

*Original Research Article***Constraints Faced by Commercial Poultry Farmers in Waste Management Practices in Kogi and Kwara States, Nigeria**

Isreal Ogunlade, Muyiwa Olarinde Oduwaiye, Kemi Funmilayo Omotesho,  
Sola Emmanuel Komolafe

*Department of Agricultural Extension and Rural Development, University of Ilorin, Nigeria*

**Abstract**

This study assessed the constraints faced by commercial poultry farmers in waste management practices in Kogi and Kwara States, Nigeria. A structured questionnaire was used to elicit information from randomly selected 138 and 125 registered commercial poultry farmers from both states, giving a total sample size of 263 for the study. Both descriptive and inferential statistics were used to analyse the data for the study. Results of analysis showed that mean age was 46.7 years, farm size was 991 birds and poultry farming experience was 11 years. Also, majority were male (82.0%), married (88.8%), had tertiary education (94.0%). Mean age of farm was 9 years. Poultry dropping was the most (mean = 2.36) generated waste in the study area. The most prevalent waste management methods used by poultry farmers were open dumping around the farm (mean = 2.23), giving wastes free to the public as farmyard manure (mean = 2.16), poultry wastes are dumped in a nearby bush (mean = 2.09), dead birds are buried in a pit near the farm (mean = 2.08), dead birds are thrown into a nearby bush (mean = 2.01) and dead birds are burnt inside a pit or in a heap near the farm (mean = 2.01). The major constraints faced by farmers in waste management practices were lack of awareness on how to use the wastes productively (mean = 4.06), no agricultural land nearby where wastes can be used (mean = 3.69), excessive odour from waste (mean = 3.66), high cost of chemical treatment (mean = 3.56), high transportation cost (mean = 3.24) and high cost of private waste management agencies (mean = 3.01). Results of Multiple Regression Analysis show that poultry wastes used as farm yard manure, burnt and buried in a pit, sun-dried and burnt and given freely to interested farm workers had inverse significant relationship to constraints while dumping of poultry wastes around the farm, nearby bush and to animals such as dogs had positive significant relationship to constraints faced by respondents in waste management. The study concluded that the level of constraints faced by commercial poultry farmers in waste management practices was high (mean = 3.39) in the study area. The study recommends among others the needs for existing poultry farmers association to include programmes that will enlighten members on poultry waste management practices that will not have negative effect upon their birds and the environments.

**Keywords:** Poultry farming; waste generated; waste treatment; waste disposal; awareness.

**INTRODUCTION**

The poultry industry is one of the rapidly growing agro-based industries in the world today, growing at a global rate of 5% *per annum* with its share in world meat production increasing from 15% three decades ago to 30% (FAO, 2006). The poultry industry according to Moreki and Chiripasi (2011) turns out enormous amount of wastes, which include both solid waste and wastewater. The solid waste consists of droppings, litter/bedding materials, hatchery waste, feathers, feed, abattoir waste (blood, offal, feathers and condemned carcasses), shells, sludge, and dead birds. Most of these wastes have been shown to be sources of high-quality nutrients that are of immense agronomic benefit if properly managed. Improper management of these

wastes can result in environmental and human health concerns. In view of the environmental hazards posed by poultry wastes, various enhanced methods of poultry wastes handling have been suggested towards correcting the effects of these wastes on the environment (Nebraska Department of Environmental Quality, 2005). In spite of the environmental effects of improper disposal of poultry wastes, poultry farmers in Nigeria do not care much about effective waste management and disposal. This is perhaps due to varied constraints militating against effective waste management and utilization among poultry farmers. The consequence of which is increase in environmental pollution hazards due to improper poultry waste management.

Therefore, this study was conducted to assess the constraints faced by commercial poultry farmers

in waste management practices. The main objective of the study was to assess the constraints faced by commercial poultry farmers in waste management practices. Specific objectives are to:

- (1) Identify the types and extent of waste generated by poultry farms in the study area.
- (2) Examine the method of waste disposal practiced by poultry farmers.
- (3) Describe methods of waste treatment methods employed by poultry farmers.
- (4) Identify various areas where poultry farmers faced problem in waste management.

**Null hypothesis tested:** H0: there is no significant relationship between the constraints reported by the farmers and the waste management methods practiced by them.

### MATERIALS AND METHODS

#### Study area

This study was conducted in Kogi and Kwara States, Nigeria. Kogi State was created in August, 1991 out of Kwara and Benue States. The state which lies between latitude 6°44'N–7°36'N and longitude 7°49'E–8°27'E. It had land area of 30,354.74 square kilometres, Kogi State has a total population of about 3,278,487 people (NPC, 2006).

Kwara State which was created on 27<sup>th</sup> May 1967 is located within the North Central zone of Nigeria. Kwara State lies between latitudes 7°45'N and 9°30'N and

longitudes 2°30'E and 6°25'E has two distinct seasons (the wet and dry seasons) and has a population of about 2.59 million people and total land area of 32,500 square kilometres. Kwara State is primarily agrarian with vast arable land and rich fertile soils with an estimated figure of 283,800 farm families, majority of which resides in the rural areas (KWADP, 2011).

#### Sampling procedure and sample size

The population for this study comprised commercial poultry farmers in Kogi and Kwara States, Nigeria. Sample frame for the study comprised 275 registered commercial poultry farmers in Kwara State and 250 poultry farmers in Kogi State obtained from Poultry association of Nigeria (PAN) of both states. A 50 percent of the total population of poultry farmers from each state was randomly selected to make a total of 263 poultry farmers for the study. However, of the 263 copies of questionnaires administered to the respondents, only 250 copies were retrieved and analysed.

#### Instrument for data collection

A structured questionnaire was used to elicit information from the respondents on issues related to objectives of the study. The study addressed content validity. The instrument was subjected to careful examination by experts in the field of agricultural and rural development, University of Ilorin to ensure its validity.

**Table 1.** Socio-economic characteristics of commercial poultry farmers in the study area

Variables	Kogi State (%)	Kwara State (%)	Total (%)
<b>Age (Year)</b>			
Below 30	6.4	14.4	10.4
30	14.4	18.4	16.4
40	33.6	23.2	28.4
50	26.4	31.2	28.8
60 and above	19.2	12.8	16.0
<b>Mean</b>			
<b>Gender</b>			
Male	84.8	79.2	82.0
Female	15.2	20.8	18.0
<b>Marital Status</b>			
Single	5.6	16.8	11.2
Married	94.4	83.2	88.8
<b>Educational Status</b>			
Non formal	0.8	0.8	0.8
Primary	5.6	0	2.8
Secondary	3.2	1.6	2.4
Tertiary	90.4	97.6	94.0

Source: Field survey, 2015

**Table 2.** Farm characteristics of commercial poultry farmers

Characteristics	Kogi State (%)	Kwara State (%)	Total (%)
<b>Farming Experience (years)</b>			
Below 5	17.6	10.4	14.0
5–10	40.0	38.4	39.2
11–15	21.6	36.8	29.2
16–20	8.0	12.0	10.0
21–25	5.6	3.2	4.0
26 and above	7.2	-	3.6
Mean= 10.81			
<b>Primary Occupation</b>			
Poultry	68.8	76.8	72.8
Others	31.2	23.2	27.2
<b>Types of Birds Reared</b>			
Broiler only	20.0	8.0	14.0
Layers only	25.6	42.4	34.0
Cockerel only	7.2	4.8	6.0
Broiler, Layers and Cockerel	47.2	44.8	46.0
<b>Management Type</b>			
Battery cage	31.2	43.2	37.2
Deep litter	33.6	7.2	20.4
Both	35.2	49.2	42.4
<b>Labour Type</b>			
Self	22.4	31.2	23.2
Family	44.6	24.0	38.0
Hired	18.4	23.2	20.8
Combination	14.4	21.6	18.0
<b>Farm Size</b>			
1–999	78.4	56.0	67.2
1000–2999	20.0	33.6	26.8
3000 and above	1.6	10.4	6.0
Mean= 991			
<b>Ownership of land</b>			
Rented	20.0	24.0	22.0
Leased	1.6	12.8	7.2
Owned	78.4	63.2	70.8
<b>Age of Farm(year)</b>			
Below 5	32.0	18.4	25.2
5–10	44.0	44.8	44.4
11–15	9.6	32.8	21.2
16–20	0.8	3.2	6.0
21–25	0.8	0.8	0.8
26 and above	4.8	-	2.4
Mean= 9.25			
<b>Record keeping</b>			65.2
Yes	61.6	68.8	34.8
No	38.4	31.2	

Source: Field survey, 2015

**Table 3.** Mean distribution of type and extent of poultry wastes generated on farm

	Type of waste	Kogi State (Mean score)	Kwara State (Mean score)	Pooled mean
1.	Poultry droppings	2.25	2.47	2.36
2.	Litter/bedding material	2.10	2.27	2.19
3.	Dead birds	2.01	2.03	2.02
4.	Waste feed	1.76	1.81	1.79
5.	Abattoir waste	1.58	1.62	1.60
6.	Damaged/rotten eggs	1.46	1.71	1.59
7.	Damaged crates	1.48	1.90	1.69
8.	Dead rats	1.49	1.82	1.66
9.	Feed bags/health care products	1.82	1.98	1.90
10.	Waste water for slaughtering house	1.56	1.78	1.67
11.	Waste water from poultry house disinfection	1.70	2.20	1.95

Note: Likert-type scale used: large extent=3, small extent=2, no extent=1  
 Source: Field survey, 2015

**Data analysis**

Data were analysed using both descriptive and inferential statistics. Multiple regression analysis was used to test the hypotheses of the study. Constraints faced by farmers in waste management practices were obtained using a 5-point Likert-type scale of: very serious (5), serious (4), not serious (3), not constraint (2) and Undecided (1).The scores were summed up and collated for respondent to represent their constraints scores. These scores were later categorized as low constraints if the score equal to or less than the mean score and high constraints if more than mean score.

**RESULTS AND DISCUSSION**

**Socio-economic characteristics of commercial poultry farmers**

Table 1 shows the socio-economic profile of the respondents. According to Oke et al. (2014), age is an important socio-economic factor in assessing the productivity of a farmer. Table 1 reveals that the mean age of respondents for both states was 46.7 years. This gives the implication that majority of the respondents were youthful and agile. This youthful potential is essential for efficient poultry production activities as the enterprise requires individuals who are economically energetic, innovative, motivated and adaptable (Yinusa, 1999). Table 1 also reveals that majority of the respondents were male. This indicates that the female participation in poultry business in the two states was low. It may be because poultry farming needs more physical strength which can be better obtained from men. Table 1 shows that majority of the respondents were married. This status implies a relative stability of the farmer on the farm, which is needed to enhance poultry production (Oladeebo and Ambe-Lamidi, 2007). Table 1 further reveals that majority of the respondents had tertiary education. This

implies that the literacy level of the respondents from the two states was very high. This is expected as modern poultry rearing requires people who are well-informed and can utilize technical information in the production and management of poultry farming. High level of education enhances farmers’ level of innovation adoption and effective utilization of resources for optimum productivity.

**Farm characteristics of commercial poultry farmers**

Results presented in Table 2 reveals respondents from both states had few years of experience years in the poultry business. The implication of this finding is that majority of the respondents were still young in poultry farming business, although majority had chosen poultry farming as their primary occupation. This potential is expected to enhance farmers’ commitment and focus which are crucial to achieving profitability and efficiency in poultry business. Table 2 reveals that almost half of the respondents from the two states kept mixed birds that included both broilers and layers and some also cockerel while few kept only layers. Table 2 reveals that less than halve of the respondents from the two states adopted mixed management types involving the use of both battery cage and deep litter systems. This result agrees with the earlier finding by Ja’afar-Furo and Gabdo (2010) that mixed farming is more commonly practiced in poultry farming.

Table 2 also reveals that most of the respondents from both states depend on family labour operating in the aggregate mean of farm size of 991 birds. Following Omotosho and Oladele (1988), Ojo (2003) and Olasunkanmi (2008) classification of farms having fewer than 1,000 birds as small scale farms, 1,000–3,000 birds as medium scale farms while those having 3,000 birds and above as large scale farms, the result implies that poultry farming in the two states is still at small-scale level.

Table 2 reveals that majority of the respondents from both states reported to own the land they are using for poultry farm. This result implies that more profits are expected by the farmers as most of them owned their lands. The breakdown of farm age according to Table 2 reveals that the mean of farm age was 9.25 years. This implies that most poultry farms in the two states were still young in operation. The high percentage of respondents who kept farm records is expected due to the high level of literacy among the respondents in the study area. This implies that majority of the respondents in both states were fully aware of the usefulness of farm records keeping in helping them make informed management decisions that will help maintain or improve their poultry business profitability.

### **Type and extent of waste generated**

Table 3 shows the mean distribution of type and extent of waste generated by commercial poultry farms in the study area. Results in Table 3 show that poultry dropping was the most generated waste in the study area followed closely by litter/ bedding material. Judging by a mean rating which is above 2.00, waste feed, abattoir waste, damaged/rotten eggs, damaged crates, dead rats, feed bags/health care products, waste water from slaughter houses and waste water from poultry house disinfection were the wastes less generated with mean less than 2.0 from the farms. In all, poultry droppings, litter/ bedding material and dead birds were the most generated poultry wastes in the study area.

### **Method of waste disposal practiced by farmers**

The results in Table 4 reveal that six items are the most prevalent waste disposal methods practised by the farmers. This judgement is based on the mean ratings which are above 2.0. The results reveal that dumping of poultry wastes around the farm and free giving to the public for crop farming were ranked first and second, respectively. This finding is similar to Moreki and Keaikitse (2013) report in Botswana that majority of the respondents disposed poultry wastes by giving it away to other farmers to use in their arable fields. Dumping of poultry wastes in the nearby bush of the poultry farms and burying of dead birds in a pit near the farm were rated third and fourth position of the waste disposal methods among respondents. Moreki and Keaikitse (2013) reported similar findings that most poultry farmers in Botswana dispose their mortality through burial and composting.

Poultry wastes are used as farmyard manure was observed as fifth position of waste disposal method of respondents. Olumayowa and Abiodun (2011) had reported that adding poultry waste to the soil as manure increases soil fertility through increase in nutrient retention capacity, improvement in the physical condition, as well as increase in the water-holding capacity and soil structure stability.

### **Method of Waste Treatment**

The pooled analysis results of the method of waste treatment used in Table 5 reveals burning as the most prevalent method used in treating poultry. Burning of waste practice according to Akinbile (2012) has negative effects on the environment as burning results in air pollution and contributes to climate change. This common waste treatment option in the study area could further be detrimental to the health of farmers and their neighbours.

### **Constraints encountered to effectively dispose and utilize poultry wastes**

Table 6 shows various constraints among respondents in the study area on poultry waste management. Table 6 reveals that lack of awareness on how to use the wastes productively, no agricultural land nearby where the wastes can be used, excessive odour from waste, high cost of chemical for treatment, high transportation cost to convey waste, high cost of private waste management agencies were the leading constraints of respondents to effective management of poultry waste in the study area. This finding is in agreement with the view of Ekong (2003) that awareness is the first stage in the adoption process. This implies that the more awareness of the waste management among farmer, there will be proper disposal and productive uses of farm wastes, the better its utilization.

### **Test of hypothesis**

Table 7 shows the result of the multiple regression in investigating the relationship between constraints faced by farmers and waste management methods practiced by them. The multiple regression model in Table 7 with eight predictors produced  $R^2 = 0.623$ ,  $F = 3.598$ . The variables of management practices that contributed to the regression model are used as farm yard manure, dumped around the farm, burnt and buried in a pit, sun-dried and burnt and used as part of poultry feed ingredient. These factors explained 62.3% of the observed variations in the constraints faced in waste management methods adopted by the farmers. The null hypothesis is therefore rejected and the alternative is accepted.

Used as farm yard manure, burnt and buried in a pit, sun-dried and burnt and given freely to interested farm workers had inverse significant relationship to constraints faced by respondents in management practices. This implies increase use of poultry waste as farm manure and given freely to interested farm workers or the public will likely reduce the quantity of waste to dispose and hence challenges of disposing it.

Dumping of poultry wastes around the farm, nearby bush and to animals such as dogs had positive significant relationship to constraints faced by respondents in management practices. This implies increase management of poultry wastes through dumping of

**Table 4.** Mean distribution of method of waste disposal practiced

Waste disposal method	Kogi State (Mean score)	Kwara State (Mean score)	Pooled mean
1. Poultry wastes are dumped around the farm	2.15	2.30	2.23
2. Poultry wastes are used as farm yard manure	2.03	2.03	2.03
3. Poultry wastes are dumped in a nearby bush	2.08	2.10	2.09
4. Poultry wastes are dumped in a far bush or open waste land	1.87	1.20	1.54
5. Poultry wastes are sold to the public to be used for farming	1.47	1.19	1.33
6. Poultry wastes are given free to the public to be used for farming	2.18	2.13	2.16
7. Dead birds are buried in a pit near the farm	2.12	2.03	2.08
8. Dead birds are thrown into a nearby bush	2.42	1.60	2.01
9. Dead birds are burnt inside a pit or in a heap near the farm	2.08	1.94	2.01
10. Dead birds are burnt inside an incinerator on the farm	1.29	1.30	1.30
11. Dead birds are given to animals such as dogs etc to eat	1.40	1.78	1.59
12. Dead birds are sold or given freely to interested members of the public	1.42	1.65	1.54
13. Dead birds are given freely to interested farm workers	1.34	1.68	1.51
14. Poultry wastes are sun-dried and burnt	1.38	1.56	1.47
15. Poultry wastes are sun-dried and sold to be used for farming	1.47	1.66	1.57
16. Poultry wastes are channelled into nearby stream or river through open canal	1.62	1.64	1.63
17. Slurry wastes are channelled into farmer's farm for irrigation	1.29	1.41	1.35
18. Poultry wastes are flushed into a soak away pit beside the farm	1.33	1.59	1.46
19. Poultry wastes are channelled to farmer's fish farm to be used as feed	1.24	1.26	1.25
20. Poultry wastes are sold to fish pond owners to be used as fish feed ingredient	1.44	1.23	1.34
21. Poultry wastes are dried and used as part of poultry feed ingredient	1.19	1.22	1.21
22. Poultry wastes are used for the generation of bio-gas	1.00	1.00	1.00

Note: Likert type scale used: always = 3, sometimes = 2, never = 1  
 Source: Field survey, 2015

poultry wastes around the farm, nearby bush and to animals such as dogs will increase the challenges faced in managing poultry waste. This is because most of the wastes dumped in the nearby bush and around the farm may further pose some environmental disaster to the bird and farm neighbours through air.

**CONCLUSION AND RECOMMENDATIONS**

Based on findings in the study, it was concluded that poultry waste management practices in the study area were confronted by a high level of constraints. Major constraints were lack of awareness on how to use poultry wastes productively, no agricultural

**Table 5.** Mean distribution of method of waste treatment (N = 1.14)

Method of Waste Treatment	Mean Kogi State	Mean Kwara State	Pooled mean
Chemical	1.54	1.67	1.61
Burning	2.07	1.74	1.91
Combination	1.13	1.12	1.13

Likert-type scale used: always = 3, sometimes = 2, never = 1  
 Source: Field survey, 2015

**Table 6.** Mean distribution of constraints encountered to effectively dispose and utilize poultry wastes

Constraints to waste disposal	Mean Kogi State	Mean Kwara State	Pooled mean	Implication
1 No agricultural land nearby where the wastes can be used	3.51	3.87	3.69	High
2 Lack of awareness on how to use the wastes productively	3.98	4.14	4.06	High
3 Insufficient farm labour.	2.85	3.10	2.98	Low
4 High transportation cost	3.45	3.02	3.24	High
5 High cost of private waste management agencies	2.87	3.14	3.01	High
6 High cost of chemical treatment	3.30	3.81	3.56	High
7 Excessive odour from waste	3.27	4.05	3.66	High
8 Delayed removal by waste collection agents	2.81	3.08	2.95	Low
<b>Grand mean</b>			3.39	

Likert-type scale: very serious = 5, serious = 4, not serious = 3, not a constraint = 2, undecided = 1  
 Source: Field survey, 2015

**Table 7.** Result of the multiple regression of the constraints faced as determinants of the waste management methods adopted by poultry farmers

Variables	Unstandardized Coefficients		t	P-value
	B	Std. Error		
Used as farm yard manure	-0.483*	0.121	-6.203	0.000
Dumped around the farm	0.304**	0.093	2.354	0.020
Dumped in a nearby bush	0.365*	0.105	3.244	0.002
Sold to the public to be used for farming	0.016	0.092	0.189	0.851
Burnt and buried in a pit	-0.241*	0.055	-2.873	0.005
Sun-dried and burnt	-0.278**	0.145	-2.612	0.010
Given to animals such as dogs etc. to eat	0.365*	0.105	3.244	0.002
Given freely to interested farm workers	-0.263**	0.060	-2.342	0.021
Used as part of poultry feed ingredient				

**R<sup>2</sup> = 0.623**  
**F = 3.598, P < 0.01**

Note: \*\*, \* implies significant at 5% and 10%, respectively

land nearby where the wastes can be used, excessive odour from waste, high cost of chemical treatment, high transportation cost and high cost of private waste management agencies.

The study therefore recommends that:

Lack of awareness on how to use the wastes productively was the leading constraints found in the study. Hence, it is suggested that agricultural extension organisations and existing Poultry Farmers Association should include programmes that will enlighten members on poultry waste management practices that will not have negative affect their birds and the environments.

Agricultural extension organisations should specifically include design programmes that will reduce the following challenges of no agricultural land nearby where the wastes can be used, excessive odour from waste, high cost of chemical for treatment, high transportation cost to convey waste and high cost of disposal through private waste management agencies among poultry farmers in the study area.

It is suggested that waste management practices such as dumping of poultry wastes around the farm, nearby bush and to animals such as dogs should be discouraged, as those practices were found to pose further challenges in poultry waste management.

## REFERENCES

- Akinbile C. O. (2012): Environmental impact of landfill on groundwater quality and agricultural soils in Nigeria. *Soil and Water Research* 7(1): 18–26.
- Ekong E. E. (2003): *An Introduction to Rural Sociology* (2nd ed.), Dove Educational Publishers, Ugo, Nigeria p. 271.
- FAO (2006): *Livestock Impacts on the Environment*. Agriculture and Consumer Protection Department of Food and Agriculture Organization of the United Nations: Retrieved January 10, 2016 from [www.fao.org/ag/magazine/0612sp1.htm](http://www.fao.org/ag/magazine/0612sp1.htm)
- Ja'afar-Furo M. R., Gabdo B. H. (2010): Identifying major factors of poultry production as sustainable enterprise among farmers using improved methods in rural Nigeria. *International Journal of Poultry Science*, 9: 459–463.
- Kwara state (2010): Kwara state Government. Retrieved February 20, 2016 from [www.kwarastate.gov.ng/about-kwara-state](http://www.kwarastate.gov.ng/about-kwara-state)
- Moreki L. C., Chiripasi, S. C. (2011): Poultry waste management in Bostwana: A review. *Online Journal of Animal and Feed Research* 1: 285–292.
- Moreki J. C., Keaikitse T. (2013): Poultry waste management practices in selected poultry operations around Gaborone, Botswana. *International Journal of Current Microbiology and Applied Sciences* 2: 240–248.
- Nebraska Department of Environmental Quality (2005): Fact Sheet on 1999 Livestock Legislation. Retrieved January 25, 2016 from <http://www.deq.state.ne.us/Priority.nsf/pages/factsh2>
- National Population Commission (NPC) (2006): *The Nigeria Population Census, 2006*. [http://www.population.gov.ng/index.php?option=com\\_content&view=article&id=89](http://www.population.gov.ng/index.php?option=com_content&view=article&id=89) (Retrieved on 12 December, 2016).
- Ojo S. O. (2003): Productivity and Technical Efficiency of Poultry Egg Production in Nigeria. *International Journal of Poultry Sciences* 2: 456–464.
- Oladeebo J. O., Ambe-Lamidi A.I. (2007): Profitability, Input Elasticities and Economic Efficiency of Poultry Production among Youth Farmers in Osun State, Nigeria. *International Journal of Poultry Science* 6: 994–998.
- Olasunkanmi M. B. (2008): Economic performance of Commercial Poultry Farms in Oyo State Nigeria. *International Journal of Poultry Science* 7: 1117–1121.
- Olumayowa O., Abiodun O. O. (2011): Profit efficiency and waste management in poultry farming: The case of Egba Division, Ogun State, Nigeria. *International Journal of Poultry Science* 10 (2): 137–142.
- Omotosho O. A., Ladele A. A. (1988): Management problems in large scale poultry business in Nigeria. *Farm Management Association of Nigeria Journal* 3: 27–35.
- Yinusa M. B. (1999): *North farms alone: A study of rural livelihoods in the middle belt of Nigeria*. DARE ASLD working paper 38. Retrieved April 10, 2016 from <https://openaccess.leidenuniv.nl/handle/1887/416>

*Received: February 9, 2017*

*Accepted after revisions: February 14, 2018*

---

**Corresponding author:**

**Sola Emmanuel Komolafe**

Department of Agricultural Extension and Rural Development

University of Ilorin, PMB 1515, Ilorin, Nigeria

E-mail: kemmas04@yahoo.com