ISSN 1682-8356
ansinet.org/ijps

INTERNATIONAL JOURNAL OF

POULTRY SCIENCE

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308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
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International Journal of Poultry Science 10 (2): 137-142, 2011
ISSN 1682-8356

Profit Efficiency and Waste Management in Poultry Farming: The Case of Egba Division, Ogun State, Nigeria

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Abstract: The study examined the profit efficiency and poultry waste management in Egba division of Ogun State, Nigeria. A sample of seventy-two (72) poultry farmers was randomly selected from the study area through structured questionnaires. The data analysis was based on complete responses from a cross-sectional survey of the respondents. The data were analyzed using frequency distribution and frontier profit function. Results showed that poultry production was dominated by males (84.7%) and majority (73.6%) was below 50 years of age. About 98.6% of the poultry farmers had minimum of primary education while 86.1% had less than 10 years of farming experience. 70.9% of the household had up to 6 members in their family while 29.1% had between 7-12 members. Statistics shows that 93.1% of the respondents collected their poultry waste manually using shovel and spade. Majority (76.39%) of the farmers did not treat their farm waste before or after disposal thereby polluting their environment. The poultry 'waste' was not considered useful by 63.9% of the farmers. However, the mean level of efficiency for poultry production in the area is 68.44 indicating that there is opportunity to still increase profit by 31.6% if technical, allocative and scale efficiencies are improved upon. Meanwhile, age, experience and sex significantly contributed to inefficiency in poultry farming in the area. It is therefore suggested that livestock farmers should be trained through workshops, conferences and extension services on the conversion and utilization of livestock waste or manure e.g. into organic fertilizers which can easily be made available to the numerous small scale crop farmers to augment the scarce and very expensive inorganic fertilizer. Effective monitoring services should be operated by government to sensitize poultry farmers to reduce environmental pollution and incidence of disease outbreak. Government should reduce import duties on poultry drugs so as to enhance increased production and profitability.

Key words: Profit efficiency, waste disposal, poultry, inefficiency factors, pollution

INTRODUCTION

Poultry is one of the most developed animal industries in Nigeria. Historically, the growth of poultry industry began as a result of its high level of energy and protein, rapid turnover rate and short incubation period (i.e. 21 days) which are advantages of poultry over other livestock (Mokwunye, 2000). Despite an increase in intensive chicken keeping in early 1980's, the withdrawal of subsidy by government on the prices of day-old chicks and feed ingredients led to a general decline in the number of poultry birds particularly under commercial production in the country. The ever-increasing cost of feeds and management forced many commercial poultry establishment to fold-up. In recent time, however, the discovery of a better feed formulation and management alternatives has made the poultry business attractive to new investors (Abioye, 1994).

One aspect of livestock and poultry operations that has not kept pace with the increase in the intensity of poultry production is manure or waste management. Poultry waste consists of droppings, wasted feed, broken eggs and feathers. It also include the dead birds and hatchery waste, all which is high in protein and contain substantial amount of calcium and phosphorus due to high level of mineral supplement in their diet. Available statistics showed that there is a steady increase in the population of chicken in Nigeria from 122 Millions in 1994 to 137.6 Millions in 2003 (FAO, 2004). The volume of waste certainly has increased due to increasing birds' population but appropriate waste management process has not been refined.

Meanwhile, Robinson and Beauchamp (1982) revealed that the approximate percentage of nutrient intake excreted by poultry are; Nitrogen (65.5%), Phosphorus (68.5%) and Potassium (83.5%). These are the essential elements for soil fertility and increased crop production. Mokwunye (2000) confirmed that poultry manure contains high phosphorus which has positive effect on the growth and productivity of crops. It is also effective when combined with mineral phosphorus fertilizer for farm use.

Adding manure to soil increases its fertility because it increases the nutrient retention capacity (or cation exchange capacity), it improves the physical condition,

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the water-holding capacity and the soil structure stability. In many systems, it is the only means available to farmers for improving soil organic matter. In spite of these facts, poultry waste has no real market value in Nigeria. The manure is disposed locally and spread on nearby fields leading to pollution (Smith, 1996).

Some researchers and agriculture specialists have argued that livestock wastes is an asset or potential hazard to the environment depending on the procedure by which it is managed. According to FAO (1997a), approximately 22% of 94 million tons total nitrogen fertilization and 38% of phosphate is of animal origin. This represents about US$ 1.5 billion worth of commercial fertilizer. Replenishing soil fertility is not the only benefit of using animal manure; it also helps in creating a better climate for soil micro-flora and fauna. It is the best way of using crop residues (FAO, 1997b). It was further affirmed that livestock wastes are used as soil conditioner (Hermanson, 2005), materials for wall plastering and construction of granaries (Muller, 1980), source of fuel or energy either by direct combustion or when converted to biogas (Hutchinson *et al*., 2005) and for feeding livestock and fish (Sevilleja *et al*., 2005). It plays a key role in sustaining the desirable soil physical conditions for crop growth (Greenland *et al*., 1998). Application of 15 tons/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.

The study of Serna and Pomares (1991) confirmed that poultry manure gave higher mineralization rate to soil than other types of manure tested. Maskeina and Randhawa (1983) found that organic manure and its level of zinc significantly increased the dry-matter yield of shoots (114%) and roots (117%) with poultry surpassing other organic manure in raising the iron and manganese content in plants. Adepetu (1997) and Greenland *et al*. (1998) asserted that the only alternative to the costly inorganic fertilizer use is organic manure, of which poultry manure is the most preferred. Poultry manure was described as the richest and most concentrated in nutrients among all sources of farm organic manure. Globally, pig and poultry industries produce 6.9 million tons of nitrogen per year, which is equivalent to 7% of the total inorganic nitrogen fertilizer production in the world (FAO, 1997b).

According to Dressler (1983), livestock production remains a vital component of the farming systems in developing countries since small farmlands are cultivated to support a high population. Meanwhile, it is a potential hazard by causing pollution through the emission of large quantities of unpleasant and provocative odours. It is poisonous when it gets in contact with surface and ground water (Fulluck, 1994). Livestock waste produces gases such as ammonia carbon dioxide (CO_2), methane (CH_4), ozone (O_3), nitrous oxide (N_2O) and other trace gases which affect the world's atmosphere by contributing about 5-10% to "global warming" i.e. global anthropogenic emissions (Bouwman *et al*., 1995; USEPA, 1995).

Though, environmental policy is contained in the 1999 constitution of the Federal Republic of Nigeria to protect and improve the environment as well as safeguard the water, air, land, forest and wildlife. In spite of these laws, farm owners do not care much about effective waste management and disposal. This is perhaps due to lack of enlightenment, innovations, monitoring and enforcement on the utilization and disposal of the waste to support the established legislation in Nigeria.

This study therefore aims at examining the methods of waste disposal and utilization as well as the profit efficiency of the poultry farms in Egba division of Ogun State, Nigeria.

MATERIALS AND METHODS

The study data and sampling technique: This study was based on primary data, obtained between March and July 2008 in a cross-section survey of poultry farms in Egba division, Ogun state. The study area is one of the four divisions that make up the State in the southwest rainforest zone of Nigeria, others being Ijebu, Remo and Yewa divisions. The study area, Egba division, consists of six local government namely; Abeokuta North, Abeokuta South, Odeda, Obafemi-Owode, Ifo and Ado-Odo/Otta local government areas. The required information was obtained through structure questionnaires administered personally on a target sample of eighty (80) poultry farmers. The farms were drawn in two-stage sampling process. In the first stage, three (3) rural based viz Obafemi-Owode, Odeda and Ifo local government areas were selected because of the intensity of poultry business in the areas. In the second stage, between twenty-one (21) and thirty (30) poultry farms were drawn from each of the three local government areas based on their population of poultry farms. Data were obtained on the socio-economic characteristics of the farming households, waste management procedures, the quantities and values of inputs and output, to mention a few. Owing to incomplete responses from some of the respondents, subsequent data analysis was based on complete information obtained from seventy-two (72) poultry farmers in the study area.

Method of data analysis: Frequency tables and percentages were used to describe the socio-economic characteristics of the poultry farmers, their farm settings and waste management procedures. Frontier profit function was fitted to the production data to determine the profit efficiency of the poultry farms. The frontier profit function approach in measuring efficiency combines the concepts of technical, allocative and scale inefficiencies

in the profit relationship and errors in the production decision are assumed to be translated into lower profits or revenue for the producer. The general form of the profit frontier, dropping the ith subscript for the farm, is defined as:

$$\ln P^1 = ao + \sum_{j=1}^{5} aj \ln P_j^1 + \frac{1}{2}\sum_{j=1}^{5}\sum_{k=1}^{5} sjk \ln P_j^1 \ln P_k^1 + \sum_{j=1}^{5}\sum_{l=1}^{2} j1 \ln P_j^1 \ln Z_l$$

$$+ \sum_{l=1}^{2} bl \ln Z_l + \frac{1}{2}\sum_{t=1}^{2} u_{lt} \ln Z_l \ln Z_t + V - u \quad (1)$$

and

$$U = do + \sum_{d=1}^{5} d_d W d + X \quad (2)$$

Where:

P^1 = Restricted profit (total revenue minus total variable cost normalized by output price)
P^1_j = Cost of jth variable input normalized by the input price (j = 1, 2, …, 5),
P_1 = Normalized cost of birds stock (e.g. day old chicks, point of lay, etc)
P_2 = Normalized cost of labour
P_3 = Normalized cost of feeding (i.e. feeds and water)
P_4 = Normalized cost of drugs/veterinary
P_5 = Normalized cost of waste disposal
W_d = Variable representing socio-economic characteristics of the farmer and the farm to explain the factors that are responsible for inefficiency such as age, education, farming experience, sex and flock size.

The Maximum Likelihood (MLE) estimates of the parameters of the translog stochastic frontier profit function were defined by equation (1) given the specifications for inefficiency effects defined by equation (2) (Coelli, 1996). The hypothesis that the efficiency effects jointly estimated with the profit frontier function were not random errors was tested. The key parameters $C = r^2u / (r^2u + r^2v)$ is the ratio of the errors and the value is between zero and one. If C = 0, inefficiency is not present and if C = 1, there is no random error. The parameter C is not equal to the ratio of the variance of the efficiency effects and the total residual because the variance of Ui is equal to $[(p-2)/p]r^2$ and not r^2. The relative contribution of the inefficiency effects to the total variance term (C*) is equal to C* = C/[C + (1-C) p/(p-2)] (Coelli *et al*., 1998).

RESULTS AND DISCUSSION

The frequency distribution of socio-economic characteristics of the poultry farmers presented in Table 2 shows that 73.6% of the respondents were below 50 years of age. This implies that majority of the respondents were in active age group. Majority (84.7%) of the farmers were male while 15.3% of them were female. This is probably because poultry farming requires more of physical strength that can be provided by men. 70.9% of the household had maximum of 6 members in their family while 29.1% had up to 12 members. This determines the quantity of family labour supply to individual poultry farm. Though, larger family consumes more of the farm products at home and this may reduce farm income.

A larger proportion of the poultry farmers (98.6%) had, at least, primary education. This is a reflection that poultry production requires some levels of formal education to be able to cope with the technical aspects such as drug administration and dosage, fumigation, specifications and other new technology. Meanwhile, 86.1% of the poultry farmers were in operation less than 10 years ago while 13.9% had between 10-25 years of experience. The low level of experience in poultry production might be due to high rate of withdrawal from poultry business in the past years. However, 63.9% of the farmers were engaged in poultry production only while 36.1% combined poultry production with other jobs. This implies that poultry production is not only profitable but also requires time and commitment.

The frequency distribution also revealed that 77.78% of the farmers rear less than 5,000 birds while 22.22% had more than 5000 birds on their farm. About 93.1% of the farmers used shovel and spade to remove the poultry manure from the pen house i.e. manual method while 6.9% flushed the droppings out through a specially constructed sloppy floor system. This shows that the level of technology in poultry farming in the area is low. However, about 93.1% of the poultry farms deposited their poultry waste either on their farm, inside bush or rivers while 6.9% buried their waste inside pit. This decision causes pollution and nuisance to the environment. In addition, 76.39% of the farmers did not treat their farm waste before or after disposal while 23.61% treated it with chemical or burn during dry season to reduce air pollution, flies prevalence and disease outbreak.

The results further showed that majority (63.9%) does not make economic use of the poultry waste; a few (36.1%) utilized the waste for making compost, organic manure and to feed fish while 1.4% sold the manure to gardeners and other users.

Majority (70.8%) of the respondents acclaimed that the constraints to poultry waste utilization was lack of awareness and affordable technology. Other constraints include labour scarcity and high cost of disposal, high cost of chemical and difficulty to burn during wet season.

Determinants of profit efficiency: Results of the stochastic profit function i.e. the ordinary least square and maximum likelihood estimates were presented in Table 1. The MLE coefficients for cost of birds/stocking, labour and feed were positive and significant at 10%, 1% and 1% respectively. This implies that additional cost to

Table 1: Estimates of the frontier profit function

Variables	Parameter	OLS coefficient	OLS t-ratio	MLE coefficient	MLE t-ratio
Constant	α_O	10.5364*	6.9584	13.4544*	12.6465
lnP_1 (Stoking)	α_S	0.0909	0.4122	0.2034***	1.6784
lnP_2 (Labour)	α_L	0.07254*	2.8211	0.0942*	3.8400
lnP_3 (Feeding)	α_F	0.6618*	6.7409	0.4521*	5.2244
lnP_4 (Medication)	α_M	-0.1191	-1.1617	-0.2323*	-2.7957
lnP_5 (Waste disposal)	α_W	0.0079	0.3689	-0.5149	-0.5179
Variance parameters					
$R^2 = r^2u + r^2v$	R^2	0.9740	-	2.0116*	4.0528
$C = r^2u/(r^2u + r^2v)$	C	-	-	0.9572*	33.4653
Log likelihood	-	-96.68	-	-85.28	-
Inefficiency factors					
Constant	∂0	-	-	-0.5149	-05179
Age	∂1	-	-	0.0450***	1.7998
Education	∂2	-	-	-0.0373	-0.4483
Experience	∂3	-	-	-0.1459**	-1.4675
Sex	∂4	-	-	1.5221**	2.1347
Flock Size	∂5	-	-	-0.0003	-1.2618
Efficiency	Mean = 68.44	Minimum = 17.09	Maximum = 89.91		

Computed from field survey data, 2008. *Significant at 1%, **Significant at 5%, ***Significant at 10%.
Note: A negative coefficient of an inefficiency factor indicates positive impact on efficiency

Table 2: Characteristics of the respondents and the poultry farms (N = 72)

Respondents			Poultry farms		
Characteristics	Frequency	%	Characteristics	Frequency	%
Age (years)			**Farm acquisition**		
Below 30 years	10	13.9	Constructed	25	34.7
30- < 40	27	37.5	Purchased	24	33.3
40- < 50	16	22.2	Leased	14	19.5
50- < 60	13	18.1	**Flock size (Birds)**		
60 years and above	6	8.3	Below 5,000	56	77.78
Sex			5,000- 10,000	11	15.28
Male	61	84.7	Above 10,000	5	6.94
Female	11	15.3	**Waste collection**		
Household size			Manual scrapping with shovels	67	93.1
1-3	11	15.3	Slopped floor system	5	6.9
4-6	40	55.6	**Waste disposal**		
7-9	16	22.2	Deposited on land surface within farm	35	48.7
10-12	5	6.9	Buried inside pit within farm	5	6.9
Education			Deposited in bush	27	37.5
None	1	1.4	Deposited in river	5	6.9
Primary	8	11.1	**Waste treatment**		
Secondary	27	37.5	No treatment	55	76.39
Tertiary	36	50.0	Chemical treatment	6	8.3
Experience (yrs)			Burning	9	12.5
below 5 years	46	63.9	Chemical treatment and burning	2	2.78
5- < 10	16	22.2	**Waste utilization**		
10- < 15	5	6.9	No utilization	46	63.9
15- < 20	3	4.2	Fish feeding	4	2.8
20- < 25	1	1.4	Manure and compost	21	29.2
25 years and above	1	1.4	Sold	1	1.4
Job combination			**Constraints to waste utilization/disposal**		
Poultry farming only	46	63.9	Lack of utilization skill	51	70.8
Poultry farming and trading	9	12.5	Irritation and labour scarcity	6	8.33
Poultry farming and craftwork	2	2.8	Lack of vehicle and transportation cost	5	6.94
Poultry farming and transport	1	1.4	Difficulty to burn during rainy season	4	5.56
Poultry farming and civil service	14	19.4	High cost of pit and chemical	6	8.33

Source: Computed from field survey data, 2008

use more of these variables would earn higher profit i.e. increase profit efficiency. Medical cost has a negative coefficient significant at 1%. This indicates that medical cost had declining effect on amount of profit made. Perhaps, this was as a result of high cost of drugs and veterinary services. However, the estimated average value of profit efficiency is 0.684 implying that an average poultry farm can still increase profit level by 31.6%.

Hence, further improvement is required to improve on technical, allocative and scale efficiencies in poultry production in the area.

However, the socio-economic factors that accounted for inefficiency among the poultry farmers are age, experience and sex. The coefficients of these variables were significantly different from zero with *a priori* expectations. The hypothesis that C = 0 was rejected at 5% level of significance confirming that inefficiencies exist and indeed stochastic. The result shows that experience plays an important role in reducing inefficiency in poultry farming at 5% significance level. Thus, increase in years of experience is favourable to making increased profit in poultry business. This result corroborates with the findings of Ojo and Ajibefun (2000). Age has a positive and significant relationship with inefficiency at 10%. Therefore, profit efficiency would continue to decline as farmers grow older in age. Sex is also positive and significant to inefficiency at 5% meaning that the few female poultry farmers were more efficient than their male counterpart.

Conclusion and policy implications: Result of the empirical analysis showed that there is no effective management of poultry waste in the study area in terms of utilization and method of disposal, leading to environmental pollution at increasing rate. The results also revealed that the poultry farmers can further increase their profit efficiency. The economic use of the poultry waste would also help in maximizing the farm's profit in addition to improvement in technical, allocative and scale efficiencies. Therefore, livestock farmers should be trained through workshops, conferences and extension services about effective utilization of livestock manure or waste. Government should develop appropriate technology for the conversion of livestock waste particularly poultry and pig manures into organic fertilizers to augment the scarce and very expensive inorganic fertilizer.

Effective monitoring services should be operated to sensitize poultry farmers on the need for environmental-friendly waste management that would reduce environmental pollution and incidence of outbreak of disease.

The positive and significant relationship of feed with profit suggests that increased production of feedstuff e.g. maize, sorghum, palm kernel cake etc should be encouraged by granting financial assistance to the producers. This would also reduce the competition in demand for the crops between man and livestock. More so, government should reduce import duties on poultry drugs to encourage increased production and farm profit since cost of medication was significant and negative to profit efficiency.

REFERENCES

Adepetu, J., 1997. Soil and Nigeria Food Security. Inaugural lecture series 119, Obafemi Awolowo University Press, pp: 19.

Abioye, A.O., 1994. Livestock Problems in Nigeria: Problems and Prospects. In: Issues in Agricultural and Rural Development. Proceedings of the Training Workshop on Agricultural and Rural Development. In Duroyaiye, B.O. (Ed), Department of Agricultural Economics, Olabisi Onabanjo University, Ago-Iwoye, pp: 105-132.

Bouwman, A., K. Van Den Hoek and J. Oliveer, 1995. Uncertainties in the global source distribution of nitrous oxide. Geophysics Resour., 100: 2785-2600.

Coelli, T., 1996. FRONTIER version 4.Ic: A Computer Programme for Stochastic Frontier Production and Cost Function Estimation. Department of Econometrics, University of New England. Amidale, USW.

Coelli, T., D.S. Rao and G. Battese, 1998. An Introduction to Efficiency and Productivity An analysis. Kluwer Academic Publisers, Boston.

Dressler, J., 1983. Standatgerenchter Landbau (SGL) in tropischen Bergled Situationemund Entwicklung Smoglicheite Landwintschaftlicher Kleinbentriebe in Rwanda (GTZ) Germany, pp: 142.

FAO, 1997a. Current World Fertilizer Situation and Outlook 1994/95-2000/2001. FAO/UNIDO/World bank Working Group on fertilizers. Rome.

FAO, 1997b. Livestock-Environmental Interactions: Issue and Options. Henning Steinfeld, Cees de Haan and Harcy Blackburn, pp: 56.

FAO, 2004. http;//www.fao.Org/DOREP/004/x6519E/x6518E00.htm.

Fulluck, A., 1994. Biology: Heineman Advanced Science. Heinemann Educational Publishers, pp: 493-494.

Greenland, D.I., P. Gregory and P. Nye, 1998. Land Resource on the Edges of the Malthusion precipile? CAB International. The Royal Society, New York, pp: 89-115.

Hermanson, R.E., 2005. Managing Livestock Manure to Protect Groundwater. Washington State University Cooperative Extension, http://whatcomcd.org/Farm Assists/BMP/Livestockops.htm.

Hutchinson, M.L., L.D. Walters, S.M. Avery, F. Munro, D.D. Jones, J.C. Nye and A.C. Dale, 2005. Methane Generation from Livestock waste, http://danpatch.ecn.purdue.edu/repados/swine/pubs/methane.htm.

Maskeina, M. and N. Randhawa, 1983. Effect of organic manure and zinc levels on the availability of zinc. Manganese and copper to wetland rice. In. J. Agric. Sci., 53: 48-52.

Mokwunye, U., 2000. Meeting the phosphorus Needs of the soils and crops of West Africa: The Role of Indigenous Phosphate rocks. Paper presented on Balanced Nutrition Management systems for the Moist Savanna and Humid Forest Zones of Africa at a symposium organized by IITA at Ku Leuva at Cotonun, Benin Republic, October 9-12.

Muller, Z.O., 1980. Feed from Animal Wastes: State of Knowledge. FAO Animal Production and Heath, Paper 18. Rome. http://www.fao.org/DOCREP/004/X6518E/X6518E00.htm.

Ojo, S.O. and I.A. Ajibefun, 2000. Effects of training on labour productivity and efficiency in oil palm production in Ondo State. Nig. J. Sustainable Agric. Environ., 2: 275-276.

Robinson, J. and E. Beauchamp, 1982. The Resource conservation Ethic Applied to Manure Management. In: The Manure Management Handbook, Ontario soil and crop Improvement Association, Ontario Ministry of Agriculture and Food, Ontario Agricultural College, Canada, pp: B1-1 to B1-2.

Serna, M. and F. Pomares, 1991. Comparison of biological and chemical methods to predict nitrogen mineralization in animal west biology and fertility of soils. 12: 89-94.

Sevilleja, R., J. Torres, J. Solows and D. Little, 2005. Using Animal Waste in Fishponds. hhp://www.fao.org/documents/show cdr.asp?url file = DOCREP/005/Y1187e34.htm.

Smith, R., 1996. Poultry Manure Handling: A Practical Approach, www.agric.gov.ab.ca/&deparment/deptdocs.nof/all/pou3606.html.

USEPA, 1995. Global Impact Domain Methane Emissions, Consultant Report for the Livestock and the Environment Study. Washington D.C., http://www.epa.gov./ow/sec1/profile/index.html.