Nig. J. Anim. Prod. 2003, 30(1):93-100
Nigerian Society for Animal Production

Economics of poultry manure utilization in land quality improvement among integrated poultry-maize-farmers in South-western Nigeria

A.S. Bamire[1*] and B.J. Amujoyegbe[2]

[1]*Deparment of Agricultural Economics, Obafemi Awolowo University, Ile-Ife, Osun State,Nigeria*
[2]*Deparment of Plant Science, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria.*

Abstract

The rapid growth of Nigerian's poultry has made it more advantageous in terms of providing the essential raw material for soil fertility enhancement than other livestock. This paper evaluates the benefits of poultry manure use among integrated poultry-maize farmers in Ekiti and Osun States of Nigeria for improved land quality and continuous food production. Data were collected using structured survey questionnaires administered on 500 randomly selected respondents in the two States. Data were analysed with descriptive statistics and costs and returns techniques. Respondents were small holders, with land area grown to mazie varying between 0.01 and 3.00 hectare. Majority of the respondents have personal farms but applied poultry manure only on small portions (25%) of the total cropped area of their farmlands. On the average, 53% of the respondents used poultry manure on their farms. Respondents were fairly literate with a mean age of 43 years. Major constraints to poultry manure use include odour, transportation, scarcity, wetness, bulkiness and time wastage in descending order of importance. While odour and transportation were identified as common problems among poultry manure users in Ekiti and Osun States, bulkiness was an additional constraint for non-user respondents in both states. Poultry manure material constituted about 91% of the total cost of inputs; transportation cost was 8% while labour cost averaged 2%. The mean net income earned per annum by poultry manure users was 1.40 times higher than that for non-users. The difference in mean net income users and non-users of poultry manure constitutes an important land improvement technique capable of enhancing farm production and income levels. Thus, technologies aimed at packaging it in such a way as to remove the associated social constraints to its use by farmers need be put in place.

Keywords: - Economics, poultry manure, farmers, land improvement, Nigeria.

Introduction

Nutrient depletion through harvested crop components and crop residues removal, and by leaching and soil erosions worsens the usually low fertility levels of many soils in the tropics. Improvement of the land resource base is therefore necessary to meet the food supply needs of the growing population.

One of the techniques employed by farm operators to maintain or improve the land resource base is through the use of poultry manure in crop production. This is more so since the use of inorganic fertilizers alone leads only to the supply of major nutrients such as NPK, does not control erosion, leads to easy leaching of soil nutrients, and destroys the soil structure (Crosson, 1995; Joshi and Ghimire, 1996).

*Corresponding author

Blake (1994), for instance, claimed that soluble fertilizer had prolong and depressing effect on soil activity and tends to flood the soil with major nutrients at the expense of minor ones which produce an unbalanced nutrient supply for the crop. Additionally, half of the inorganic fertilizers applied may leach away to pollute waterways both above and below the ground (Ghimire, 1996). According to Karl *et al.*,(1994), the production of inorganic fertilizer requires considerable energy, although over the years, the high price and scarcity associated with it have been of tremendous concern to farmers and farm operators. Moreover, relying solely on inorganic fertilizers as a source of plant nutrients may not be sufficient since inorganic fertilizer alone cannot sustain long term productivity on many soils. Organic material inputs are thus required to maintain soil organic matter levels and to improve crop productivity. Adepetu (1997) and Greenland *et al.*, (1998) maintained that the only alternative to inorganic fertilizer use is organic manure, of which poultry manure is the most preferred.

Importance of poultry manure to agricultural production

Livestock production remain a vital component of the farming systems in many developing countries (Dressler, 1983). This is especially so in the traditional farming systems where a small amount of land must support a high population. Thus, a common observation among farmers is that soil fertility is improved when organic matter is returned to the soil. There are various sources of organic manure, which has been described as an important source of alternative energy i.e. "biogas" (Mijindadi and Erhabor, 1998). The common sources include crop residues, green manure, urban waste (i.e gargbage, night soil, sludge), and animal waste such as livestock dung and urine, and poultrty manure that occur commonly on farms and in the homestead. Among these sources of organic manure, poultry manure has been described as one of the richest and most concentrated in nutrients on the farm (Ahn, 1979; Jaiswal *et al.*, 1971; McCalla, 1975; Karl *et al.*, 1994). The proportion of soluble nitrogen is relatively high in poultry manure as compared to other livestock wastes and the nutrients are also more readily available. Recycling of biological wastes and by-products can improve soil quality and hence farm income. Greenland *et al.*, (1998) claimed that soil organic matter and organic manure both play a key role in sustaining the desirable soil physical conditions for crop growth. Adeoye, (1985) reported that application of 15 tonnes/ha of farmyard manure to a loose soil in Northern Nigeria significantly improved the aggregate soil stability as well as reduced soil compaction and crust strength. Investigation under continuous cropping in Ghana (Djokoto and Stephens, 1961) showed that 5 – 10 tonnes/ha of manure would supply about 25kg/ha each of N and P_2O_5 and 35kg/ha of K_2O. the amount of animal manure produced worldwide is enormous. In India alone, where one-fifth of the world's cattle are raised, it is estimated that 1,762 million tonnes of manure are produced yearly (Bala-subramanian, 1980). For Nigeria, the rapid growth of poultry production has made poultry manure more available for organic farming than manure from other livestock. This may be due to the relative opportunities that poultry offer over other classes of livestock. This is in terms of the high turnover rate of its products such as eggs and chickens, and the increasing use of poultry wastes in soil fertility enhancement. Fabiyi and Ogunfowora (1992) observed that poultry dropping is of economic importance in Nigeria because of the increase in poultry farming and poor performance of cattle. Nevertheless, Studies have paid little attention to the benefits derivable from poultry manure use for land quality improvement in the South western Nigeria. This paper therefore evaluates the benefits of poultry manure use as an avenue for improving food production among smallholder farmers in South-western Nigeria. Specifically, the paper examines the socio-economic characteristics of farm operators in the study area, determine the cost and returns to poultry manure use, and identifies the constraints to poultry manure use for land improvement in the

survey location. The result of this study will be applicable to areas with similar basic farm characteristics.

Materials and Methods

The study was conducted in Osun and Ekiti States in the South-western Nigeria. The vegetation distribution in the two states supports the growth of major crops like cassava, maize, yam, kola etc, and majority of the population predominantly practice agriculture.

Data were collected with the aid of structured survey questionnaire administered on 500 respondents in the study area between August and November 1999. information sought included respondents' socio-economic characteristics, costs and returns to poultry manure use in organic farming. Secondary data were obtained from States' Ministry of Agriculture, and the Agricultural Development Projects. Multi-stage sampling technique was employed to select the respondents in the study area. In each state, 5 Local Government Areas (LGAs) were purposively chosen based on information about poultry manure users in the area, while 5 villages were randomly selected in each LGA. Simple random sampling was then used. to select 10 respondents in each village in proportion to the number of poultry manure using maize crop farmers. A total of 250 respondents were selected in each state. Data were analysed using descriptive statistics and costs and returns analysis.

Results and Discussion

Respondents in the study area were integrated poultry-maize farm operators who applied poultry manure on a small proportion of their total cropped area (23% and 27% respectively) for Ekiti and Osun States), (Table 1).

Table 1 *Selected socio-economic characteristics of respondents in the study area.*

Characteristics	Ekiti State				Osun State			
	User of poultry manure		Non-users of poultry manure		User of poultry manure		Non-users of poultry manure	
	Percentage (%)	Mean	Percentage (%)	Mean	Percentage (%)	Mean	Percentage (%)	Mean
Age (years)		47.00		42.00		43.00		40.00
Literacy level (years)		5.00		7.50		7.00		10.00
Household size (No of Persons)		6.00		4.00		8.00		5.00
Primary occupation (% farming)	78.00		65.00		72.00		60.00	
Farm size (ha)		0.59		0.47		0.65		0.55
Crop area on which poultry manure is applied (%)	23.00				27.00			
Distance of farm from poultry manure source (km)		0.66				0.54		
Use of poultry manure (%)	45.00				61.00			
Use of other organic manures(%)	13.00		40.00		9.00		52.00	
Sources of poultry manure:								
Manure pit/Heap (%)	3.5				2.9			
Personal poultry farm (%)	62.2			49.4				
Other poultry farms (%)	34.23				47.7			

Source: Data analysis 1999.

This may be adduced to the insufficient quantity available from personal farms and the long distance to/fro other poultry farms. In effect, this may account for the inability of 47% of the respondents to use poultry manure. However, an average of 11% (13% in Ekiti state and 9% in Osun state) of this figure used types of organic manure on their farms (Table 1)., while 46% of the respondents who do not use poultry manure indicated using other types of organic manure. These include sheep and goat dropping, human waste and cow dungs. On the average, 53% of the respondents used poultry manure on their farm during the survey period with a larger proportion recorded for Osun state. Majority of the respondents are fairly literate and within age range capable of engaging in active farm work. The mean age of respondents in the study area was 43 years.

Table 2 *Respondents' farm size (Hectares) according to use and non-use of poultry manure*

Farm Size (ha)	Ekiti State				Osun State			
	Users		Non-Users		Users		Non-Users	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
0.01 – 0.50	31	27.0	26	19.0	29	26.0	23	16.0
0.51 – 1.00	53	47.0	29	21.0	46	41.0	28	20.0
1.01 – 1.50	18	16.0	22	16.0	19	17.0	37	27.0
1.51 – 2.00	09	8.0	37	27.0	11	10.0	32	23.0
> 2.00	02	2.0	23	17.0	06	6.0	19	14.0
Total	113	100.0	137	100.0	111	100.0	139	100.0

Source: Data analysis, 1999.

The land area grown to maize crop varied between 0.01 and 3.00 hectares in the study area (Table 2). Farm sizes among respondents in the two states followed a similar pattern of distribution with the majority of respondents having farm sizes of between 0.51 and 1.50 ha. This shows the small-scale nature of respondents' production activities. The number of poultry manure-using respondents in Ekiti state contributing a larger proportion (61%), (Table 3). Non –users of poultry manure also kept some birds.

Table 3 *Distribution of respondents' by number of birds kept*

Number of Birds	Ekiti State				Osun State			
	Users		Non-Users		Users		Non-Users	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
<50	03	3.0	72	53.0	12	11.0	57	41.0
51 – 100	15	13.0	45	33.0	16	14.0	23	17.0
101– 150	19	17.0	13	9.0	19	17.0	34	24.0
151 – 200	44	39.0	05	4.0	21	19.0	13	9.0
201 – 250	26	23.0	02	1.0	29	26.0	07	5.0
> 250	06	5.0	-	-	14	13.0	05	4.0
Total	113	100.0	137	100.0	111	100.0	139	100.0

Source: Data analysis, 1999.

Major constraints to poultry manure use were directly linked to the material in terms of its social problems. These include: odour, transportation in terms of long distance movement from source points, scarcity, wetness, bulkiness and time requirement for search/application of the manure in descending order of importance. Odour, transportaion and bulkiness of poultry manure however constituted the major constraints to their use in the study area (Table 4). While odour and transportation were identified as major constraining factors among poultry manure users in the two states, the bulkiness of poultry manure was an additional constraint among non-users in both states. Most of the respondents claimed that if the poultry manure could be made lighter and easier to transport, more farmers will be encouraged to use it.

Table 4 *Constaints to poultry manure use according to State*

Constaints	Ekiti State				Osun State			
	Users		Non-Users		Users		Non-Users	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Odour	18	15.9	10	7.3	15	13.5	19	13.7
Wetness	12	10.6	05	3.6	07	6.3	07	5.0
Transportation	15	13.2	19	13.9	16	14.4	13	9.4
Scarcity	13	11.5	07	5.1	11	9.9	04	2.9
Time consuming	10	8.8	04	2.9	09	8.1	02	1.4
Bulkiness	08	7.0	29	21.2	12	10.8	21	15.1
Odour/Wetness	06	5.3	04	2.9	03	2.7	06	4.3
Odour/ Transportation	02	1.8	09	6.6	02	1.8	04	2.9
Odour/Scarcity	03	2.7	02	1.5	01	0.9	04	2.9
Odour/Time Consuming	06	5.3	-	-	02	1.8	03	2.2
Odour/Bulkiness	04	3.5	03	2.2	04	3.6	07	5.0
Wetness/ Transportation	01	0.9	01	0.7	02	1.8	03	2.2
Wetness/Scarcity	01	0.9	-	-	01	0.9	02	1.4
Wetness/Time Consuming	-	-	01	0.7	01	0.9	03	2.2
Wetness/Bulkiness	03	2.7	07	5.1	05	4.5	05	3.6
Transportaion/ Scarcity	02	1.8	-	-	01	0.9	02	1.4
Transporation/ Time consuming	03	2.7	02	1.5	03	2.7	05	3.6
Transporation/ Bulkiness	02	1.8	26	19.0	11	10.0	20	14.4
Scarcity/Time Consuming	01	0.9	01	0.7	01	0.9	04	2.9
Scarcity/Bulkiness	02	1.8	04	2.9	03	2.7	02	1.4
Time consuming/ Bulkiness	01	0.9	03	2.2	01	0.9	03	2.2
Total	113	100.0	137	100.0	111	100.0	139	100.0

Source: Data analysis, 1999.

Poultry manure use constituted 91% of the total variable cost components in the study area. This is attributed to the large quantity required per hectare of land rather than on the cost of the manure (Table 5). Labour cost was however low at an average of about 2% (1.72 in Ekiti state and 1.42 in Osun state), while transportation cost constituted 8% of the total cost of inputs. This may reflect the bulkiness of organic manure vis-a-vis the small proportion of land to which it is applied. Mean net income per annum was higher for users of poultry manure, with users recording 1.40 times non-users earning in the area. The difference in mean net income between users and non-users of poultry manure was statistically significant at the 1% level of probability. This shows that in the absence of other alternatives, use of poultry manure is economically beneficial than its non-use.

Table 5 *Respondents' mean net returns (₦/ha) per annum*

Item	Ekiti State		Osun State	
	Users	Non-Users	Users	Non-Users
1. Input				
i. Mean rate of poultry manure applied (kg/ha)	48.28	-	35.63	-
ii. Mean price of manure (₦/Kg)	0.65	-	0.72	-
iii. Mean cost of poultry manure (₦/50kg bag)	31.35	-	25.65	-
iv. Mean transport cost (₦)	2.90	-	2.10	-
V. Mean cost of labour (₦/ha)	0.60	-	0.40	-
vi. Total cost of variable inputs (₦)	34.85	-	28.15	-
2. Income				
vii. Mean yield (kg/ha)	686.20	506.67	660.20	453.53
viii. Mean price (₦/kg)	17.90	17.90	18.10	18.10
ix. Gross income (₦/ha)	12,283	9,069	11,950	8,209
x. Net income (₦/ha)	12,248	9,069	11,921	8,209
t	3.65*		2.87*	
n	113	137	111	139

Source: Date Analysis, 1999

*Significant at 1% probability level; n implies number of respondents; 1 U.S $ = ₦ 85.00

Summary and Conclusion

The study examined the economies of poultry manure utilization among maize farmers in Osun and Ekiti States of Nigeria. The main objective of the study was to evaluate the benfits of and constraints to the use of poultry manure produced within integrated poultry-maize enterprises in the study area. Over 50% of the respondents used poultry manure. Small scale farming is associated with poultry manure use in the study area as only a small proportion of manure could be obtained from personal farms, which formed the main source of poultry material used for land improvement. Respondents have to move long distances to source from other poultry enterprises. Significant difference were observed between the mean net returns per annum earned by users and non-users of poultry manure per hectare of cropland cultivated. This implies that poultry manure, as an organic fertilizer is capable of enhancing soil fertility, and increasing crop productivity and farm income. Problems

encountered by poultry manure users in the study area included: long farm distance from manure source, as few poultry farms existed in the area; poor accessibility to poultry manure, bad odour, wetness of the manure and the large quantity requirement which makes it difficult to transport from its source to the farm sites.

It can be concluded that farmers and farm operators in the study area should be encouraged to keep more birds as integrated enterprises to provide sufficient quantity of the product for soil improvement and for enhanced crop productivity. This could be achieved through farmer education and may possibly result in increased cropped area. Easy accessibility and better combination of poultry manure with other soil conservation practices could be fashioned out to ensure higher farm yield and income levels. However, since the use of poultry manure produces higher net earnings than its non-use, its use becomes more economically advantageous than its non-use.

Nonetheless, there is a need to address the various problems that hinders the use of poultry manure by farm operator. Thus, a major research effort is required to develop improved strategies for packaging poultry manure to remove the associated social constraints to its use by the farmers. As well as appropriately combine various organic materials for land quality improvement.

References

Adeoye,K.B. 1995. Effects of some management practices on soil crusting in the savannah soils. Proc. Int. Conf. Soil fert., Soil tilth and post-clearing land degr. In the humid tropics. Pp 302 - 309.

Adepetu,J.A. 1997. Soil and Nigeria food security. Inaugural Lecture Series 119. O.A.U.,Ile-Ife. 19pp.

Ahn,P.M. 1979, *West African Soils.* Oxford University Press, London.pp 252 – 259.

Bala-subramanian,V. and L.A Nnadi. 1980. "Crop residue management and soil productivity in Savannah areas of Nigeria".F.A.O Organic recycling in Africa. *Soil Bulletin*, No 43: 106 – 120.

Blake,F. 1994." Organic food production". In *World Agriculture* (Ed) Alan Cartwright. Sterling Publication Ltd. London. Pp22 – 24.

Crosson,P. 1995." Future supplies of land and water for world agriculture". In *Population and Food in the early twenty-first century: meeting the future food demand of an increasing population.* (ed. N.Islam), 143 – 159. Washington,D.C International Food Policy Research Institute.

Djokoto, R.K and D. Stephens . 1961. Thirty long term fertilizer experiments under continous cropping in Ghana. In crop yields and responses to fertilizers and manures. *Experimental Agriculture*,U.K., 29:181 – 195.

Dressler, J. 1983. standatgerenchter Landbau (SGL) in tropischen Bergland *Situationenund Entwicklung smoglicheite landwirtschaftlicher Kleinbentriebe in Rwanda* (GTZ) Germany. 142pp.

Fabiyi, Y.L. and O.O Ogunfowora. 1992. "Economics of production and utilization of organic fertilizer". Paper presented at the National Organic Fertilizer Seminar, March 26 – 27, 1991, Zaria, Nigeria. Pp 138 – 145.

Greenland, D.J., Gregory,P.J and P.H. Nye. 1998. " Land resources: on the edge of the Malthusian Precipice?" *CAB International.* The Royal Society, New York. 89 – 115.

Jaiswal, P.L., Wadhwani,A.M., Jain, M.K. and C. Chhaanra (eds). 1971. Handbook on manure and Fertilizers: *Indian Council*

of Agricultural Research, 2nd Ed. New Delhi, 396 pp.

Joshi, B.R. ands.C. Ghimire. 1996. Livestock and soil fertilizer: a double bind. In ILEIA Newsletter. 12(1):18

Karl, M. Muller-Samann and J. Kotschi. 1994. sustaining growth, soil fertility management in Tropical smalholding. Margraf Verlag Ltd., Germany. 486pp.

McCalla, T.M. 1975. Use of animal waste as a soil amendment F.A.O Organic materials as fertilizer. F.A.O. *Soils Bulletin*, No. 27: 83 – 88.

Mijindadi, N.B. and P.O. Erhabor. 1998." Rural poverty and agricultural resource utilization: Implications for the Nigerian environment". *In Poverty, Helath and the Nigerian enviroment* (ed) Osuntogun,A. Foundation for Environmental Development and Education in Nigeria. (FEDEN). Pp 124 – 131.

(Received 16 February 2001;Accepted 22 April 2002)