inflorescences. Irene *et al.* (2015) opined that 6t/ha poultry manure best supports the performance of fluted pumpkin in the degraded ultisol.

In an experiment carried out by Si Ho Han *et al.* (2016) on the effect of organic manure and chemical fertilizer on the growth and nutrient concentrations of yellow poplar (*Liriodendron tulipifera* lin.) in a nursery system in the Forest Practice Research Centre of Korea Forest Research Institute, it was discovered that organic manure significantly increased the soil pH and the concentration of nitrogen, available phosphorus, exchangeable potassium, calcium and magnesium.

In Imo State, it appears that poultry manure is not used to its maximum potential because of dearth of information on its economic value as a source of plant nutrients, failure to recognize how and where to use it and the inability of crop and poultry farmers early adoption of this innovation as a strategy for environmental sustainability and hence the relevance of this study.

Table 1: Global Positioning System (GPS) of sampled zones in Imo State

S/N	Zone	LGAs Selected	GPS Coordinates	Total Number of Respondents
1	Owerri	4	5 ⁰ 29 ¹ 20.6124 ⁰ N and 7 ⁰ 1 ¹ 3.3168 ¹¹ E	80
2	Orlu	4	5 ⁰ 47 ¹ 44.34 ¹¹ N and 7 ⁰ 02 ¹ 6.47 ¹¹ E	80
3	Okigwe	4	5 ⁰ 47 ¹ 45.01 ¹¹ N and 7 ⁰ 21 ¹ 2.02 E	80

Source: Imo State GPS Coordinate, www.countrycoordinate.com

Method of Data Collection

The researchers collected both primary and secondary data for this study. Primary data came through the use of structured questionnaires and personal observation by the researcher. In collecting such data, the researcher asked the larger and smaller farm holders relevant questions pertaining to poultry production and recycling of poultry dropping (manure). The secondary data for this survey were gathered from existing findings in form of books, Journals, Newspapers, Magazines, Bulletins, Project work etc. through literature review.

Data Analysis Techniques

The data collected were analyzed using descriptive statistics which include measure of central tendencies such as mean, frequencies and percentages.

RESULTS AND DISCUSSION

Socio-economic characteristics of poultry farmers in the study area

Age is one of the socio economic characteristics influencing output and labour availability in the poultry industry. Respondents whose ages ranged between 41 to 50 years dominated the farming population (33.33%)(table 1). This was followed by age range of 31-40 years (29.17%). According to Nigerians National bureau of statistics, (2020) about 65% of the population was aged between 16-40 in 2015 and of these 37% (about 42 million people) were engaged in agriculture (Alawode, 2016). However, the dominant players in the poultry industry are those between the age of 41-50 years implying that in the years to come there will be a decline in productivity since ageing is a complex multifactorial process characterized by progressive changes in body tissue, which eventually lead to decline in function and death of individual (Jayanthi *et al.*, 2010).

40% of poultry farmers have secondary education followed by tertiary education which recorded 29.17%. Poultry farming on global outlook is going scientific and technical training is required for entrepreneurial skills and competence. Greater proportions of the farmers are males (58.33%). Poultry production is a seven day a week job and intensive labour is needed for maximum efficiency and profitability which of course may not be achieved by the female counterparts. 70% of poultry farmers population in the area are married and the implication is that high level of responsibility would be ensured and married couples are better considered in loan/credit grants from financial institution than youths and moreover, their children also contributes in daily routine operations which hitherto enhances productivity (Mgbakor and Nzeadachie, 2013). 33.33% of poultry farmers in the area have 6-9 years cognate experience while those of 20 years and above farming experience is only 5%. The data on farming experience shows that the awareness on poultry production just came a decade ago.

59.17% of poultry farmers reared their stocks intensively while 33.33% are on semi-intensive system. Intensive system generates birds with faster growth rate and gives room for record keeping which is an efficiency assessment factor.

Table 2: Socio-Economic characteristics of respondents in the study area

i. Age range	Frequency	Percentage
21-30	40	16.67
31-40	70	29.17
41-50	80	33.33
>50	50	20.83
Total	240	100.00
ii. Sex	-	-
Male	140	58.33
Female	100	41.67
Total	240	100.00
iii. Marital status	-	-
Married	168	70.00
Single	72	30.00
Total	240	100.00
iv. Educational Level	-	-
No. Formal Education	30	12.50
Primary Education	44	18.33
Secondary Education	96	40.00
Tertiary Education	70	29.17
Total	240	100.00
v. Years of farming Experience	-	-
<5	68	28.33
6-9	80	33.33
10-15	60	25.00
16-19	20	8.34
20 and above	12	5.00
Total	240	100.00
vi. System of poultry management	-	-
Intensive	142	59.17
Semi-intensive	80	33.33
Extensive	18	7.50
Total	240	100.00
vii. Types of feed used in feeding Stock (Poultry)	Frequency	Percentage
Commercial formulated feed	154	64.17
Locally formulated feed	86	35.83
Total	240	100.00

Source: Field Survey, 2022

Stock size and manure generation.

Majority of poultry farmers (52.50%) reared less than 100-110 birds in the area implying that they are mainly small holder poultry dimension while 40% kept stocks ranging from 110-1000 birds. 7.5% of poultry farmers are under the category of medium scale keeping 1100-10,000 birds. Stocking rate in the poultry industry determine the quantity of waste that are generated from poultry units (Barura and Omodara, 2018). Moreover, the quantity of waste generated varies depending on the rate of consumption of feed and water intake. Statistics revealed that poultry farmers housing 110, 1000 and 10,000 birds generates 5,913.6, 53,760 and 537,600 kg of droppings (approximately 30-40% moisture content) on yearly basis respectively (Mariusz *et al.*, 2019; University of Georgia Extension News, 2022) and this aligns with the findings of Baruwa and Omodara (2018) that effective waste management method is a panacea for a long-term productivity, growth and environmental sustainability of poultry enterprises. 70.83% of poultry farmers in the area recycle their manure into vegetable production while those with larger output sell the excess to crop farmers.

Table 3: Stock size and manure generation

Characteristics	Frequency	Percentage
i. How many birds do you keep	-	-
100-110	126	52.50
111-1000	96	40.00
1100-10,000	18	7.50
Total	240	100.00
ii. Do you recycle your poultry manure	-	-
Yes	170	70.83
No	70	29.17
Total	240	100.00
iii. Do you consider the use of Poultry Manure in Crop production laudable?		
Yes	186	77.50
No	54	22.50
Total	240	100.00

Source: Field Survey, 2022

Poultry manure as pollutant

72.50% of poultry farmers are of the view that poultry manure is a very serious threat to HUMAN health and THE environment while 27.50% of respondents maintained that the use of poultry manure should be intensified considering the fact that it doesn't constitute environmental menace (Table 3). 78.33% of respondents stores poultry manure within the farm premises despite their contention that the product is an environmental menace while 21.67% dispelled the notion that it doesn't constitute health nuisance but rather binds soil particles together, provides home for earthworms and other beneficial organisms and improves the soil. 81.67% of respondents agreed that channeling this by product in crop production will help in reducing environmental pollution emanating from the odour threshold and directly improves irrigation efficiency, soil retention and uptake of plant nutrients (Shibi Thomas *et al.*, 2020).

Economic consideration of recycling poultry manure.

Table 4 indicated that 90.83% of poultry farmers in the state are of the opinion that poultry manure is the best manure in conservation agriculture, because it improves soil fertility and leads to higher yields of crops in terms of increased productivity, and soil health improvement

On the rate of manure utilization, 59.16% of respondents applied poultry manure at the level of 10-20t/ha while 29.17% applied 40t/ha. 8.34% of respondents apply at the rate of 45-50t/ha while 3.33% of respondents are ignorant of any specific application rate but rather contented that the utilization depends on output or stocking capacity.

91.66% of poultry farmers in the state reported that poultry manure can be used to cushion the effect of high cost of poultry feed. For instance, at an estimated rate of N400.00 per bag of poultry manure (mixed with wood shavings and other organic materials), a poultry farm that uses 225 bags of feed, would generate about 75 bags of poultry waste which attracts N30,000 on monetary terms and when added to farm income raises the profit margin for broiler enterprise to about 16.80% (Bamire, and Amuyoyegbe, 2013).

Table 4: Poultry manure as a pollutant

Characteristics	Frequency	Percentage
i. Does air emission from poultry manure constitute a threat to human health or environment?	-	-
Yes	174	72.50
No	66	27.50
Total	240	100.00
ii. Do you store your poultry manure within the farm premises?	-	-
Yes	188	78.33
No	52	21.67
Total	240	100.00
iii. Do you consider poultry manure as environmental menace?	-	-
Yes	172	71.66
No	68	28.34
Total	240	100.00
iv. Does Poultry manure constitute handling problems due to the formation of crust and sediments during storage?	-	-
Yes	93	77.50
No	27	22.50
Total	120	100.00
v. Does the use of poultry manure in crop production offers solution to environmental pollution in the state?	Frequency	Percentage
Yes	196	81.67
No	44	18.33
Total	240	100.00

Source: Field Survey, 2022

Table 5: Economic consideration of recycling poultry droppings characteristics

Characteristics	Frequency	Percentage
i) Does the use of poultry manure conform to the principles of conservation Agriculture?	-	-
Yes	218	90.83
No	22	9.17
Total	240	100.00
ii. What is the rate of Poultry manure utilization in your farm?	Frequency	Percentage
(a) 10-20t/ha	142	59.16
(b) 21-40t/ha	70	29.17
(c) 45-50t/ha	20	8.34
(d) No specific level	08	3.33
Total	240	100.00
iii. Does the use of poultry manure in organic agriculture save cost?	Frequency	Percentage
Yes	220	91.66
No	20	8.34
Total	240	100.00
iv) Do you think that the use of poultry manure has positive effect on the farmer's net revenue?	Frequency	Percentage
Yes	210	87.50
No	30	12.50
Total	240	100.00

Source: Field Survey, 2022

CONCLUSION AND RECOMMENDATION

The study investigated the economics of poultry manure use as fertilizer in Imo State. Poultry farmers in the study area uses poultry manure in the fertilization of their crops because of its availability, least cost involvement and leaching repellent properties on erosion prone soils. Based on the findings of this study, the following recommendations are made;

- i. Government should assist poultry farmers by giving them loans/subsidies so as to enhance their productive capacity and by extension establish crop farms as 50-65% of grains utilized in livestock feed manufacture are obtained from crop farms.
- ii. Government should intensify the use of poultry droppings by embarking on public enlightenment campaigns in the rural areas to change the philosophy and mindset of rural conservative farmers on the adoption of new technology aimed at boosting food security.
- iii. Apart from recycling poultry waste as fertilizer in the crop farm, waste can also be channeled into biogas production for energy generation.
- iv. Synergy between animal agriculture and organic farming in Nigeria will open a window of opportunity for the utilization of these benefits.

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