Nigerian J. Anim. Sci. 2013, vol. 15:229-240

An Analysis of Benefit and Cost of Local Chicken Production By the Adopters and Non– Adopters of Newcastle Disease Vaccination in Kogi – State, Nigeria.

Saliu[1], O. J., Sanda[2], M.E., Dairo[2], F. A. S. and Salihu[1], I.

[1]Department of Agricultural Economics and Extension Kogi State University, Anyigba
[2]Department of Animal Production Kogi State University, Anyigba

Target audience:

Abstract

Newcastle disease (ND) has high seroprevalence rate and inflicts heavy economic losses on poultry as often the case in rural poultry production. This study examined the social-economic characteristics of the respondents and the benefit/ cost analysis of rural chicken farmers in two local council areas of Kogi State of Nigeria which were selected by purposive sampling and 122 respondents were administered structured questionnaires. They comprised 61 farmers' tagged adopters of immunization against ND by vaccinations and 61 non-adopters. Educational status and farming experience were found to influence adoption of ND vaccination as immunization against Newcastle disease which in turn had positive and significant ($P<0.05$) influence on the income of rural chicken farmers in Lokoja and Dekina Local Government Areas selected for the study. Flock size of the vaccinated chickens also significantly ($P<0.01$) influenced income generation. The cost benefit ratio of the adopters was 2.42:1 as against 1.11:1 of non adopters. Cost of transportation for pooling birds to a centre for vaccination was responsible for 9.5% of total variable cost. It is recommended that extension agents should intensify effort to educate farmers on the incremental benefit of vaccination against the disease and that government should organize the rural chicken farmers into co-operative for visitation by veterinary extension specialist to reduce cost of immunization, encourage job creation for an improved rural economy.

Key words: *Benefit/Cost, Adopters, Non-Adopters, Newcastle Disease, Immunization*

Description of problems

Rural poultry production is one of the most widely practiced livestock activities in the non-urban areas of Nigeria. It contributes significantly to the family livelihood and subsequent enhancement of the rural economy. This is because rural poultry production has been identified as a reliable and profitable source of income for the rural poor (1), The total poultry population in recent time in Nigeria was reported to be 175,970,000 out of which chicken accounted for 84,986,000 (2), Chicken meat is one of the major sources of animal protein in Nigeria because of its availability as cut-parts and hence relatively cheap (3, 4).

Incidences of diseases and infestations have been major militating factors against rural poultry production which often results into high losses or mortality (5, 6). The high mortality rates consequently manifest in the reduction of chicken and its products in the market. Newcastle disease (ND) is a major threat to local chicken production and has been identified to be responsible for over 70 – 80% of annual death in rural poultry production in Nigeria (2), Estimated economic losses due to Newcastle disease (ND) was put at (1.4) 1,440 billion Naira (7). The frequent outbreak of ND results in increased mortality, morbidity and loss of eggs either for breeding or consumption (8).

Vaccination of indigenous chicken has been recommended due to the high potential losses (6). It is in the recognition of this that the Australian Centre for International Agricultural Research (ACIAR) has been supporting collaborative research on the control of Newcastle disease in village chickens in South East Asia and sub-Sahara Africa since 1984.

Live vaccines are produced by National Veterinary Research Institute (NVRI) located in Vom, Plataeu State of Nigeria. The applications of the different vaccines produced prevent the attack of Newcastle disease by increasing the antibody of the birds gradually to a protection level for a longer period of time (9).

The two types of Newcastle disease vaccines produced by NVRI are the intra–occular B-Strain (Lasota) and Komorov which are available in Nigeria. Application of the vaccines can be by eye drops or through drinking water. The eye drop method was reported to probably have about 80 percent protection against the disease (6). Chicken production is a very popular enterprise among rural farmers in Kogi State of Nigeria located in the middle belt with guinea savanna vegetation which provides a suitable environment for poultry and livestock production. Newcastle disease is prevalent in the study area especially during the dry season of December to March with seroprevalence rate of about 63% (10). Vaccination has been the only prophylactic measure against ND, however the level of awareness among the chicken producers in the rural communities of the study is obscure. The socio-economic variables that can enhance the income from chicken production and the benefit/cost ratio among the adopters and non–adopters of ND vaccination/immunization become an important question in Kogi State of Nigeria. This study therefore is poised to assess the socio-economic characteristics of the selected rural communities in Kogi State of Nigeria with a view to address the raised issue among other questions. The specific objectives of the study are to;

i. determine and describe the socio-economic characteristics of the rural chicken producers and establish which of them will influence the income generation from chicken production.

ii. determine the level of awareness of vaccination/immunization against Newcastle disease.
iii. estimate the benefit/cost ratio of rural chicken production by the adopters and non-adopters of vaccination/immunization as a technology.

Materials and Methods

The study area

The study was carried out in two local council areas of Kogi State of Nigeria delineated as local government areas (LGA). They are namely; Lokoja Local Government Area and Dekina Local Government Area. Lokoja LG and Dekina LG were located respectively in the western and eastern agro-ecological zones of the State. Kogi State is located on latitude $7^{o}31'$ to $8^{o}10'$ north and longitude $6^{o}15'$ east of the equator. It is a rural agrarian State with about 3.2 million people while the population of the local government areas was about 196,643 for Lokoja LGA and 260,968 for Dekina LGA (11). The annual rainfall in the State is 1016 – 1524mm with clear two seasons in the year namely, the wet/rainy season (April – October) and the dry season (November – March). Residents of the State and indeed the LGA are mostly farmers. The farmers engaged in production of arable crops such as cereals, (maize and rice), legumes (soybeans and bambara nut) and tree crops mainly cashew and mango. However, Lokoja LGA because of its location around river Niger confluence also engage in a lot of fishing activities while Dekina LGA are more into bambara nut production. The natives in Lokoja LGA are mostly the Nupe, Oworo and the Kakanda while Igala tribe predominante in Dekina LGA. These two LGAs have infrastructural facilities such as electricity, schools, roads, health centres, departments/annexes of the Ministry of Agriculture and Rural Development and other government parastatals.

Sampling techniques

Kogi State has four agro-ecological zones as clearly demarcated by Kogi State Agricultural Development Project for extension structure. Multi – stage random sampling was used to select the respondents. The first stage was to select two zones namely, B and C from the four agro-ecological zones. In the second stage, one local council area or LGA was selected from each of the two zones. Dekina LGA (Zone B) and Lokoja LGA (Zone C) emerged as the selected local councils.

There are six hundred and forty (640) contact farmers in Lokoja LGA and five hundred and seventy six (576) contact farmers in Dekina LGA. (12). Five percent (5%) of the contact farmers that adopted Newcastle vaccination in Lokoja and Dekina LGAs were purposively selected. In Lokoja LGA 32 farmers were selected out of those who adopted ND vaccination while 29 were also randomly picked in Dekina LGA to give a total of 61. A total number of 61 farmers that did not adopt vaccination were also purposively selected from the two LGAs

that represented the non-adopters to make a total of 122 respondents in all.

Data collection

Data were collected by administering 122 sets of structured questionnaires to the local chicken producers through field observations for over a period of three months (October - December 2009). These data include the socio-economic characteristics such as age, farming experience, household size, number of birds reared, adoption of Newcastle disease vaccination, income from local chicken production and other social variables like education and job description. Secondary data were generated from variable cost of inputs and sales of products.

Primary data were also collected which includes number of eggs, chicks, hens and cocks raised from which income were calculated by farmers in the study area. The number of chickens vaccinated per respondent of farmers that adopted vaccination against ND was also recorded. Estimate of benefit and cost of those that adopted ND vaccination and those that did not were derived using the market and current prices of the various categories of local chickens and eggs.

Data analysis

The primary data were ranked and analyzed using descriptive statistics while multiple regression was employed to find the socio-economic characteristics which influenced income generated from local chicken production using the implicit model $Y = CX_1, X_2, X_3 - - - X_n)$,

and the explicit form;

$Y = b0 + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + b_6x_6 + n$

Where:

Y = Income from sales of poultry products (in naira)

X_1 = Age (in years)

X_2 = Educational status

X_3 = Number of birds (in number)

X_4 = Family size (Number of people living and feeding together)

X_5 = Experience in chicken farming (in years)

X_6 = Use of vaccines (Number of birds vaccinated)

U = Error term

Benefit/Cost ratio analysis was calculated from the values of the incremental benefit from the vaccination and the cost of vaccination based on the data generated from the study (Tables 3& 4). Gross margin was calculated using the equation below;

GM = TR – TVC

Where GM = Gross Margin, TR = Total Revenue and TVC = Total Variable Cost. Water, feed consumed and other routine traditional management practices by village chicken producers in these LGAs were constant for both adopters and non-adopters of Newcastle disease vaccination.

Results and Discussion

Table 1 presents the social-economic characteristics of the respondents. There were more females (69.67%) involved in rural chicken production than the males (30.33%). It implies that women raised

chicken in the rural area more than men. The men in the rural area were more into arable crop farming which took more of their time. Women in the process of carrying out daily routine chores in the house, spare time to raise chicken and feeding them often time in the morning before going out to market or getting involved in other farming activities. Women also raise chicken for economic gains in terms of cash to cater for emergency financial obligations. These findings agreed with report of (13) that poultry farming served as the main cash earnings available to rural women. It could also be a carry forward effect of the agricultural policy of the military administration in Nigeria called "Better Life for Rural Women Development" that lingered on till about 1999 where women were trained and empowered by government in their choice of agricultural vocation. Among the animal component of the programme is poultry production. Others include rabbit, and snail production. This may have given the women an edge over the men.

The age distribution of respondents that practiced rural chicken indicated that adults engaged more in rural chicken production (Table 1). Those in age group 31 – 40 years practiced rural chicken production more (50.82%) than those within 41 – 50 years (22.13%) and were closely followed by 21 – 30 years (18.03%). Those in school age bracket below 20 years were not engaged in rural chicken production as report gathered on the field indicated that they assisted in feeding and other routine chores for the birds.

This shows that adults in their productive age are more engaged in rural chicken rearing. Farming enterprise at subsistence level of production appears not generally attractive to youth and young school leavers (14) which is contrary to the reports of earlier workers that the young and youth of rural communities engaged in rural poultry and/or livestock farming (15). Generally, youth in Nigeria are more interested in commercial ventures that can fetch them instant income (14).

Rural chicken farming cuts across the educational strata in the LGAs (Table 1). The spread covers those with primary school education as well as degree holders. Those with primary school education recorded highest involvement in rural chicken production (55.74%) followed by respondents that possessed adult education (21.31%) and closely by dwellers trained to secondary school level (20.49 %). Respondents with higher education like degree were the lowest (2.46%). This results further buttressed the fact that adult of productive age were more interested in rural chicken production because those with adult education and primary school education must have constituted the largest percentage of the respondents. Generally, possession of training/education must have assisted some of the farmers in adopting new technology of advantage and profitability.

Table 1 Socio-economic Characteristics of the respondents

Respondent	Frequency	Percentage
Gender		
Male	37	30.33
Female	85	69.67
Age		
20-30	22	18.03
31-40	62	50.82
41-50	27	22.13
≥50	11	09.02
Educational qualification		
Adult education	26	21.31
Primary education	68	55.74
Secondary education	25	20.49
Degree/equivalent	3	02.46
Family size		
1-5	45	36.89
6-10	52	42.62
11-15	22	18.03
≥16	3	02.46
Farming experience		
1-5 years	37	30.32
6-10 years	45	36.89
11-15 years	30	24.59
16-20 years	5	04.10
>20 years	5	04.10
Awareness level		
Aware	64	52.46
Not aware	58	47.54

The household size of 6 – 10 constituted the largest percentage of rural chicken producers (42.62%) in Lokoja and Dekina LGAs. They were followed by household size of 1 – 5 (36.89%), 11 – 15 (18.03%) and those having above 16 ranked lowest (2.46%). The household size of 6 – 10 appeared to be the average size of low income group of most rural dwellers and probably raised local chickens for economic purpose. This implies that routine poultry husbandry services or labour could be made available by family with fairly large size. Respondents with 6 – 10 years of experience in farming ranked highest (36.89%) among the rural chicken producers while those with 16 – ≥20 was lowest (4.10%). The years of experience tally with the possibility of influence of

the government agricultural policy of Better Life for Rural Women Development that metamorphoized into different names by successive administrations in government up to 1999. This no doubt may have influence on the rate of adoption of ND vaccination. About 52.46% of the respondents were aware of immunization against Newcastle disease using ND vaccines. This indicated that the farmers were well informed on some of the management principles of chicken production that may be attributable to experience on the field and this agreed with the previous work of (16).

Figure 1 shows the number of chicken reared by the respondents. Those that reared 1 – 20 birds ranked highest with 45.08% while 41 – 60 birds were lowest (8.20%). It implies that the rural chicken producers were small scale farmers. This may have effect on the adoption of Newcastle disease vaccine as the vial or dosage produced was for minimum of 200 birds, considered a bit expensive hence adoption of immunization technique may be perceived as not cost effective especially by non-educated farmers. It therefore implies that birds must be pooled to effectively reduce labour and other overhead cost of ND immunization.

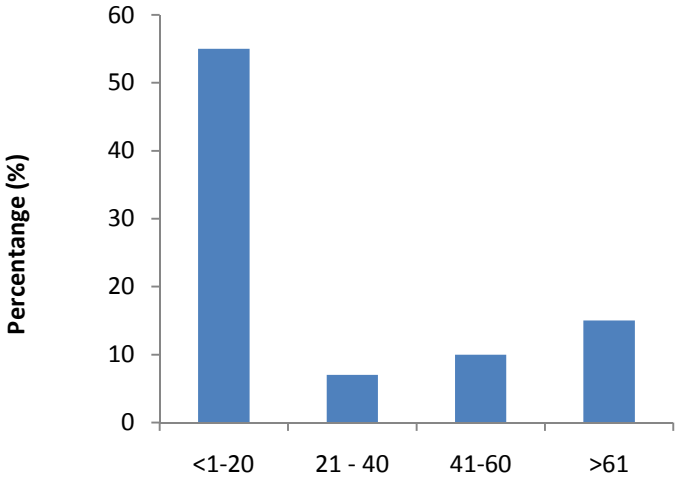

Figure 1 Number of chicken reared by the respondents

Table 2 shows the effectiveness of vaccination on some of the indices monitored. Results indicated that education showed positive and significant ($P<0.01$) influence on the income from local chicken production through immunization by the adoption of ND vaccines. Other socio-economic status of the respondents, such as farming experience and number of birds also significantly ($P<0.05$) influenced income generation from rural chicken production. These results agreed with the *apriori* expectation. The result on vaccination

implies that the more the number of birds vaccinated against Newcastle disease, the more the possibility of increasing the income which is in agreement with previous studies (17; 6). The R^2 also revealed that about 70.1 percent of the income generated from local chicken production was influenced by the listed socio-economic variables.

Table 3 shows the indices for analysis of the benefit cost ratio. It is clear from the data those respondents that adopted ND immunization using the vaccines recorded higher economic gains from chicken and egg sales than those that did not adopt the immunization technology. The disparity was obviously as a result of loss due to death or mortality caused by infestation of Newcastle disease.

Table 2 Socio-economic factors influencing income from local chicken production.

Explanatory variables	**Standardized coefficient**	**T- value**	**/P/ Level**
Constants	0.287	28.204	0.00*
Age	0.007	0.383	0.72
Education	0.26	1.944	0.004**
Number of Birds	0.23	0.940	0.349
Family size	0.10	0.439	0.662
Chicken experience	0.061	2.222	0.004**
Vaccination adopted	0.361	11.192	0.00*

Source: Field survey 2009

*Values significant p<0.01; ** Values significant p<0.05 $R^2 = 0.70$

Table 3 Indices for Analysis of Benefit/Cost Ratio

S/N	Types of bird	Adopters			Non-Adopters		
		No of birds vaccinated	No of birds lost/ Mortality (%)	No of birds after Mortality	No of birds	No of birds lost/Mortality (%)	No of birds after Mortality
1	Hens	559	43(7.69)	516	512	213(41.4)	299
2	Cocks	435	19(4.37)	416	427	109(25.5)	318
3	Chicks	1078	192(17.8)	886	769	391(50.8)	378
4	Total	2072	254(12.3)	1818	1708	713(41.7)	995
5	Average Egg/ hen	5031	387(7.69)	4644	4608	1917	2691

Table 4 presents all the variable cost used in the calculation of the gross margin and benefit cost ratio. The gross margin of respondents that adopted ND vaccines immunization was higher by 883.8% than the non-adopters.

The benefit cost ratio of the adopters of immunization through ND vaccination was 218% higher than the non-adopters (2.42:1 and 1.11: 1, respectively). It implies that those who adopted the vaccination against Newcastle disease gained more income on the average than those who did not adopt. This study however observed that cost of transportation for pooling of birds together for vaccination at a centre was responsible for 9.35% of the total variable cost. This could be addressed by organizing the rural chicken farmers into co-operatives recognized by government. They could be assisted to hire the services of veterinary extension specialist as it is done for the nomads engaged in cattle production with a view to encourage adoption, production and ultimately improved economy of the rural dwellers.

Proper enlightenment of the rural chicken producers through extension will not only improve economic gains of the farmers but also serve as a window of opportunity for job creation at local level and revenue generation for government.

Table 4 Benefit/Cost ratio of adoption and non-adoption of Newcastle disease vaccines by farmers' in Lokoja and Dekina Local Government Areas

S/N	Items	Unit Price ₦	Adopters of Newcastle Vaccines		Non-adopters of Newcastle vaccines	
			Quantity	Amount ₦	Quantity	Amount ₦
A	Eggs	15	4644	69, 600	2691	40, 365
B	Cocks	800	416	332, 800	318	254, 400
C	Chicks	100	886	88, 600	378	37,800
D	Hens	500	516	258, 000	299	149, 500
E	Total revenue			749, 060		482, 065
F	*No of birds & cost of vaccination	*see footnote	2075	5, 200	No vaccination	-
G	Cost of chicks @ 4 weeks old	100	2075	207, 500	1708	170, 800
H	Labour Cost for vaccination	₦200 for 200 birds.	2075	2075	No vaccination	-
I	Transportation cost to vaccinate	475 per adopter	61 adopters	28, 975	No vaccination	-
J	**Cost of total birds & eggs lost to ND	Unit cost as in A, B, C & D	Birds=317 Eggs is 43x9=387	309, 735	Birds = 713 Egg is 213 x 9 = 1917	432, 355
K	Total variable cost	F+G+H+I+J		309, 735		432, 355
L	Gross margin	E - K		439, 325		49, 710
M	Benefit/Cost Ratio	E/K		2.42:1		1.11:1

Source: Field survey 2009

*One vial of ND vaccines cost ₦500/200 birds; ** See data from Table 3

Conclusions and Application

It was concluded that:

1. Vaccination against Newcastle disease was found to be profitable for rural chicken producers. This can help to alleviate poverty and encourage job creation.
2. Extension agents should increase the rate of educating farmers on adoption of the vaccination with emphasis on the benefits from

vaccination against Newcastle disease.

3. Pooling of birds to a centre for vaccination as observed in this study could further encourage spread of disease. It is therefore recommended further that veterinary extension specialist should be employed to visit rural farmers with a view to offer clinical services.
4. Farmers could be organized into co-operatives that may be empowered to hire the services of veterinary consultants for this purpose as it is applicable for the nomads engaged in cattle production.

References

1. Food and Agriculture Organization (FAO) 2002. Characteristics and Parameters of Family Poultry Production in Africa. Printed by IAEA in Austria. Pp. 6.
2. Muhammed, L.U, Fasira, F.O. and Dawina, M.S. (2002). The Poultry in Nigerian. An overview. In: Muhammed L.U, B. Maisaaman and M.E. Ogedengbe (Eds). Towards the Economic Enhancement of Women. Proceeding of the National Veterinary Research Institute, Vom in Collaboration with Project Coordinating Unit (PCU) Shada FCT, Women alive foundation and ADPS October 7 – 10.
3. Atteh, J.O. (1990) Rural poultry production in western middle belt region of Nigeria. *In* E.B. Sonaiya, ed. *Rural poultry in Africa: proceedings of an international workshop,* p. 211-220. African Network for Rural Poultry Development (ANRPD), Department of Animal Science, Obafemi Awolowo University, Ile Ife, Nigeria.
4. Aini, I. (1990). Indigenous chicken poultry production in South- East Asia. World's Poultry Sc. J. 46: 51-57.
5. Alders R, Anjos. F.D. Baguol, B., Fringe, R., Lobo, G., Meta, B. and Young, M. (2005). Learning about the Control of Newcastle disease with Village Chicken Farmers in Mozambique. In: Czech C. (Ed) Participatory Livestock Research. A Guide CTA Publication Pp. 153 – 163.
6. Ajayi, F.O. (2010). Nigeria indigenous chicken: A valuable genetic resource for meat and egg production *Asian J. Poult. Sci. 14:164-172.*
7. Usman, M. and Haruna, E. S. (2002). Poultry Production Innovation. In: Muhammed L.U, B. Mcusaaman and M.E. Ogedengbe (Eds) Towards the Economic Enhancement of Women. Proceeding of the National Veterinary Research Instiutte, Vom in Collaboration with Project Coordinating Unit (PCU) Shada FCT, Women valive

foundation and ADPS October 7 – 10.

8. Abdul, P. A. , Sa'du, I. and George, B. D. G. (2002) Diseases of local poultry in Nigeria. Discovery and Innovation. 14: 107 – 118.
9. Rahman, M.M., Bari, A.S.M., Grasuddin, M., Islam, M.R., Alan, J. and Sill, G.C. (2002). Evaluation of Maternal and Humeral Immunity against Newcastle disease virus in chicken. Int. J. Pout. Sc. I. 161–163.
10. Orajaka, L.J.E., Adene, D. F., Anene, B. M., Onuna, E.A. (1999). Seroprevailence of Newcastle Disease in Local Chickens from South East derived Savanna Zone of Nigeria. Rev. Ecev. Med Vet. Pays. Trop; 52 (3 – 4): 185 – 188.
11. Federal Government of Nigeria (FGN, 2007). Federal Republic of Nigeria Official Gazette 94(24): 182.
12. Saliu, O. J. (2011) Fertilizer use in rice production in North Central Zone of Nigeria. A case study of Benue and Kogi State, Nigeria. Lambert Academic Publishing Sarbrucken. Germany. info@lap.publishing.com.
13. Hassan, M.K, Afify, M. and Ally, M.M. (2002). Susceptibility of Vaccinated and Unvaccinated Egyptian Chickens to Virulent Infectious Bursal Disease, Virus. Avian Pathol 31: 147 – 156.
14. Dairo, F. A. S., Abi, H. M. and Oluwatusin, F. M. (2012) Social acceptability of rabbit meat and strategies for improving its consumption in Ekiti State Southwestern Nigeria. *Livestock Research for Rural Development. Volume 24, Article #94.* Retrieved August 15, 2012, from http://www.lrrd.org/lrrd24/6/dair24094.htm
15. Onifade, A. A., Abu, O. A., Obiyan, R. I. and Abanikannda, O. T. F. (1999) Rabbit production in Nigeria: Some aspects of current status and promotional strategies. *World Rabbit Science.* 7 (2): 51-58.
16. Saliu, O.J., Sanda, M.E. and Audu, S. I. (2009). Adoption of Vaccination Against Newcastle Disease by Rural Poultry Women Farmers in the North Central Zone of Nigeria. Int. J. Poultry Sci. 8 (5) 500 – 503.
17. Nwanta, J.A, Unoh P.A, Abdul, Ajogi and Egege, S. C. (2004). Comparative Cost Implications of Unvaccinated and ORAL Vaccinated Local Chickens with A Malaysian Thermostable Newcastle Disease Vaccine (NDV_4 HR) in Kaduna State, Nigeria. *Journal of Animal Production Research,* 19 (1 and 2): 21 – 31.