International Journal of Agricultural Extension and Rural Development Studies

Vol.4 , No.1, pp.1-22, February 2017

Published by European Centre for Research Training and Development UK (www.eajournals.org)

ADOPTION OF IMPROVED FEED PRODUCTION TECHNOLOGIES BY POULTRY FARMERS IN AKWA IBOM STATE, NIGERIA

IDIO, A. D. and Okoro, G. I.
Department of Agricultural Economics and Extension,
University of Uyo, Uyo, Nigeria

ABSTRACT: *Own – poultry - feed producers in Akwa Ibom State are producing low quality feeds for their birds, resulting in poor quality chicken and eggs supplied for consumption. Adoption of improved feed production technologies is central to meeting expected feed standards in the poultry industry. While the value of improved feed production technologies have been recognized for feed enrichment and fortification, there is dearth of information about own – poultry - feed producers' level of adoption of improved feed production technologies in feeds production in Akwa Ibom State. Therefore, own – poultry - feed producers' awareness and level of adoption of improved feed production technologies in feeds production in Akwa Ibom State were investigated. Using Akwa Ibom State Agricultural Development Project (AKADEP), an extension parastatal of Akwa Ibom State Ministry of Agriculture, responsible for extension services delivery in the state, as the sampling frame with 540 registered poultry farmers, a multistage sampling technique was used to select 190 respondents for the study. A validated structured questionnaire with items on awareness and adoption of improved feed production technologies was administered to the sample. Data were subjected to both descriptive and inferential statistical analysis. Results showed that males constituted 54.2% of the respondents; mean age was 38 yrs ± 2.1 with 3.5% between 30 and 39 years; above sixty percent (60.5%) of the respondents were University graduates and 87.0% had monthly income less than ₦74, 500.00. Few (31.1%) belonged to livestock and livestock-related organizations. All the respondents (100%) were not aware of mould inhibitors, salmonella inhibitors, acidifiers, enzymes and mycotoxin eliminators. More than half (56.8%) of the respondents were aware of pre-mixes, anti-oxidant, anti-caking, protein concentrates and antibiotics. Fellow poultry farmers were the major (43.6%) source of improved feed production technologies information to the respondents, while print and electronic media accounted for 25.0% of source of information on improved feed production technologies and/or awareness to the respondents. More than forty three percent (43.6%) of the respondents adopted protein concentrates in their feeds production. Forty-one percent of the respondents adopted pre-mixes, anti-caking, anti-oxidants and antibiotics in their feeds production. Sex, educational level and social participation were significantly associated with improved feed production technologies adoption (X^2=8.27, $p \leq 0.05$; $x^2 = 8.44$, $p \leq 0.05$; and $x^2 = 17.36$, $p \leq 0.05$, respectively). Similarly, awareness of the improved feed production technologies was significantly associated with its adoption ($X^2 = 8.27$, $p \leq 0.05$). Total lack of adoption of mould inhibitors, salmonella inhibitors, acidifiers, enzymes and mycotoxin eliminators could negatively affect poultry feeds and predispose birds to infections, thereby reducing the quality of these products. There is a need for the extension delivery system to improve on their service delivery approach and packaging of feed production technologies information to enhance their adoption.*

KEYWORDS: Poultry farmers, feed production technologies, poultry feeds.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

INTRODUCTION

Poor nutrition and poor reproductive management are the two most important constraints to livestock productivity in Africa (Makkar, 2000). The basic reason for poor nutritional management of livestock in developing countries is the inadequacy of feed, both in quantity and quality. The resulting deficiencies have rarely been corrected by conservation, and, or, supplementation, often, for lack of infrastructure, technical know-how, poor management and lack of sufficient funds. In addition, many feed resources that could have a major impact on livestock production continue to be either unused, or poorly utilized. Inadequate understanding of the nutritional principles underlying the utilization of the feed resources constitutes yet another critical factor.

Formulated feed has been shown to greatly improve the feed conversion efficiency and, the value of improved feed production technologies have been recognized for feed enrichment and fortification (Ziggers, 2000). The various complementary sources of feed ingredients or improved feed production technologies include vitamins, minerals and trace elements premixes; anti-oxidants; mould inhibitors toxin binders; salmonella inhibitors and acidifiers. Others are enzymes, mycotoxin eliminators, anticakings, antibiotics, flavours, sweeteners and feed colours.

Improved feed production technologies, Wand (2002) observes, offer feed compounders and livestock producers a consistent and complete reliable source of micronutrient elements for all molecular and cellular needs of farm animals. However, modem techniques have led to a more refined definition of the health benefits of, and requirements for some of these micro ingredients (Wiseman, 1986; Mcdonald, Edward, and Greenhalgh., 1995; Esonu, 2000; Biesalski, 2001):

(a) Vitamins, minerals and trace elements premixes: These are mixtures of some single vitamins, mineral and trace elements in proportion according to daily requirements of livestock for:

(i) maintenance of normal body functions and health;
(ii) enhancement of digestion, absorption, excretion, and body weight gain:
(iii) enhancement of metabolism, egg production and hatchability;
(iv) enhancement of development and maintenance of epithelial tissues:
(v) enhancement of cell permeability; and
(vi) improvement of vision.
Bio-mix. zoodry, vitadiz, frank wright, agricare, godomix, embavit, atn, prime and vital premixes and many more are the various brand names of premixes in Nigerian poultry feed industry.

(b) Antioxidants: These are substances that first, following their absorption by livestock from the gastrointestinal tract, participate in physiological, biochemical, and cellular processes that

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

inactivate free radicals or prevent free radical-initiated chemical reactions; secondly, when introduced into feed, suppressed free radicals and prevent feed from becoming rancid. Vitamins are prone to destruction should feed go rancid. Therefore, where manufactured feed is to be stored for a long time or in a case where oil is added in the feed, antioxidants are included. They generally protect vitamin A, D, E and K from being destroyed. Examples of common antioxidants are butylated hydroxytoluene (BHT) and propyl galate. Vitamins E and C are natural antioxidants. Others are superoxide dismutases, catalases, thioredoxin, glutathione peroxidases, methionine, sulfoxide reductase, transferrin faro-oxidase. ferritin and ceruloplasm.

(c) Mould inhibitors: Mould inhibitors or antifungals are substances used to prevent harmful moulds from growing in the feed or in the digestive tracts of poultry or pigs. Examples of antimould agents are propionic acid, sodium propionate, sorbic acid, and gentian violet. Benzoic acid is highly effective in inhibiting the growth of moulds in feeds.

(d) Salmonella inhibitors: Salmonella inhibitors or antimicrobials are substances used to prevent harmful microbes like salmonella from being present in the feed and causing problems to poultry when ingested. Raw materials, especially, of animal origin transmit pathogenic organisms to feeds including salmonella. Salmonella causes yolk sac disease in poultry. The use of antimicrobials inhibits the harmful effect of these undesirable factors in feed. Examples of salmonella inhibitors include salscap and salstop.

(e) Mycotoxin eliminators: Mycotoxins are toxic factors in feed. Examples of mycotoxins include afflatoxins, pesticide residues, herbicide residues and many more. Feed raw materials contain a wide variety of undesirable toxic factors which limit the extent to which they may be included in feeds for specific classes of livestock. Mycotoxin eliminators are substances used in treatment of feed raw materials to check the levels of these undesirable toxic factors and in feeds to prevent them from exhibiting characteristics of toxic infection. Example of mycotoxin eliminator is elitox.

(f) Acidifiers: These are highly effective reducing agents. They participate in a large number of redox processes in which single electron transfer or hydroxylation takes place. Hydroxylation reactions are of key importance in the deactivation of drugs and toxins. Examples of acidifiers are acidal, and ascorbic acid.

(g) Antibiotics: These are chemical substances produced by microorganisms, which in minute quantities, inhibit the growth of other microorganisms or even destroy them. Antibiotics are classified into two (Nagy, 1980; Mcdonald et al, 1995), namely, broad-spectrum and narrow-spectrum antibiotics. Broad-spectrum antibiotics inhibit the growth of a wide range of microorganisms. Narrow spectrum antibiotics inhibit the growth of one or a small number of other microorganisms. In poultry, the rate of response to antibiotics varies with the standard of health, management and age of the bird.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Turkey poults, for example, respond better than chicks with increase of up to 15% in growth rate (Nagy, 1980; Mcdonald et al, 1995). Average response to feeding antibiotics is found to be about 5% improvements in the efficiency of feed utilization (Nagy, 1980; Mcdonald et al, 1995). The response is greater where the standards of hygiene and management are poor, and in young rather than older animals and when an all vegetable proteins ration are fed (Nagy, 1980; Mcdonald et al, 1995). It is probable that the improvements in productivity achieved by the use of antibiotics are mainly due to the suppression of sub-clinical infections, although there might be other effects (Nagy, 1980; Mcdonald et al, 1995). Low intake of antibiotics is known to improve productivity of pigs, poultry and calves (Nagy, 1980; Mcdonald et al, 1995). Prolonged use of antibiotics in livestock feeds at recommended levels is unlikely to become a health hazard to the consumers of the animal products (Nagy, 1980; Mcdonald et al, 1995). Examples of antibiotics that are commonly used are tetracycline. tetramycin, chloramphenicol, penicillin, neomycin, erthromycin, bacitracin, chlortetramycin, flavomycin and moneusin.

(h) Enzymes: Enzymes are organic catalysts elaborated by living organisms. They are capable of increasing rates of reaction by a factor of at least 10_6 (Wiseman, 1986; Biesalski, 2001). The treatment of poultry feeds with enzymes is recently an accepted method of enhancing the nutritional value of poultry feeds (Wiseman, 1986; Biesalski, 2001). Enzymes improve the digestion of non-starch polysaccharides and of plant derived phosphorus (Wiseman, 1986; Biesalski, 2001).

The former is achieved by adding exogenous polysaccharidase enzymes, which have the additional advantage that birds fed in this way keep their litter drier. The later is achieved by supplementing with phytase enzymes either from phytase-rich cereals or by using phytase of fungal origin (Wiseman, 1986; Biesalski, 2001). This development is important because two-third of phosphorus in plant tissues is in the form of phytate phosphorus which is not readily available to poultry (Wiseman, 1986; Biesalski, 2001).

(i) Animal protein concentrates: These are mixture of meat and bone meals, fish meal, blood meal, feather meal, milk products such as whole milk, whey, skim milk, and some offals such as haddock and cod. Other materials used in the production of protein concentrate are anchovies, capelin, and menhaden. Protein concentrates can be directly fed to poultry but in much smaller amounts than conventional formulated feeds or have some macro or primary feed ingredients such as grains, offal, and cakes added to it before being fed to the birds. Protein concentrates are not used primarily as a source of protein but as a short cut to feed making and for correcting deficiencies of certain indispensable amino acids from which poultry and other non-ruminants may suffer when they feed on all-vegetable protein diets.

Protein concentrates often make significant contribution to the poultry mineral nutrition as well as supplying various vitamins of the B-complex, especially, riboflavin, choline, nicotinamide and B_{12}.

(j) Aromas / flavours: These are palatability enhancers or palatants. Flavours are included in feeds to provoke a response from the animals senses, to improve feed intake in situations where

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

this is a limiting production factor. Aromas or Flavours are included in feeds at dosages ranging from 100grams to 1000 grams per metric ton depending on the product intensity or concentration. Examples include fish, chicken, meat, orange flavours and many more.

(k) Sweeteners: Like flavours, Sweeteners are palatability enhancers. They are also included in feeds to provoke a response from the animals' senses and to improve feed intake in situations where this is a limiting production factor. Sweeteners are included in feeds at dosages ranging from 100grams to l000grams per metric ton depending on the product intensity or concentration.

Wand (2002) adds that the addition of these feed technologies to feed supplements like urea - molasses, multi-nutrient blocks, high quality forages, brewery residues, kitchen waste, and residues from farm mills, and, to rations for enrichment and fortification in the case of compounded or formulated feeds will not only enhance livestock performance, but will also introduce a sustainable farming practice that will ensure a continuous supply of quality livestock and its products. This is an indication that healthy livestock production is dependent upon adoption of improved feed and production of improved feed is derived from adoption of improved feed production technologies.

In Nigeria, great potentials exist for the development of the livestock sub-sector through the adoption of improved feed production technologies in livestock feeds production since this offers an attractive solution to the problem of nutritional management of livestock. Emeruwah (1999) noted that with the ban on the importation of maize which constitutes at least 60 percent of poultry feed, coupled with the ban on concentrates and other inputs, there has been insufficient production of quality feeds. Orok (l990) reported that a critical feature of the Nigerian livestock sub-sector is that livestock farmers largely depend on feeds from toll millers and commercial mills and this has posed severe quality and quantity margin challenges to livestock farms.

Insufficient large scale production of high quality poultry feeds for poultry farmers have therefore been confirmed even when high feed quality have been adjudged to have great impact on effective and efficient poultry production.

To meet the demand for local supplies of high quality feeds, many local and international micronutrient manufacturers like Bio - Organics Nutrients Systems Limited, Pfizer, Roche BV, Livestock Feeds Plc, Agrited, Frank Wright, Grand Cereals and Oil Mills Limited and many more have embarked on massive production and distribution of very high quality feed technologies to feed producers for adequate enrichment and fortification of animal feeds. These has brought about several changes in Nigeria's poultry industry in terms of aims, tasks, and trends, particularly, the adoptions of own-feed production and improved feed production technologies in feeds production.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

In Akwa lbom State, poultry farmers are also adopting own feed production for their farms. There is lack of information about their rate of adoption of improved feed production technologies in their feeds production for their poultry birds.

Inspired by the relationship between improved feed production technologies and good quality feed based on enrichment and fortification of the later by the former, this study attempted to fill an information gap on the rate of adoption of improved feed production technologies as a means of tackling feed quality problem for an increased and sustainable poultry production in Akwa lbom State.

METHODOLOGY

This study was carried out in Akwa lbom State, Nigeria. Akwa lbom State was created from Cross River State on September 23, l987. Akwa lbom State has a total population of 3,920,208 citizens (Government of Akwa lbom State, 2001). It has thirty one Local Government Areas (LGAS), and these thirty one LGAS are grouped into six agricultural zones. All the six agricultural zones are managed by Akwa lbom Agricultural Development Programme (AKADEP). Akwa lbom State lies between latitude $4^{o}32^{1}$ and $5^{o}33^{1}$ north and longitude $7^{o}25^{1}$ and $8^{o}25^{1}$ east. It is bounded on the north by Abia and Cross River States, in the south by Atlantic Ocean, on the west by Rivers and Abia States and on the east by Cross River State.

Akwa lbom State has an area of 7,246.01 sq km. It has basically two main seasons: rainy and dry seasons. The rainy season begins from April to October while the dry season starts from November to March. The temperature is moderately high throughout the year and varies between 29°C and 34^{0}C. Akwa lbom State belongs to the south-east agricultural zone of Nigeria by the l997 Agricultural zones creation by the then federal military government. It has a high potential for Agriculture. Akwa lbom State is suitable for wildlife conservation, food crops farming, tree crops farming, fish farming and livestock farming. Agriculture is pursued by about eighty percent of the working population, all at a small-medium scale level; out of which 30% are engaged in poultry farming (Government of Akwa lbom State, 2001).

Akwa lbom State Agricultural Development Project (AKADEP) was used as the sampling frame with six agricultural zones and 540 registered poultry farmers across the zones. The study population consisted of all poultry farmers in Akwa lbom State.

A multi-stage sampling technique was used in the selection of respondents for this study. The first stage, designed to capture a greater number of poultry farmers in order to have a reasonable sample size for the study, involved purposive selection of medium and large scale poultry farmers from a list of registered poultry farmers in the State obtained from AKADEP.

The list had a total of five hundred and forty registered poultry farmers with a total flock size of four hundred and twenty eight thousand birds. Poultry farmers were grouped into small scale

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

(less than 500 birds), medium scale (500- 1000birds) and large scale (more than 1000 birds). This classification was adapted from Bukar, Aliyu, and Bakshi (1997) and Obori (1999).

For justification of economic necessity and farms exposure to the effects of quantity and quality deficiencies of poultry feeds, the study excluded small scale poultry farmers, and made use of only the medium and large scale poultry farmers. Having done these, there were three hundred and nineteen medium and sixty one large scale poultry farmers, giving a total of three hundred and eighty medium and large scale farmers in the State.

In the second stage, on one hand, out of the three hundred and nineteen medium scale poultry farmers, one hundred and twenty nine were selected through simple random sampling technique. This was about forty percent of the total number of the medium scale poultry farmers in the State. On the other hand, all the sixty one large scale poultry farmers were purposively selected, giving a total of one hundred and ninety respondents for the study. Table 1 shows the sampling procedure and sample size for the study.

Table 1: Agricultural Zones in Akwa Ibom State, Nigeria showing total Number of poultry Farms selected

Agricultural zones	**Number of poultry farms of medium and large scale size**			**Number of poultry farms selected**		
	Medium	**Large**	**Total**	**Medium**	**Large**	**Total**
Abak zone						
Abak	21	5	26	8	5	13
Etim Ekpo	16	0	16	8	0	8
Ika	10	0	10	5	0	5
Oruk Anam	4	0	4	2	0	2
Ukanafun	9	3	12	3	3	6
Etinan Zone						
Etinan	12	2	14	5	2	7
Nsit Ibom	12	4	16	4	4	8
Nsit Ubium	11	0	1	8	0	8
Okobo	4	5	1	4	4	8
		0	4	2	0	2
Eket Zone						
Eket	16	4	20	6	4	10
Esit Eket	12	0	12	6	0	6
Eastern Obolo	4	0	4	2	0	2
Ikot Abasi	4	0	4	2	0	2
Ibeno	0	0	0	0	0	0
Mkpat Enin	6	2	8	0	2	2
Onna	12	4	16	2	6	8
Oron Zone						
Oron	10	6	16	3	5	8
Urueoffiong Oruko	12	0	12		0	6

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Mbo	10	2	12	4	2	6
Udung Uko	10	0	10	5	0	5
Uyo Zone						
Ibiono Ibom	10	0	10	5	0	5
Itu	10	2	12	4	2	6
Uyo	16	8	24	4	8	12
Uruan	10	6	16	4	6	10
Ibesikpo Asutan	14	2	16	6	2	8
Ikot Ekpene Zone						
Obot Akara	4	0	4	2	0	2
Ikot Ekpene	10	4	14	3	4	7
Essien Udim	9	1	10	4	1	5
Ikono	16	0	16	8	0	8
Ini	9	1	10	4	1	5
Total	319	61	380	129	61	190

Source: Field Survey, 2015

A structured questionnaire divided into four sub-sections on the basis of each of the specific objectives of the study including personal characteristics of the poultry farmers, awareness of the technologies, sources of awareness, and adoption of the technologies was used to elicit information from poultry farmers. Only primary data were collected for the study.

Data collected were coded and subjected to statistical analysis. Both descriptive and inferential statistical techniques were used for data analysis and were tested at five percent level of significance. Descriptive statistical tools used included frequency counts, simple percentages and mean. The inferential statistical tool used were Chi – square and PPMC.

A chi-square analysis was utilized to find whether or not there were significant relationships among the personal characteristics of poultry farmers in Akwa lbom State and the adoption of improved feed production technologies in their farm operations. Chi-square was adopted because the data set of selected personal characteristics were obtained at nominal level of measurement while that of adoption was obtained at an interval level and was sub-categorized into 3 levels-low adoption, average adoption and high adoption.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

RESULTS AND DISCUSSION

Personal characteristics of poultry farmers in Akwa Ibom State

Table 2: Percentage distribution of respondents on the basis of their personal characteristics (n-190)

Characteristics	Frequency	Percent	Mean
Sex			
Male	103	54.2	
Female	87	45.8	
Age (years)			
Below 29	8	4.2	
30-39	68	35.8	
40-49	58	30.4	38
50-59	49	25.9	
60+	7	3.7	
Level of Education			
Non-Formal Education	0	0.0	
Primary Education	0	0.0	
Adult Education	8	4.2	
Secondary Education	13	6.8	
O.N.D/N.C.E./H.N.D	54	28.4	
B.Sc and Above	115	60.5	
Marital Status			
Single	88		
Married	96	50.5	
Divorced	2	1.1	
Widowed	4	2.1	
Household size			
1-4	103	54.2	
5-8	76	40.0	5
9-12	11	5.8	
Secondary occupation			
Piggery	8	4.2	
Fishing/fish farming	9	4.7	
Crop farming	10	5.3	
Commodities trading	33	17.4	
Working in public service	90	47.4	
Engaging in supplies and contract work	31	16.3	
Hairdressing	3	1.6	
Tailoring	6	3.2	
Estimated monthly income (N)			
Below 74,500	164	87.0	
74,501 – 133,000	18	19.3	
133,001 – 191,500	3	1.6	79,800.60
191,501 – 250,000	4	2.1	

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Social participation		
Livestock and livestock – related organizations	59	31.1
Farmers' union	7	3.7
Farmers cooperative	16	8.4
Credit cooperative	55	28.9
Traditional crafts union	4	2.1
Labour groups	11	5.8
Trade union	36	18.9
Others	2	1.1

Source: Field survey, 2015

Table 3: Chi-square analysis of the relationship between the adoption of improved feed production technologies and some selected personal characteristics of poultry farmers in Akwa Ibom State

Item	Variable	X^2 value	Df	p-value	Remark
1	Sex	0.271	2	0.004	Sig. *
2	Educational Level;	8.414	5	0.038	Sig.
3	Estimated income	5.525	3	0.035	Sig.
4	Social participation	17.339	8	0.015	Sig.

*sig = significant

Sex

The result (Table 2) shows that 54.2 percent of the respondents were males, while 45.8 percent were females. This result shows that males are more involved in poultry farming in Akwa lbom State than females. This sex distribution confirms (Abasiattai (1994) assertion that the people of Akwa lbom State traditionally would rather depend on small and medium scale livelihood activities as a source of income generation and money reserve than waiting endlessly for a government's white collar job and shows a commitment to the traditional role - playing of the male sex as breadwinners requiring them to have a source of income generation, particularly when they transit from the stage of family dependence to active and productive independent life.

It further suggests a concerted effort by the male population in the fight against animal protein deficiency, using poultry and a support by the female sex, thereby making it a collective concern to ensuring protein availability to Akwa lbom citizens. Having a source to generate income in order to provide for the family is an act that helps males sex to impress their paternal and masculine authority over their households. Financial demands on women are less, as they are expected to make only a little support to family breadwinning.

Chi-square analysis of the relationship between the adoption of improved feed production technologies and some selected personal characteristics of poultry farmers in Akwa lbom State (Table3) revealed that sex had a chi-square value of 8.271 and an asymptotic significance of 0.004. Since the significance value was lower than the p-value, then the test of influence or relationship was significant.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

This implies that sex of poultry farmers influenced the adoption of improved feed production technologies. Akwa lbom State traditional assumptions are based on the fact that males (fathers) are the economic providers for the family or household (Abasiattai, 1994). A larger percentage of males engaging in poultry farming were symbolic as income providers for their family in the State, hence would adopt innovations that will help boost their efforts of income generation.

Age:

The result (Table 2) shows that 35.8 percent of the respondents, which was the largest age bracket, were between 30 -39 years of age, 30.4 percent were between 40 - 49 years of age, 25.9 percent were between 50-59 years, 4.2 percent were below 29 years and 3.7 percent were above 60 years of age. The mean age of the poultry farmers was 38±2.1.

This result shows that a high proportion of poultry farmers in Akwa lbom State are young or middle - aged people still in their active and productive years. This agree with the finding of Matthew (2002) that it is the middle aged group of men that predominates small and medium scale economic systems as a source of income generation and money reserve in Akwa lbom State. The group has many decision-making heads of families. The attitude of male parents towards home management especially in the rural Akwa lbom State communities as reported by Etim (2001) shows that most male parents or heads of families are keen and committed to strategies of improving productivity especially as regards their livelihood activities to ensure better living standard for their families.

Education:

All the respondents in the study area had formal education. Those who attained secondary education were 6.8 percent, adult education were 4.2 percent, OND/NCE/HND were 28.4 percent, B.Sc. and above were 60.5 percent (table 2).

The result suggests that education is probably one of the main thrusts of successful poultry management. Technologies changes on a continual basis, therefore, acquisition of formal education is necessary for poultry farmers to enable them understand scientific agriculture (Obibuaku, 1983); keep current within the industry (Olawoye, 2001); adapt technologies to their own needs, assess needs and priorities and plan to reduce nutritional deprivation in poultry farms. New ideas or innovations in agriculture can only be effective when the farmers are able to appreciate the needs and understand how to apply them in the business of farming (Hamidu et al, 2003). Education increases the farmers' stock of knowledge and enhances agricultural development from static to dynamic position.

Chi-square analysis of the relationship between the adoption of improved feed production technologies and some selected personal characteristics of poultry farmers in Akwa Ibom State (Table 3) shows a chi-square value of 8.414 and an asymptotic significance of 0.035 for education. This indicates that there is a significant relationship between educational level and adoption of improved feed production technologies by poultry farmers in the State, since the

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

significance value is less than the stated p-value. Educational background has been linked to better mental ability (Udoh, 1992). Persuading farmers to accept and use innovation and relevant information have often proved to be a difficult task. Good education would undoubtedly help farmers to appreciate with ease the need to adopt improved feed production technologies and gain equal access to the adoption benefits. Good education would equip them with the knowledge and skills they would need to survive in the business.

Household Size

Table 2 shows that 54.2 percent of the respondents had 1-4 members in their houses. Forty percent had 5-8 family members and 5.8 percent had 9 – 12 members in their houses. The average household size was 5 members and this is an important factor when considering the adoption of production technologies of poultry farmers. The financial and economic aspects of household size on poultry production in many instances assume critical importance. They serve as the vehicle for coordinating and harmonizing the various analyses in a decision valuation, that is, they constitute the common denominator. Due to the labor intensiveness, small farm size and low level of mechanization, the poultry farmers rely primarily on the human efforts provided by household members. Titilola et al, (2001) hypothesized that the larger the household size, the more available hands for farm work. However, the quality and the structural composition of the household will determine the performance rather than the sheer number of individual in the household.

Marital Status:

The result shows that 46.3 percent, 50.5 percent, 2.1 percent and 1.1 percent of the respondents were single, married, widowed and divorced respectively (Table 2). This implies that a high proportion of poultry farmers in Akwa lbom State were married people. Animal protein plays a critical role in the nutrition of Akwa lbom people. The result depicts that both single men and women and married people are taking active role in poultry production in the study area, as a contribution to giving the state a future as a primary producer of animal protein for its citizenry, and to help the state‘s livestock sector to align properly with national goals in livestock production.

Secondary Occupation:

Table 2 further shows that 47.4 percent of the respondents were also working in the public service. More than seventeen percent (17.4%) were also engaged in general commodities trading. More than sixteen percent (16.3%) were also involved in supplies/contract works. More than five percent (5.3%) also engaged in crop farming, and 4.2 percent were also pig farmers and 4.7 percent were also fisher folks, while those who were also tailors were 3.2 percent. Only 1.6 percent also engaged in hairdressing.

The implication of these findings is that sole poultry production is not practiced by majority of poultry farmers in Akwa Ibom State. This suggests that poultry production practice is still at a very low level in the state as farmers are less occupied with poultry farming activities and hence

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

have time to get involved in some other occupations. A big size of operation will command full time attention of the poultry farmers without leaving any time for their involvement in a secondary occupation.

Estimated monthly income:

The result of the study (Table 2) shows that 87 percent of poultry farmers in Akwa Ibom State made below ₦74, 500.00 per month. More than nineteen percent (19.3) generated between ₦74, 501.00 – ₦133,000.00 every month; 1.6 percent generated between ₦133, 001.00 - ₦191, 500.00 every month and about 2.1 percent generated between ₦191, 501.00 - ₦250, 000.00 every month. No respondent generated above ₦250, 000.00 per month. The average monthly income generated by the respondents was ₦79, 800.60.

The implication of these finding is that as the average income generated per month is low (₦79, 800.60), poultry farmers may not be capable of making any reasonable savings from investment in poultry production. They may find themselves barely able to exist. Good income is not only important for accelerating adoption of improved feed production technologies but also for proper funding of other farm operations for farms' productivity.

Chi square analysis of the relationship between monthly estimated income and adoption of improved feed production technologies (Table 3) revealed that there exist a positive relationship as the significance value of 0.035 was lower than the stated p-value of 0.05. This suggests that the number of technologies available for adoption might have been relatively static while the revenue accruing from the business was slightly varied during each month.

Income is an important determinant of investment in poultry farming. Income is a predominant factor in feed production and feed acquisition practice. Akwa lbom State poultry farmers need nutritious, safe and abundant feed supply. Lower incomes might cause larger number of poultry farmers to take to alternatives and frequently patronize alternative vendors rather than buy quality products from convenient manufacturing outlets, not undertake on-farm feed production and adoption of improved feed production technologies.

Social participation:

Findings of the study (Table 2) reveal that 3l.l percent of the respondents were members of various livestock and livestock - related organizations. Those who belonged to credit co-operations were 28.9 percent; members of various trade unions were l8.9 percent, and members of farmers‘ cooperatives were 8.4 percent. Labor groups’ members were 5.8 percent, while 2.l percent belonged to traditional crafts unions.

These finding implies that poultry farmers in Akwa Ibom State identified with one social organization or the other. These social affiliations give them contact with source of information on new technologies and source of influence for adoption of such technologies.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

This finding agrees with Adams (1982) that the rate of adoption could be affected by social affiliation as well as technical characteristics of innovation and the personal qualities of the adopters.

Chi square analysis for the relationship between social participation and adoption of improved feed production technologies (Table 3) shows a chi-square value of 17.339 and an asymptotic significance of 0.015 for social participation. Since the significance value is less than the stated p-value, the test of relationship is significant, indicating that there is a significant relationship between poultry farmers' social participation and adoption of improved feed production technologies in Akwa lbom State.

Awareness of Poultry Farmers on improved feed production technologies

Table 4: Percentage distribution of poultry farmers according to their awareness of improved feed production technologies (n=190)

Technologies	Freq.	Awareness percent
Vitamin/mineral premixes	108	56.8
Antioxidants	108	56.8
Mould inhibitors	0	0.0
Salmoenlla inhibitors	0	0.0
Acidifiers	0	0.0
Enzymes	0	0.0
Mycotoxin eliminators	0	0.0
Anticaking	108	56.8
Anibiotics	108	56.8
Flavours	97	51.1
Sweeteners	57	30.0
Feed colours	79	51.1
Protein concentrates	108	56.8

Source: field survey, 2015

Table 5: PPMC analysis result showing the relationship between awareness of the poultry farmers and adoption of improved feed production technologies.

Variable	r- value	p-value	Remark
Poultry farmers awareness and adoption of improved feed production technologies	0.568	0.000	Sig.

The result as presented in Table 4 shows that a high proportion (56.8%) of poultry farmers were aware of vitamin/mineral premixes, antioxidants, anticaking, protein concentrates and antibiotics. Over fifty percent (51.1%) of poultry farmers were aware of flavors and feed colors. Sweeteners were known by 30 percent of the poultry farmers. All the respondents (100%) were

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

not aware of mould inhibitors, salmonella inhibitors, acidifiers, enzymes and mycotoxin eliminators.

The result agrees with the findings of Aina (1995) that awareness is one of the prerequisites for improvement on individual's endeavors and it is define as data for decision-making. Every individual needs awareness in order to take decision and every sector of the population including literate and non-literate farmers need awareness. Total lack of adoption of mould inhibitors, salmonella inhibitors, acidifiers, enzymes and mycotoxin eliminators could negatively affect poultry feeds and predispose birds to infections, thereby reducing the quality of these products.

It also confirms the opinion of Amalu. (1998) that the strategy of increasing agricultural output of any nation through modernization of production methods for farmers requires that farmers have sufficient awareness for steady and assured access to all possible incentives, agricultural credits and all input, both traditional and modern and effective utilization of the inputs. The result shows that poultry farmers in Akwa lbom State have knowledge of only a few of the improved feed production technologies and suggests that they may probably not been fully exposed to the importance of adopting feed technologies.

The null hypothesis of the study stated that poultry farmers' awareness of improved feed production technologies do not have significant influence on their improved feed production technologies adoption.

The result of PPMC analysis (Table 5) for the correlation between poultry farmers' awareness and adoption of improved feed production technologies shows a correlation coefficient of 0.568 and an asymptotic significance of 0.000. This significance value is lower than the stated p-value of 0.05 hence a positive correlation between the two variables is upheld. The result as shown in Table 5 therefore indicates that the influence was highly significant at 0.05 level of probability. By implication, the more poultry farmers were aware of improved feed production technologies, the higher the adoption and vice versa.

When a person has knowledge about innovation, then the drive to utilize innovation is provided. Awareness can lead to substantial increment in the expected income, gain in egg clutch, live and carcass weight gain and disease resistance among others.

Sources of awareness of improved feed production technologies by Poultry Farmers in Akwa Ibom State

Table 6: Percentage distribution of Akwa Ibom State poultry farmers on the basis of their sources of information or awareness on improved feed production technologies (n-190)

Source of information on awareness	Frequency	Percentage
Through enquiry from other poultry farmers	83	43.68
Extension agents	2	1.07
Through farmers groups and cooperative societies	0	0.00

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Through sales representatives	1.07	10.00
Through livestock and/or livestock-related organizations	19	3.68
Through local distributors	7	1.05
Learnt from school	30	15.18
Through print and electronic media	47	24.74
Total	**190**	**100**

Source: Field survey, 2015

The result as presented in Table 6 shows that 43.68 percent of poultry farmers became aware of improved feed production technologies through enquiries from other poultry farmers. More than fifteen percent (15.78%) had knowledge of the improved feed production technologies from their various former schools attended: whereas. 1.07 percent were aware of the improved feed production technologies through extension agents. while none got information from farmers' groups and cooperative societies. About 2 percent (1.05%) had their information through local distributors, while 24.74 percent had improved feed production technologies awareness through print and electronic media. Ten percent were aware of improved feed production technologies through sales representatives while 3.68 percent were aware of the technologies through livestock and/or livestock - related organizations.

This result is in support of Olawoye (1985) assertion that the advantages of innovation may not be realized if the message therein is not appropriately delivered to the users for awareness and adoption

Poultry Farmers' Adoption of Improved Feed Production Technologies in Akwa lbom State.

As shown in table 7, a hundred percent of the following technologies had zero rate of adoption: mould inhibitors, Salmonella inhibitors, acidifiers, enzymes and mycotoxin eliminators. This suggests that there was no application of these technologies in poultry feeds production in the poultry industry in Akwa lbom State. At 350g per ton of poultry feed, only 40.5 percent of the following technologies were adopted: antioxidant, anticaking and antibiotics. Flavors adoption was only 16.3 percent at 350g per ton of feed, sweeteners 12.6 percent and feed colors 28.9 percent. At the rate of 380g per ton of feed, only 0.5 percent of the following technologies were adopted: antioxidant, anticaking and antibiotics. At 2.5kg per ton of feed, 39.5 percent adopted vitamin/mineral premixes and 6.2 percent adopted protein concentrates. At the rate of 5kg per ton of feed, 36.9 percent adopted protein concentrates and l.6 percent vitamin/mineral premixes.

The result indicates that application of protein concentrate appears to be the traditional and dominant method for maintaining feed quality used by poultry farmers in Akwa lbom State. Concentrates are made of various grains-sorghum, millet, wheat, oats, barley, maize- and

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

cassava, with leaves, nuts and other natural protein sources. Also added are minerals and vitamins.

The result confirms that a mixed technology is still in use in the study area thereby confirming Lamorde (1997) assertion that some farmers still practice mixed technologies in Nigeria. Mixed technology is incompatible with targeted intensive production.

Productive poultry practice requires good all round macro as well as micro ingredients in their right quantities in feed. These desirable characteristics demand generous and careful fortification and enrichment of feeds with more advanced technologies for birds right from day-old-chicks and throughout the animals' lives.

These results have implication for technology diffusion in Akwa lbom State. First, it shows that dissemination decision and implementation have received very limited or no attention by persons and agencies responsible for it. Secondly, the result provides a strong case for extension and other farmer contact variables to expand the scope of their activities to include necessary feed support for rapid attainment of desired improvement goals. . There is a need for the extension delivery system to improve on their service delivery approach and packaging of feed production technologies information to enhance their adoption.

The adoption scores of the 13 selected improved feed production technologies indicated a highest adoption score of 43.6 percent for protein concentrates. Also 41.1 percent adoption score was found for vitamin and mineral premixes. A total adoption score of 41 percent was found for each of antioxidant, anticaking and antibiotics. Feed colors and flavors had adoption scores of 28.9 percent each. The lowest adoption score of 21 percent was found for Sweeteners. Zero adoption was recorded for mould inhibitors, salmonella inhibitors, acidifiers, enzymes and mycotoxin eliminators.

Low rates of adoption of improved feed production technologies suggest that farmers are apathetic to the adoption of new technologies and improved farming operation. Low adoption score may also indicate that farmers have not been sufficiently aware of the technologies and lack the motivation to change their feed quality maintenance practices.

Generally, this is indicative that adoption of improved feed production technologies in Akwa lbom State is at the beginning stages and, at the lowest ebb.

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Table 7: Distribution of poultry farm's quantity of improved feed production technologies adopted in Akwa Ibom State (n=190).

Quantity of tech. adopted (kg/ton of feed)	Improved feed production technologies												
	Vitamin mineral premixes	Anti-oxidants	Mould inhibitors	Salmonella inhibitors	Acidifiers	Enzymes	Mycotoxin elimination	Anticakings	Antibiotics	Protein concentrates	Flavours	Sweeteners	Feed colours
0.25	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	24(24.6)	16(8.4)	0(0.0)
0.35	0(0.0)	77.((0.5)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	77(40.5)	77(40.5)	0(0.0)	31(16.3)	24(12.6)	55(28.9)
0.38	0(0.0)	1(0.5)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	1(0.5)	1(0.5)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
2.50	75(39.5)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	25(6.7)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
5.00	3(1.6)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	70(36.9)	0(0.0)	0(0.0)	0(0.0)	0(0.0)
Total quantity adopted	78(41.1)	78(4.1)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)	0(0.0)

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

SUMMARY, CONCLUSION AND RECOMMENDATIONS

The study was mainly carried out to investigate the rate of adoption of improved feed production technologies by poultry farmers in Akwa lbom State. The findings were made from 190 poultry farmers in six agricultural zones of Akwa lbom State.

Related literatures were reviewed to support the study and the research design used was ex-post - facto. The questionnaire was divided into four sub-sections reflecting the specific objectives of the study. The dependent variable was the rate of adoption of improved feed production technologies by poultry farmers in Akwa lbom State. Independent variables included selected personal characteristics of the poultry farmers and the improved feed production technologies. Three null hypotheses were formulated which were all tested at 5% level of significance. The data collected were subjected to both descriptive and inferential statistical analysis. Descriptive statistics like frequency counts and percentages were used for some selected personal characteristics of the respondents. Chi-square was used to test the relationship between personal characteristics of the poultry farmers and their rate of adoption of improved feed production technologies.

PPMC was used to test the relationship between poultry farmers' awareness and their rate of adoption of improved feed production technologies. The following results emerged:

(i) Sex, educational attainment and social participation made poultry farmers in Akwa lbom State to be receptive to innovation, perhaps as a means of generating more income to satisfy domestic demand pressures.

(ii) The more poultry farmers in the study area were aware of improved feed production technologies, the more they adopted them and vice versa.

The result of the test of the formulated hypotheses showed that a small proportion of poultry farmers in Akwa lbom State adopted improved feed production technologies. It highlighted that adoption of improved feed production technologies is a function of educational background, sex and social participation of farmers in the State.

Based on the finding of this research, the following recommendations are made to feed technologies providers, neutraceutical blending industries, researchers, sales and marketing managers of feed additives, farm scale and commercial feed compounders, toll millers, feed raw materials distributors, agricultural development project (ADPs. Non - governmental extension organizations (NGOS), veterinary practitioners, research laboratories, research institutes and policy makers that:

(i) There is need to strongly integrate into the poultry production sector in Akwa Ibom State private milling or on-farm feed compounding culture. That Way, the much felt need to balance nutritional

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

inclusions will be ascertained. On-farm feed compounding programs and promotions should be introduced and enforced.

ii. It is important to improve on information giving approach and increase the sensitization and/or awareness of poultry farmers in the study area on the available improved feed production technologies as a means of arresting the shortfall in micronutrient inclusions in feeds.

iii. Government should re-train existing extension officers on feed formulation by mounting refresher courses and promoting in – house training to update their knowledge on on-farm feed formulation and production programs.

REFERENCES

Abasiattai, M. B (1994): People and Culture of Akwa lbom and Cross River States. Modern Business Press, Uyo. p95.

Adams. M. E. (1982): Agricultural Extension in Developing Countries. Intermediate Tropical Agricultural Series. Longman Ltd. Burnt-field, Harlow Essex, UK.

Aina. L. O. (1995): Information and Agriculture in Africa. In: Aina. L. O et al (eds): Agricultural Information in Africa. lbadan Third World information Services Ltd. Ibadan. Nigeria. p 25.

Amalu, U. C. (1998): Agricultural Research and Extension Delivery System in Sub-Saharan Africa. University of Calabar Press, Calabar. Nigeria. p2-1-57.

Biesalski, H. K. (2001): Nutraceuticals. In: Kramer. Klaus; Peter-Paul. Hoppe; Lester. Packer (eds): Neutraceuticals in Health and Disease Prevention. Marcel Defamer Inc.; New York Pp. 1 - 26.

Bukar. S: Aliyu A. and Bakshi, J. S. (1997): Nigerian National Agricultural Research Strategy plan: 1997 -2010. Department of Agricultural Science, FMANR, ABUJA. pp48 -62

Emeruwah. V. A. N. (1999): A step-by-step guide on how to make your own feed (in the tropic).

Esonu B. O. l2000): Animal Nutrition and Feeding: A Functional Approach. P and R. Books, Owerri. Nigeria pp. 10-18.

Etim. N. A (2001): Analysis of Urban Farming among Households in Akwa Ibom State. An unpublished NI. Sc Thesis in the Department of Agricultural Economics. University of Ibadan. p 45.

Government of Akwa lbom State (2001): Agricultural Statistics 1994 - 1999. Dept. of Statistics, Ministry of Finance and Economic Development, Uyo pp. ii

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Hamidu, B. M; Murtala, N; Haruna, U. and Adamu, I. P. (2003): Analysis of Farmers and Extension Agents' Attitudes towards Afforestation Programme in Darmbratta Local

Mcdonald, P; Edward, R. A and Greenhalgh, J. F. D (1995): Animal Nutrition.5th Edition. Longman Scientific and Technical Publications. Singapore. Pp 62

Oyediji, G. O. (2002): Challenges of Scientific Feed - milling in Nigeria: The Role of Professionals. Paper Presented at the 27thAnnual Conference of NSAP on behalf of Industrial Feed Millers Association of Nigeria. Federal University of Technology, Akure.

Orok, E. J (1990): The LIVESTOCK Component of the Unified Extension Service of Akwa Ibom Agricultural Development Project (AKADEP). AKADEP Abak Zonal Report, Abak pp2-56

Obori, G (1999): Poultry Care: a Complete Guide To Chicken Production. Ganob Associates, Kaduna pp52

Obibuaku, L. O (1983): Agricultural Extension as a Strategy for Agricultural Transformation. University of Nigeria Press, Nsukka

Olawoye, J. E (2001): Contemporary Research Interests and Problem Areas in Agricultural Extension and Rural Development. Ibadan Extension YMonogragh Series. No 2. Department of Agricultural Extension and Rural Development, University of Ibadan

Olawoye, J. E (1985): Rural Women's Role in Agricultural Production.An Occupational Survey from Six Selected RURAL Communities in Oyo State. Journal for Rural Sociology Vol. 2 No. 1 pp 1 -10

Nagy, K (1980): Nutrition and the Vitamins: Some Considerations on Nutrition and the Physiological Role of Vitamins as well as Vitaminized Staple Foods and their Influence on the Nutritive Status of the Population. Roche, Basle. Pp 1 – 13

Matthew, J. S (2002): Resource Use Technical Efficiency In Cocoyams (xanthosoma sagihifolium) Production in Ibiono Ibom Local Government Area. Akwa Ibom State. Nigeria. Unpublished B. Sc. Project. Department of Agricultural Economics and Extension, University of Uyo. Pp25 – 57

Makkar, H. P. S (2000): Development and Field Evaluation of Animals Feed Supplementation Packages (AFRFA PROJECT 11 – 17 – RAF / 5 / 041) Joint Division of Nuclear Techniques in Food and Agriculture. International Atomic Energy Agency. May 5. Pp 1 – 5.

Lamorde, A. G (1997): Practical Cattle Nutrition in Dairy and Beef Cattle Operations. Seminar paper on 'Worlwide Trends in Agricultural Productivity: Challenges Facing the Nigeria

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107

Practicing Farmer' Organized by Ilhamma (Nigeria) Limited at Yola International Hotel, Yola. Adamawa State. November 3 – 5. Pp 1 - 14

Udoh, A. J (1992): Agricultural Extension Development Administration and Socio – Technological Change in Nigeria. University of Uyo. Nigeria

Wand, C (2002): Diet Supplementation for Grazing and Outwintering Ewes. Factsheet. Ministry of Agriculture and Food. Ontario pp 1 – 5.

Wiseman, Julian (1986): Feeding of Non – Ruminant Livestock. Butterworth and Co. Publishers Ltd. Comwall, England. Pp 6 – 11

Ziggers, D (2000): Food Formulation as a Decision – Making Tool. Feed Tech. Vol4 No 1 Elsevier International, Netherlands. Pp 12 - 19

Print ISSN: ISSN 2058 - 9093 Online ISSN: ISSN 2058 - 9107