G.J.B.A.H.S., Vol.6(4):1-7 (October-December, 2017) ISSN: 2319 – 5584

GLOBAL JOURNAL OF BIOLOGY, AGRICULTURE & HEALTH SCIENCES
(Published By: Global Institute for Research & Education)

www.gifre.org

MANAGEMENT OF POULTRY FARMS THROUGH THE USE OF ELECTRONIC FACILITIES FOR ENHANCED FOOD SECURITY IN ENUGU STATE, NIGERIA

Cajethan Uche Ugwuoke[1*], Felicia Ngozi Ezebuiro[1], Chinyere Roseline Okwo[1] & Augustine Chukwuma Nnadi[2]

[1]Department of Agricultural Education, University of Nigeria, Nsukka, Nigeria
[2]Scientific Equipment Development Institute, Enugu, Nigeria
*Corresponding Author

Abstract

The study was on the management of poultry farms through the use of electronic facilities for enhanced food security in Enugu State, Nigeria. Specifically, the study sought to determine the utilization, benefits, and obstacles limiting the application of electronic facilities in the management of poultry farms. This study adopted a survey research design. The study was carried out in Enugu state, Nigeria. Population of the study was 466 representing 413 poultry farmers, and 53 extension agents in Enugu state. Data were collected using checklist and questionnaire developed by the researchers. The instruments were face validated by three experts. Cronbach alpha statistical method was used to determine the internal consistency of the questionnaire which yielded a reliability coefficient of 0.74. Administration and collection of the instruments were done by the researchers with the help of 15 research assistants. Out of the 466 instruments administered, 423 representing 370 poultry farmers and 53 extension agents were retrieved. This represents a return rate of 91%. Data collected were analyzed using frequency and percentage to determine the extent of utilization of electronic facilities in poultry farms. Similarly, mean was used to analyze the data collected on the benefits and obstacles limiting the use of electronic facilities in farms. The study found among others that majority of the poultry farmers do not utilize electronic facilities in the management of their poultry farms. It was equally found that automation of poultry farms increases production of meat and eggs, but was also faced by so many challenges.

Key words: *poultry farms, electronic facilities, food security, management*

Introduction

Poultry are domesticated birds kept for meat, table egg or fertile egg production. They can be raised using extensive, semi-intensive or intensive management systems. Whichever system that is adopted, poultry rearing serves as a good subsidiary occupation that supplements the income of smallholder farm families and rural households in most developing countries (Anang, Yeboah and Agbolosu, 2013). According to the authors, greater proportion of poultry production in Nigeria is still at the subsistence level and managed by backyard poultry farmers. However, Ekunwe, Soniregun and Oyedeji (2006) noted that poultry production has assumed an important role with enormous potentials for rapid economic growth in Nigeria. This was in line with National Bureau of Statistics (NBS) (2010) which reported that poultry industry in Nigeria has witnessed a great leap in the population of birds as well as poultry establishments. According to NBS, there was an upward trend in the population of birds from 158,216,684 in 2006 to 166,127,481 in 2007, representing an increase of 2.35 percent. In 2010, the figure rose to 192,313,325 or 7.72 percent compared to 2006. This signifies that Nigeria is making significant positive shift in poultry production to feed the population. The types of poultry that are commonly reared in Nigeria are chickens, ducks, guinea fowls, turkeys, pigeons, quail and more recently ostriches. Those that are of commercial or economic importance are the fowls, guinea fowls, and turkeys, amongst which fowls predominate (Food and Agricultural Organization, FAO, 2006a).

Poultry farming is an important agribusiness enterprise that has a great potential for providing additional income to farming communities and educated unemployed persons. In addition to its contribution to the Gross Domestic Product (GDP) and provision of employment opportunities, poultry production is a major source of protein supply to the increasing population of the country (Ohajianya, Mgbada, Onu, Enyia, Ukoha, Chendo and Ibeji, 2013). Though poultry production is an important agribusiness, the authors noted that it is faced with a lot of problems. The authors outlined the problems of poultry production in Nigeria to include low capital base, ineffective management, technical inefficiency, economic inefficiency, diseases and parasites, poor housing, high cost of feeds, poor quality of feeds, poor quality day old chicks, inadequate extension and training, among others. Some poultry businesses, both commercial and non-commercial, find it difficult to cope due to these enormous challenges in the production systems.

There are two distinct poultry production systems in Nigeria: the commercial poultry production and rural poultry production (Food and Agricultural Organization, FAO, 2006a). Food and Agricultural Organisation stated that the commercial system is capital and labour intensive and demands a high level of input and technology while rural poultry production is by convention a subsistence system which comprises stock of non-standard breeds or mixed strains, types and ages. It is usually small-scaled, associated with household or grassroots tenure and little or no veterinary inputs.

Consequently, many people in Nigeria keep poultry as a family business enterprise. Family poultry according to Food and Agricultural Organization (FAO) (2014) encompasses the wide variety of small-scale poultry production systems found in rural, urban and semi-urban areas of developing countries. It is a production system that is practised by individual families as a means of obtaining food security, income and gainful employment. Family poultry production can be categorized as extensive scavenging, semi-intensive and small-scale intensive (FAO, 2014). The conditions and requirements of these systems and the resulting performance differ significantly, as a result of the type of genetic resource used, feeding practices, prevalence of diseases, prevention and control of diseases, the management of flocks and the interactions among these factors. The main outputs from family poultry production are food for home consumption, either in the form of poultry meat or eggs, and income from the sale of these products. Poultry raised for meat production is called broilers while the poultry for table egg production is termed layers. Layers in Nigeria are reared under free range, deep litter system or battery cage system, with battery cage system being more prominent. Management in terms of feeding, vaccination, medication, egg collection, control of cannibalism, among others, is more efficient in battery cage system. However, this system is capital intensive and does not allow the hens to move around. Broilers are not reared in battery cage system to avoid injury of the legs.

Broilers are chickens kept for meat production. They are commonly reared in litter system. Broilers used in intensive system are of strains that have been bred to be very fast growing in order to gain weight quickly (Compassion in World Farming, 2013). Generally, poultry keeping requires enough and appropriate equipment for proper management.

Modern houses are fully automated, with fans linked to sensors to maintain the required environment (Glatz and Pym, 2006). According the authors, some commercial operators use computerized systems for the remote checking of settings in houses, and forced-air furnaces as the main method of providing heat to young chicks. The web-based application can be used to monitor the growth of chicken based on the data given (Purnomo, Somya and Ardaneswari, 2014). Electronic feeding system is capable of dispensing more feed inside the feeding trough by sensing the feed level as the level reduces and this allows for reduced manual labour expended in the poultry farms with corresponding increase in cost benefit and high profit yield (Olaniyi, Salami, Adewumi and Ajibola, 2014). Correct air distribution can be achieved using negative pressure ventilation system (Glatz and Pym, 2006). According to the authors, when chicks are very young, or in colder climates, the air from the inlets should be directed towards the roof, to mix with the air there and circulate throughout the house while in older birds and in warmer temperatures, the incoming air is directed down towards the birds, and helps to keep them cool. Evaporative cooling pads can be placed in the air inlets to keep birds cool in the hot weather. According to Ramdurge and Patil (2016), temperature, humidity and ammonia concentration of surrounding environment are measured with the help of developed node. The authors stated that water management can be maintained with the help of level measurement circuit, light detection circuit as well helps to control illumination system of poultry farms while the GSM module is provided to send current status of broiler house to farmers on mobile phones. Artificial incubation and hatching of poultry eggs using incubators where temperature, humidity, air flow and egg turning are electrically controlled to replaced natural incubation and hatching. In natural incubation and hatching of eggs according to Boopathy, Satheesh, Muhamed and Dinesh (2014), hens sometimes break eggs, occasionally quit and get off nest, sit on a small number of eggs at a time, and can transmit diseases to the chicks. The authors noted that heavy poultry industries adopt incubators to hatch huge number of poultry eggs into chicks that can be reared to produce meat and eggs for food security.

Food security is the situation where all people at all times have physical, social and economic access to sufficient, safe and nutritious food that meets their dietary needs and food preferences for an active and healthy life (World Food Summit 1996 in FAO, 2008a). Food security is the ability of people to secure adequate food (Toit, 2011). Food security according to De Muro and Mazziotta (2011) consists of four essential parts and include food availability, access, utilization and stability. Food availability is the presence of sufficient quantities of food at appropriate quality, supplied through domestic production or imports (including food aid) while food access relates to the access by individuals to adequate resources for acquiring appropriate food for a nutritious diet (FAO, 2006b). Food utilization is commonly understood as the way the body makes the most of various nutrients in the food (FAO, 2008a). FAO emphasized that sufficient energy and nutrient intake by individuals is the result of good care and feeding practices, food preparation, diversity of the diets and intra-household distribution of food. Stability is the ability of a population, households, or individuals to have access to adequate food at all times (FAO, 2006b). Therefore, stability refers to both the availability and access dimensions of food security. Availability and access of poultry meat and eggs can be promoted by the management of poultry farms through the application of electronic facilities. Computerization of operations in poultry industry ensures higher quantity and quality of poultry products.

However, poultry production in Nigeria is dominated by small scale poultry farming. This was in line with FAO (2008b) that Nigeria chicken population was 150.682 million of which 25% were commercially farmed, 15% semi-commercial, and 60% backyards. Similarly, poultry production in Nigeria can be classified into extensive and intensive production systems based on scale, and the extensive production system presently accounts for about 85%. In accordance with SAHEL (2015), the Nigerian poultry sector is extremely fragmented with most of the chicken raised in backyards or in poultry farms with less than 1000 birds. Nonetheless, the Nigeria poultry industry produced 650,000 MT of eggs and 290,000 MT of poultry meat in 2013. SAHEL (2015) reported that Nigeria's egg production is largest in Africa and second largest in chicken production after South Africa's 200 million birds. Hence, the need to study the application of electronic facilities in the management of poultry farms for enhanced food security in Enugu state, Nigeria. Specifically, the study sought to determine the utilization of electronic facilities in the management of poultry farms; benefits of the application of electronic facilities in the management of poultry farms; and obstacles limiting the application of electronic facilities in the management of poultry farms.

Materials and Methods

This study adopted a survey research design. A survey research design according to (Nworgu, 2006) is the one in which a group of people or items is studied by collecting and analyzing data from people or items considered to be representative of the entire group. This design was deemed appropriate since poultry farmers and extension agents considered to be representative of the entire population were studied. The study was carried out in Enugu state, Nigeria. The state lies between $6^0 27' 9.60'' N$ and $7^0 30' 37.20'' E$ (Enugu, 2017). Enugu state is made up of 17 local government areas.

Population of the study was 466 representing 413 poultry farmers, and 53 extension agents in Enugu state. Data were collected using check list and questionnaire developed by the researchers. Checklist was used to collect data on the number of farmers utilizing electronic facilities in managing their poultry farms while structured questionnaire was used to collect data on the benefits and obstacles limiting the use of electronic facilities in managing poultry farms. The instruments were face validated by three experts. Cronbach alpha statistical method was used to determine the internal consistency of the questionnaire which yielded a reliability coefficient of 0.74.

Administration and retrieval of the instruments were done by the researchers with the help of 15 research assistants. Out of the 466 respondents issued the instruments, 423 instruments representing 370 poultry farmers and 53 extension agents were retrieved. This represents a return rate of 91%. Furthermore, out of the 370 instruments retrieved from poultry farmers, 65 were from commercial poultry farmers with average number of birds 5000 and above, 109 were medium scale poultry farmers with average number of birds between 2000 and 5000 while 196 were small scale and backyard poultry farmers with average number of birds less than 2000. Data collected were analyzed using frequency and percentage to determine the extent of utilization of electronic facilities in poultry farms. Similarly, mean was used to analyze the benefits and obstacles limiting the use of electronic facilities in farms. Real limit of numbers based on Grand Mean was used for interpretation. Furthermore, t-test was used to test the significant difference between the mean responses of poultry farmers and extension agents on the benefits and obstacles limiting the use of electronic facilities in poultry farms using Statistical Package for Social Sciences (SPSS) software. Significant difference was said to exist when the probability value was less than 0.05 ($p<0.05$). Consequently, there was no significant difference ($p>0.05$) in the mean responses of poultry farmers and extension agents when the probability value was greater than 0.05.

Result

Data presented in Table 1 showed that majority of the poultry farmers do not utilize electronic facilities in managing their poultry farms. Automatic feeders and drinkers were being utilized only by 36 farmers (9.73%) while debeaking machine, refrigerators and automatic weighing machines were utilized in only 40 (10.81%), 17 (4.59%) and 30 (8.11%) farms out of 370 farms studied (Table 1). Automatic manure removing system, climate control system and automatic nests were available in 8 (2.16%), 5 (1.35%) and 6 (1.62%) farms. Inter-row LED lighting system and inter-cage lighting system were not available at all for utilization (100%) in all the poultry farms in Enugu state (Table 1).

Table 1: Percentage Analysis of the Extent of Utilization of Electronic Facilities in the Management of Poultry Farms in Enugu State, Nigeria

S/N	Electronic facilities	Frequency	% Utilized	Frequency	% Not Utilized
1	Automatic feeders	36	9.73	334	90.27
2	Automatic drinkers	36	9.73	334	90.27
3	Automatic manure removing system	8	2.16	362	97.84
4	Automatic egg collection system	2	0.54	368	99.46
5	Climatic control system	5	1.35	365	98.65
6	Heat exchanger	4	1.08	366	98.92
7	Ventilation system	3	0.81	367	99.19

8	Cooling system	3	0.81	367	99.19
9	Manure drying system	2	0.54	368	99.46
10	Egg counter	1	0.27	369	99.73
11	Electronic egg candlers	1	0.27	369	99.73
12	Incubators	2	0.54	368	99.46
13	Lux meters	4	1.08	366	98.92
14	Circulation fans	3	0.81	367	99.19
15	Debeaking machine	40	10.81	330	89.19
16	Automatic nests	6	1.62	364	98.38
17	Refrigerators	17	4.59	353	95.41
18	Inter-row LED lighting system	0	0.00	370	100.00
19	Inter-cage lighting system	0	0.00	370	100.00
20	Automatic weighing machine	30	8.11	340	91.89

Poultry farmers and extension agents in Enugu state strongly agree that automation of poultry farms increases production of meat and eggs; reduces wastage of feeds; provides feeds and water at appropriate quantity and time to the birds; reduces labour in the farm; accurate farm operations; reduces egg breakage; enhances speedy farm operations; reduces stress from heat and noise; and reduces intruders in the farm (Table 2). The respondents equally agree that management of poultry farms using electronic facilities helps to expand the scale of farms; keeps the farm clean and hygienic; increases the uniformity of birds; allows the farmers engage in another business; reduces theft from employed workers; reduces mortality in the farm; regulates micro-climate of the farm; reduces the rate of cannibalism; among others (Table 2). Furthermore, there was no statistically significant difference ($p>0.05$) in the mean responses of poultry farmers and extension agents on the benefits of the application of electronic facilities in the management of poultry farms (Table 2).

Table 2: Mean and t-test Analysis of the Responses of Poultry Farmers and Extension Agents on the Benefits of the Application of Electronic Facilities in Poultry Farms

					N1=370		N2=53			
S/N	**Items**	$\overline{X}_G$	**SD**	**DEC**	$\overline{X}_1$	**SD_1**	$\overline{X}_2$	**SD_2**	**Sig(2-tailed)**	**Rem**
1	Increase production of meat and eggs	4.60	0.63	SA	3.41	0.75	3.43	0.51	3.41	NS
2	Expand the scale of the farm	4.43	0.58	A	3.28	0.78	3.17	0.38	3.28	NS
3	Reduce wastage of feeds	4.61	0.74	SA	3.15	0.98	3.40	0.50	3.15	NS
4	Reduce wastage of water	4.37	0.78	A	3.40	1.05	3.43	0.50	3.40	NS
5	Regular provision of feeds and water at appropriate quantity and time to the birds	4.61	0.72	SA	3.38	0.94	3.60	0.50	3.38	NS
6	Keep the farm clean and hygienic	4.39	0.70	A	3.43	0.92	3.30	0.47	3.43	NS
7	Increase the uniformity of birds	4.47	0.69	A	3.44	0.88	3.60	0.50	3.44	NS
8	Allow the farmers engage in another business	4.39	0.76	A	3.43	1.03	3.60	0.50	3.43	NS
9	Reduce labour in the farm	4.51	0.58	SA	3.73	0.65	3.60	0.50	3.74	NS
10	Reduce theft from employed workers	4.38	0.78	A	3.34	1.08	3.33	0.48	3.34	NS
11	Accuracy of farm operations	4.53	0.79	SA	3.30	1.09	3.37	0.49	3.30	NS
12	Less mortality in the farm	4.37	0.72	A	3.43	0.94	3.60	0.50	3.43	NS
13	Reduce egg breakage	4.50	0.63	SA	3.50	0.78	3.30	0.47	3.50	NS
14	Regulate the micro-climate of the farm	4.32	0.62	A	3.71	0.73	3.60	0.50	3.71	NS
15	Enhances speedy farm operations	4.64	0.63	SA	3.43	0.59	3.37	0.67	0.59	NS
16	Reduce stress from heat and noise	4.54	0.54	SA	3.18	0.56	3.13	0.51	0.66	NS
17	Reduce intruders in the farm	4.56	0.63	SA	3.14	0.76	3.37	0.49	0.13	NS
18	Reduce the rate of cannibalism	4.38	0.57	A	3.48	0.63	3.37	0.49	0.35	NS
19	Reduce incidence of diseases	4.45	0.54	A	3.42	0.56	3.53	0.51	0.30	NS
20	Reduce incidence of wet litter	4.39	0.48	A	3.46	0.50	3.27	0.45	0.06	NS
21	Reduce egg pecking	4.45	0.49	A	3.45	0.52	3.30	0.47	0.15	NS
22	Record emergencies in the farm	4.40	0.60	A	3.29	0.71	3.33	0.48	0.76	NS

Key: $\overline{X}_G$=Grand Mean; SD=Standard Deviation; $\overline{X}_1$=Mean responses of poultry farmers; SD1=Standard Deviation of the poultry farmers; $\overline{X}_2$=Mean responses of extension agents; SD2=Standard deviation of extension agents; NS=Not significant; Dec=Decision; Rem=Remark; SA=Strongly Agree; A=Agree

On the obstacles limiting the application of electronic facilities in the management of poultry farms, poultry farmers and extension agents strongly agree that Poor technical knowhow of the farmers; poor credit facilities; poor breeds of poultry birds; unreliable government policies on agriculture; and investors' inability to invest due to the poor economy hinder automation of poultry farms (Table 3). Similarly, the respondents agree that constant power

interruptions; limited number of electronic facilities manufacturing companies in Nigeria; import restrictions of some electronic facilities; and economic recession in the country limit the application of electronic facilities in the management of poultry farms in Enugu State, Nigeria (Table 3). Moreover, there was no statistically significant difference ($p>0.05$) in the mean responses on poultry farmers and extension agents on the obstacles limiting the application of electronic facilities in the management of poultry farms (Table 3).

Table 3: Mean and t-test Analysis of the Responses of Poultry Farmers and Extension Agents on the Obstacles Limiting the Application of Electronic Facilities in Poultry Farms

N1=370 N2=53

S/N	Items	$\overline{X}_G$	SD	DEC	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	Sig(2-tailed)	Rem
1	Poor technical knowhow of the farmers	4.60	0.96	SA	3.46	0.82	3.24	1.09	0.13	NS
2	Constant power interruptions	4.43	0.79	A	3.55	0.71	3.53	0.87	0.24	NS
3	Poor credit facilities	4.61	0.87	SA	3.46	0.77	3.24	0.97	0.31	NS
4	High interest rate of bank loans	4.37	0.87	A	3.45	0.71	3.24	1.03	0.84	NS
5	Poor breeds of poultry birds	4.61	0.89	SA	3.33	0.79	3.29	0.99	0.17	NS
6	Most of the manufacturing companies are not in Nigeria	4.39	0.80	A	3.36	0.73	3.35	0.86	0.55	NS
7	High import duties of some electronic facilities	4.47	0.95	A	3.40	0.77	3.18	1.13	0.11	NS
8	Import restrictions of some electronic facilities	4.39	0.91	A	3.43	0.77	3.29	1.05	0.19	NS
9	Unreliable government policies on agriculture	4.51	0.85	SA	3.45	0.76	3.41	0.94	0.15	NS
10	Economic recession in the country	4.38	0.84	A	3.45	0.76	3.29	0.92	0.26	NS
11	Investors' inability to invest due to the poor economy	4.51	0.58	SA	3.73	0.65	3.60	0.50	3.74	NS

Key: $\overline{X}_G$=Grand Mean; SD=Standard Deviation; $\overline{X}_1$=Mean responses of poultry farmers; SD1=Standard Deviation of the poultry farmers; $\overline{X}_2$=Mean responses of extension agents; SD2=Standard deviation of extension agents; NS=Not significant; Dec=Decision; Rem=Remark; SA=Strongly Agree; A=Agree

Discussion

Majority of the poultry farmers do not utilize electronic facilities in the management of their poultry farms (Table 1). The minimal automation of poultry farms found in Enugu state were available in few commercial farms as most of the commercial farms work with hired labour while medium and backyard poultry farmers work with hired or family labour. The findings were in line with Glatz and Pym (2006) that most medium-scale commercial layer and chicken meat farms in developing countries rely on natural airflow through shed for ventilation while small-scale farms were constructed in various shapes and dimensions using local building materials consisting of timber or mud bricks and bamboo. Backyard, small, and medium scale poultry farms accounted for over 80% of poultry farms in Enugu state (Uchendu, et al, 2015), which do not integrate electronic facilities in the management of their farms. The West African poultry sector faces high production cost as well as safety problems due to lack of sanitary control and technical constraints (Killebrew et al, 2010). The authors further found that production costs were high due to the lack of integrated and automated poultry sector. On the more evidence of poor automation of poultry industry in Nigeria, Oyeyinka et al (2011) found that the Nigerian poultry sector is less capitalized and it is based on smallholdings owned by many peasant farmers. The authors reported that birds usually perform at low level due to the application of unimproved facilities where micro-climate of the farms was not regulated.

The study further discovered that automation of poultry farms increases production of meat and eggs; reduces wastage of feeds; provides feeds and water at appropriate quantity and time to the birds; reduces labour in the farm; accurate farm operations; reduces egg breakage; enhances speedy farm operations; reduces stress from heat and noise; reduces intruders in the farm; among others (Table 2). Furthermore, there was no statistically significant difference ($p>0.05$) in the mean responses of poultry farmers and extension agents on the benefits of the application of electronic facilities in the management of poultry farms (Table 2). The findings were in agreement with the study of Sinduja et al (2016) who found that automated control system is labour saving for the farmer as it reports environmental changes immediately, thereby enabling the farmer to forestall adverse damage in the farm. The authors emphasized that it is low cost system as it reduces the cost of hiring labour. It is also flexible as it can be integrated into small and medium sized poultry farms. Mechanical set up available for liquid flow for the hens monitors the rate of dispensation of water from the water pipe (Boopathy et al, 2014), thereby reducing the inconveniences of the farmer being in the farm all the time. In support of the benefits of automation, Kanjilal et al (2014) found that humidity and moisture control mechanism make sure the animals are comfortable in the enclosures they are kept for greater productivity while auto lock and release doors help to guard the coming in and

going out of livestock in the farm. The authors reported that smoke detectors are installed to prevent fire hazards which if not detected on time could lead to loss of livestock and valuable resources.

On the obstacles limiting the application of electronic facilities in the management of poultry farms, it was found that poor technical knowhow of the farmers; poor credit facilities; poor breeds of poultry birds; unreliable government policies on agriculture; investors' inability to invest due to the poor economy hinder automation of poultry farms; among others (Table 3). Moreover, there was no statistically significant difference ($p>0.05$) between the mean responses of the respondents on the obstacles limiting the application of electronic facilities in the management of poultry farms (Table 3). The findings were in support of Aromolaran et al (2013) who found that non-availability of credit/loan; lack of technical knowhow; and disease outbreak are few of many challenges limiting the application of electronic facilities in Nigeria poultry farms. On the challenges and prospects of the commercial poultry industry in Ghana, Kusi et al (2015) found that inadequate infrastructure; inadequate access to affordable credits; poor managerial acumen; inadequate technical knowhow; and unfavourable and indifferent government policy direction limit automation of poultry sector. The authors recommended that the government should mandate the National Agricultural Fund to support the modernisation and automation of poultry farms in the country. In the study of Adeyemo and Onikoyi (2012), it was found that inadequate and sometimes outright lack of basic infrastructure particularly electricity; roads; and water supply often discourage poultry farmers migrating from subsistence to higher scale automated commercial production. The study conducted by Masuku and Siyaya (2013) revealed that lack of credit to buy capital equipment; poor chicken housing; lack of electronic facilities; non-integration of new technologies; poor infrastructure; poor market creation; and trade policies affect commercialisation of indigenous chickens in Swaziland. Application of electronic facilities in managing poultry farms cannot be achieved in a situation of erratic power supply. Availability of credit to acquire the facilities is equally essential.

Conclusion

Most of the electronic facilities required for the automation of poultry farms were not available in majority of the poultry farms in Enugu state, Nigeria. Few commercial farms were automated while majority of the commercial farms and all the medium and backyard poultry farms rely heavily on hired labour. Automation of poultry farms help to reduce labour cost; increase farm efficiency; and improve productivity. Automatic supply of feed and water to the birds and regulation of the micro-climate of the farm help to increase the production rate of meat and chicken eggs to combat food insecurity. However, application of electronic facilities in managing poultry farms is hindered by poor infrastructural provision; poor technical knowhow of the farmers; inaccessibility of credits by farmers; among others. Automation of poultry farms is the only way to ensure regular supply of meat and eggs to the populace and should be encouraged by the favourable government policies.

References

Adeyemo, A.A. & Onikoyi, M.P. (2012). Prospects and challenges of large scale commercial poultry production in Nigeria. *Agricultural Journal*, 7(6) 388-393

Anang, B. T.; Yeboah, C. & Agbolosu, A. A. (2013). Profitability of Broiler and layer production in the Brong Ahafo region of Ghana. *ARPN Journal of Agricultural and Biological Sciences 8(5) 423-430*

Aromolaran, A.K., Ademiluyi, I.O. & Itebu, O.J. (2013). Challenges of small poultry farms in layer production in Ibadan, Oyo state Nigeria. *Global Journal of Science Frontier Research (D),* 13(2) 5-11

Boopathy, S., Satheesh, K.M., Muhamed, F.A. & Dinesh, R. (2014). Performance optimization of poultry farm by using instrumentation with help of embedded automation. *International Journal of Innovative Research in Science, Engineering and Technology,* 3(1) 890-895

Compassion in World Farming (2013). The life of broiler chicken. From https://www.ciwf.org.uk/media/5235306/The-life-of-Broiler-chickens.pdf

De Muro, P. & Mazziotta, M. (2011). Master of Human Development and Food Security: Towards a Food Insecurity Multidimensional Index. From http://www.fao.org/fileadmin/templates/ERP/uni/FIMI.pdf

Ekunwe, P. A.; Soniregun, O. O. & Oyedeji, J. O. (2006). Economics of small scale deep lither system of egg production in Oredo Local Government Area of Edo State, Nigeria. *International Journal of Poultry Science*, 5(1) 81-83

Enugu (2017). https://en.wikipedia.org/wiki/Enugu

Food and Agricultural Organization (FAO) (2014). Family poultry development: Issues, opportunities and constraints. Retrieved on 06/03/2015 from http://www.fao.org/3/a-i3595e.pdf

Food and Agricultural Organization (2006a). Poultry Sector Country Review-Nigeria. Retrieved on 24/10/2013 from ftp://ftp.fao.org/docrep/fao/011/ai352e/ai352e00.pdf

Food and Agricultural Organization (2006b). Policy brief on food security. From http://www.fao.org/forestry/13128-0e6f36f27e0091055bec28ebe830f46b3.pdf

Food and Agricultural Organization (2008a). An introduction to the basic concepts of food security. Food security information for action plan practical guides. From http://www.fao.org/docrep/013/al936e/al936e00.pdf

Food and Agricultural Organization (2008b). Assessment of the Nigerian poultry market chain to improve biosecurity

Glatz, P. & Pym, R. (2006). Poultry housing and management in developing countries. In poultry development review of Food and Agricultural Organization of the United Nations. From http://www.fao.org/3/a-al734e.pdf

Kanjilal, D., Singh, D., Reddy, R. & Matthew, J. (2014). Smart farm: extending automation to the farm level. *International Journal of Scientific & Technology Research*, 3(7) 109-113

Killebrew, K., Gugerty, M.K. & Plotnick, R. (2010). *Poultry market in West Africa: Nigeria*. Washington: Evans School of Public Affairs

Kusi, L.Y., Agbeblewu, S., Anim, I. & Nyarku, K.M. (2015). The challenges and prospect of the commercial poultry industry in Ghana: A synthesis of literature. *International Journal of Management Sciences*, 5(6) 476-489

Masuku, M.B. & Siyaya, B.J. (2013). Factors affecting commercialization of indigenous chickens in Swaziland. *Journal of Agricultural Studies*, 1(2) 86-101 doi:10.5296/jas.v1i2.4016

National Bureau of Statistics (2010). The Review of the Nigerian Economy. Retrieved on 07/03/15 from www.nigerianstat.gov.ng

Nworgu, B. G. (2006). *Educational research: Basic issues and methodology*. Nsukka: University Trust Publishers

Ohajianya, D. O.; Mgbada, J. U.; Onu, P. N.; Enyia, C. O.; Ukoha, A. H.; Chendo, N. G. B. & Ibeji, C. C. G. (2013). Technical and Economic efficiencies in poultry production in Imo State, Nigeria. *American Journal of Experimental Agriculture*, 3(4) 927-938

Olaniyi, O.M., Salami, A.F., Adewumi, O.O. & Ajibola, O.S. (2014). Design of an intelligent poultry fed and water dispensing system using fuzzy logic control technique. *Control Theory and Informatics*, 4(9) 61-72

Oyeyinka, R.A., Raheem, W.K., Ayanda, I.F. & Abiona, B.G. (2011). Poultry farmers' awareness and knowledge of improved production practices in Afijio Local government area, Oyo state, Nigeria. *E3 Journal of Agricultural Research and Development*, 1(1) 001-008

Purnomo, H.D., Somya, R. & Ardaneswari, A. (2014). The design of chicken growth monitoring system for broiler farm partnership. *International Journal of Computer Science of Electronics Engineering*, 2(4) 182-184

Ramdurge, R..D. & Patil, M.S. (2016). Automatic monitoring and controlling system for broiler house. *International Journal on Innovative Research in Electrical, Electronics, Instrumentation and Control Engineering*, 4(7) 27-30. doi: 10.17148/IJIREEICE.2016.4708

Sinduja, K., Jenifer, S.S., Sri Abishek, M. & Sivasankanri, B. (2016. Automated control system for poultry farm based on embedded system. *International Research Journal of Engineering and Technology*, 3(3) 620-624

SAHEL (2015). An assessment of the Nigerian poultry sector. From http://sahelcp.com/wp-content/uploads/2016/12/Sahel-Newsletter-Volume-11.pdf

Toit, D.C. (2011). *Food security*. South Africa: Agriculture, Forestry and Fisheries. http://www.nda.agric.za/docs/genreports/foodsecurity.pdf

Uchendu, G.G., Ihedioha, J.I., Ogbu, C. & Onyeaka, E.C. (2015). Distribution and characteristics of poultry farms in Enugu state, Nigeria after 2007 outbreak of highly pathogenic avian influenza. *International Journal of Livestock Production*, 6(3) 41-46 doi: 10.5897IJLP14.0234