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Rearing Methods, Seasons of the Year and Survivability of Rural Poultry Enterprise in Nigeria

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Abstract. The study was carried out to investigate the performance of rural poultry enterprise in Nigeria with respect to survivability and mortality rates during the various seasons of the year under three rearing systems. The two major seasons of the year (Rainy and Dry seasons) were considered in phases namely early rainy, late rainy, early dry, and late dry seasons, while the rearing conditions were intensive, semi-intensive and extensive (free-range) systems. In each of the phases of the seasons, farmers were visited and questionnaires used to extract responses from the various categories of farmers in the area regarding the management conditions adopted and the performance of their poultry under the different rearing conditions, notably the prevalent causes of mortality, the time they occur most, and number that died/survived in each season. A total of two hundred and twenty (220) rural poultry farmers in the State were selected for the study. The results showed that 120 (54.5%), 80 (36.4%) and 20 (9.1%) rural poultry farmers practiced extensive, semi-intensive, and intensive systems respectively. It was observed that rearing system play a highly significant ($P < 0.01$) role on the mortality and survivability of birds in the rural poultry enterprise. Mortality of birds is very high (53.6%) under the free-range system of poultry management, followed by the semi-intensive system (39.05%) and lowest in the intensive system (7.36%). A higher rate of mortality of birds in the free-range rural poultry system was witnessed during the late rainy (58% of birds reared) and late dry seasons (59% of bird reared).

Survivability was very high under the intensive system of poultry management in all seasons while survival rate in the early rainy and early dry seasons of the year was higher in the semi-intensive than free-range system. It was deduced that season of the year and management systems adopted in rural poultry production influenced the mortality rate and number of birds surviving.

Keywords: Smallholders Poultry Enterprises, Socio-Economic Characteristics, Rainy and Dry Seasons, Diseases Management.

1.1 Background to the Study

The survival of rural poultry industry in developing countries depends to a large extent on the type of rearing methods employed and seasonal changes in weather conditions. In nearly all African countries, poultry production in rural areas is predominantly based on a free-range system utilizing indigenous types of fowl, (Kitalyi, 1998; Horst, 1988). The system is characterized with family ownership of the birds. Then birds are then left to scavenge to meet their nutritional needs. The feed resources vary depending on local conditions and the farming system. Housing may or may not be provided, (Huchzermeyer, 1973; Atunbi and Sonaiya, 1994; Kuit, Traore and Wilson, 1986). Where housing is provided, usually local materials are used for construction. Low productivity is the main feature of this production system, which can be attributed to low genetic potential, poor disease control programmes and poor feeding. Recently, the highly infectious Newcastle disease (NCD) is reported to have caused 100 percent mortality. And it has been identified as a major poultry production constraint in the village chicken production systems of many African Countries (Chabeuf, 1990; Olayiwole, 1984; Achiempong, 1992). Livestock husbandry activities are minimal with some roles played by gender. The health of the birds is not guaranteed because; there are no disease control programmes such as vaccination of the birds at various stages and ages. The birds are exposed to many disease conditions at various seasons of the year. In most cases indigenous knowledge are used to

treat/handle the poultry (Ugwu, et al., 2009).

Disease like Newcastle and parasitic infection have been reported to be the most devastating and prevalent poultry disease in many developing countries including Nigeria, (Chabeuf, 1990; Chrysostome, 1995; Bell, Kane and Le Jan, 1995). Parasites are also prevalent due to favourable environmental conditions, (Zaria, et al. 1993). In spite of low-input by rural poultry farmers in developing countries on poultry production, free-range birds play many socio-economic roles. In Africa, they constituted over 50 percent of the total poultry population and contributed 30 to 80 percent of total national poultry products (Sonaiya, 1990). Estimates based on human and livestock population in Ethiopia showed that the village chicken provides 125kg of poultry meat per capital per year, whereas, cattle provides 5.23kg, (Forsiddo, 1986).

In Nigeria, mortality of indigenous chickens under free-range system was very high due to diseases, poor management, poor breeding system and malnutrition, (Dipleolu, Keripe, Gbadamosi, and Gbadamosi, 1998). Also, some diseases can appear more prevalent and devastating at certain seasons of the year. Newcastle disease and other respiratory diseases become more prevalent in the dry season while parasitic infections appear more during the rainy seasons. Given this information, what have been the actual experiences of poultry farmers in Nigeria and especially those in Kogi State?

1.2 Objectives of the Study

Poor management system of poultry production has been identified as a major constraint militating against the survivability of rural poultry enterprise in Nigeria in general and Kogi State in particular. The poor management of the enterprise greatly favoured other seasonally-dependent poultry diseases that constitute a major threat to poultry business in the region. Thus, the objectives of the study were to:

(a) obtain the demographic data of poultry farmers in Kogi State, Nigeria;

(b) investigate and identify the pattern of disease outbreak in rural poultry business under different management methods and at different seasons of the year;

(c) find out the most devastating and prevalent poultry disease s(s), in rural poultry business;

(d) find the most favourable management system of poultry production in rural areas and also, the most favourable seasons of the year with high rate of survivability;

(e) find out the worst management methods of poultry production and the most unfavourable seasons of the year with high chick mortality; and

(f) make recommendations for improved poultry enterprise in Nigeria;

1.3 Justification

The population of rural poultry in Africa has been estimated to account for more than 60 percent of the total national poultry population, (Sonaiya, 1990a). Also, in Nigeria, rural poultry accounted for about eighty percent of the total national flock, (Awan, 1993). Despite the high percentage, the survivability of rural poultry industry in Nigeria is very low due to poor management techniques embarked upon by rural poultry farmers, and outbreak of seasonally dependent diseases that can account for high chick losses.

The management of village chicken is complicated by the presence of multi-aged groups in the same flock. High chick mortality can be attributed to poor feeding, house and health control practices. There was no preferential treatment for the chicks, as they compete for the available feed resource with other animals. Where supplementary feeding and water are provided, the containers used are too deep for the chicks to reach the contents. Predation can also be a major cause of high chick mortality because; the young chicks are more vulnerable. Predators like hawks, rats, mongooses, snakes, dogs, cats and foxes prey on young chick especially those in free-range management system.

This management system can leads to failure of health control programs due to poor administration of vaccine carriers whether food or water as the birds are

unprotected. Feeding and health improvement programmes will only be successful if this situation is given due consideration to ensure that the different birds are protected. The mortality rate of naturally brooded chicks, whose only source of feed is from scavenging under free-range conditions, is very high and often exceed 50 percent up to eight weeks of age (Chabeuf, 1990; Olayiwole, 1984; Achiempong, 1992).

2.0 MATERIALS AND METHODS

2.1 Location of the Study

The study area is Kogi State, a state carved out of the former Benue and Kwara State. The State has twenty one (21) Local Government Areas. Kogi is situated in the humid tropical part of Nigeria with annual rainfall of about 1000mm, experiencing minimum and maximum temperatures of 20^0C and 30^0C respectively and relative humidity of 50 to60% in the dry season to 70 to 80% in the rainy season. The vegetation is largely derived Savannah.

The location has two distinct seasons. These are the rainy seasons, (April-October) and dry season (November-March). Harmattan weather may occur during the earlier, middle or later part of the dry season. It may also occur throughout the season depending on changes in weather condition. The main occupation is farming which provides income, food and employment for about 75% of the population. Because of the 'conducive' climatic conditions, poultry and other domestic animals are successfully reared in the State.

2.2 The Design of the Study

The study was intended to find out the performance of poultry (exotic and local) with respect to survivability and mortality rates during the various seasons of the year and under three rearing conditions. The two major seasons of the year were sub divided into the early dry, late dry, early rainy and later rainy seasons while the rearing conditions were intensive, semi-intensive and free range system. In each of the seasons, farmers were visited and questionnaires used to extract

responses from various categories of farmers in the area regarding the management conditions adopted and the performance of their poultry under the different rearing conditions, notably the prevalent causes of mortality, the time they occur most, number that died/survived in each season, etc.

2.3 Sample and Sampling Technique

The State is made up of 21 Local Government Areas. Eleven (11) Local Government Areas were randomly selected out of the 21 Local Government Areas. The Local Government Areas were selected from the three (3) agricultural zones of the State as shown in Table 1.

Table 1: Sampling Technique Based on the Three Agricultural Zones in Kogi State

Zones	No. of the L.G.A of the Zone	Sampled LGA	No. of Farmers
Igala/Bassa (Kogi East)	8	4	80
Ibira (Kogi West)	10	5	100
Okun (Kogi West)	3	2	40
Total	21	11	220

Thus, out of the Local Government Areas in each of the zones, four (4), five (5) and two (2) were sampled from Kogi East, Kogi Central and Kogi West respectively, totaling eleven (11) out of the twenty one (21) Local Government Areas in the State.

2.4 Data Collection Technique

The data for this study were obtained through oral interviews and use of

structured questionnaires. Several visits were made to selected rural farmers on their farms. The questionnaire was structured to ensure that information on the number of birds stocked, their performance with respect to survivability and mortality (including their causes) of birds under the various rearing conditions during the seasons were collected.

The questionnaire had three sections. Section A dealt on the bio-data, the social and educational status of the respondents (farmers). Section B dealt on the type of birds reared either (exotic or local) and the management methods. Section C dealt on the effects of the various seasons on the performance (survivability and mortality) of the birds.

2.5 METHOD OF DATA ANALYSIS

The data collected were analysed using descriptive statistics such as means, percentages and standard errors of the means. Some aspects of the data (number of birds reared, survivability and morality of birds) were subjected to Randomized Complete Block Design analysis of variance. The SASS computer software was used for analysis. Significantly different means were separated according to the procedure of Duncan's New multiple range test.

3 RESULTS AND DISCUSSION

3.1 Personal Characteristics of the Respondents

The personal characteristics of the respondents (poultry farmers) that were investigated included sex, age, educational background, special training in poultry business and relationship with government agencies.

3. 1.2 Distribution of Poultry Farmers in Kogi State by Sex

The distribution by sex of farmers in Kogi State is presented in Table 2. It can be deduced from the Table 2 that the majority of rural poultry farmers were females (81.8%) while the number of males engaged in poultry keeping was low (18.2%). This result agrees with the report of Chale and Carloni (1987) who on

reviewing the attributes of rural poultry in Africa and Asia highlighted the improvement of chicken as diversification component in rural farming system particularly for women. The authors noted that income accrued from the sale of eggs in women's project in the Sudan was useful in the purchase of household consumable goods, thus increasing the household welfare.

Table 2: Distribution of Poultry Farmers in Kogi State by Sex

Sex	Frequency	Percentage
Male	40	18.2
Female	180	81.8
Total	**220**	**100.0**

Source: Field data

Also, Gittinger Leslie and Hoisington (1987) in a survey of food production by women and its impact on food security found that households that had cropping as their only source of food production were more food insecure than household that had livestock including poultry. These reports tend to show that women were more in poultry keeping than men and it offers beneficial diversification and security against crop failures and economic down-turn in rural households. It ensures economic empowerment of rural women as reported in India (Desai, 1996; Janviriyasopak, et al 1989; FAO, 1994).

3.1.3 Distribution of Poultry Farmers in Kogi State by Age

Results on Table 3 revealed that those within the ages of 50 to 59 years were the majority (54.5%), followed by those within the ages of 40 to 49 years which constituted 22.7%. Table 3 showed the age distribution of poultry farmers in the study area.

Table 3: Distribution of poultry farmers in Kogi State by Age

Age	Frequency	Percentage
25 – 29	5	2.3
30 – 39	40	18.2
40 – 49	50	22.7
50 – 59	120	54.5
60 – 69	5	2.3
Total	**220**	**100.0**

Source: Field data

3.1.4 Educational Status of Poultry Farmers in Kogi State

The information in figure 1 reveals that majority of rural poultry farmers were illiterates. This may have accounted for the poor management practices that prevailed in most of the farms. A high percentage of poultry farmers (63.6%) were illiterates while those that had first school living certificate (up to elementary six level) was just 20.5%. Figure 1 shows the educational status of poultry farmers in Kogi State.

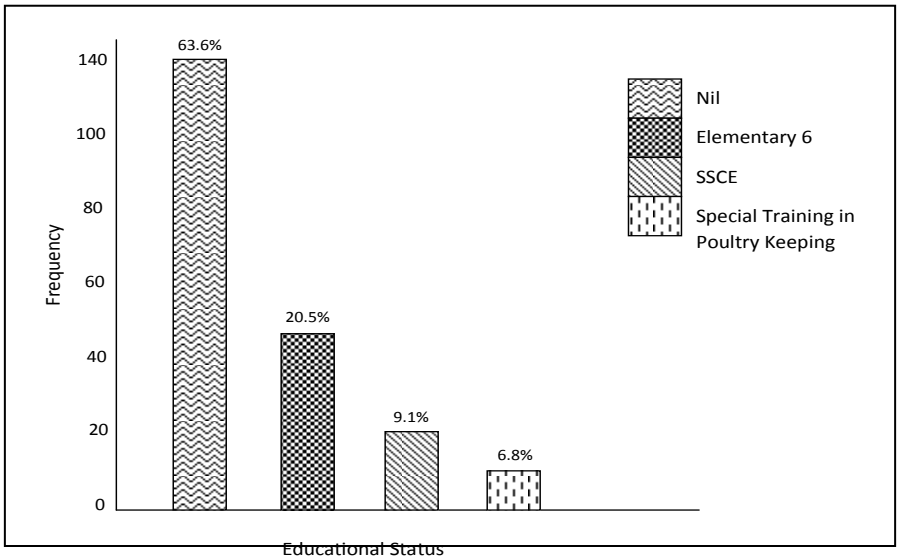

Figure 1: Educational Status of Poultry Farmers in Kogi State

Source: Field data

3.1.5 Experience in Poultry Business

The Figure 2 showed that the farmers who had spent 5 to 10 years in poultry business were the majority and they constituted 68.2%, followed by those of 2-5 years who constituted 21.7%. Only 9.1% of the farmers had spent less than 2 years in the business. The years of experience that farmers had in poultry farming is presented in the pie chart (Figure 2) below.

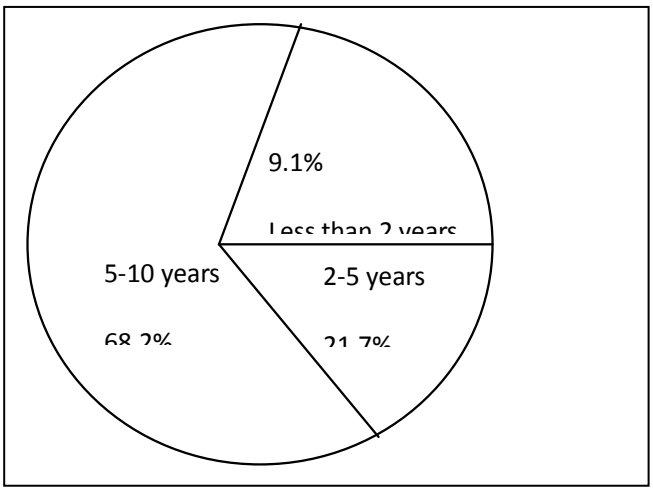

Figure 2: The Years of Experience of Farmers in Poultry Business

Source: Field data

3.2 Size of Farms, Breeds Uses and Sources

3.2.1 Size of Poultry Farm (Number Reared and Stocked)

The sizes of poultry farms in terms of number of birds reared and stocked are presented in Table 4. The Table 4 shows that the majority of rural poultry farmers in Kogi State were involved in small-scale poultry business. It is because 45.0% of the rural poultry farmers stocked between 100 – 199 birds per year followed by those that stocked from 200 – 299 birds which constituted 22.27%; while those that stocked between 600 – 1000 constituted just 4.5%.

Table 4: Size of Poultry Farm in Terms of Number of Birds Reared/Stocked

Size of Farm	Frequency	Percentage
100 – 199	99	45.0
200 – 299	49	22.27
300 – 399	29	13.18
400 – 499	19	8.63
500 – 599	14	6.36
600 – 1000	10	4.54
Total	**220**	**100**

Source: Field data

3.2.2 Types of Poultry reared by Rural Poultry Farmers in Kogi State

The distribution of farmers based on the types of birds reared in Kogi State are presented in Table 5.

Table 5: Percentage distribution of rural poultry farmers based on the types of birds reared

Types	Frequency	Percentage
Local	180	81.8
Exotic	40	18.2
Total	**220**	**100**

Source: Field data

Table 5 shows that the predominant type of birds reared by rural poultry farmers in Kogi State was the local or the indigenous chickens which constituted 81.8% while the farmers that rear the exotic breed constituted 18.2%. This result is in consonance with the report by ANPRD (1995) that village chickens were more widely distributed in rural Africa than other livestock species. Also, Collier *et al.*

(1986) reported a survey of 600 households in 200 villages in Tanzania and showed that local chickens were the only form of livestock found in most households. A similar result was obtained by (Awan, 1993) who noted that imported breeds have not taken over the Nigerian poultry enterprises /industries as some schools of thought or feel. In that study, the proportion of Nigeria flock that was local poultry was 12,000,000 which constituted about 80% of total poultry population.

3.2.3 Source of Poultry Stock

The source of the poultry stock reared by rural poultry farmers in Kogi State are presented in Table 6.

Table 6: Source of Poultry Stocked/Reared by Rural Poultry Farmers in Kogi State

Source of Poultry Stock	Frequency	Percentage
Purchase from rural market	180	81.8
Gifts from friends/relations	30	13.6
Agro/ Veterinary offices	10	4.6
Total	**220**	**100**

Source: Field data

Table 6 shows that majority of the rural poultry farmers' source their birds from the rural market as 81.8% were involved; while only 4.6% source their stock from agro-veterinary shops. The fact that most of the birds reared in poultry farm were largely obtained from the markets seems to account, in part, for the high mortality usually experienced. This is because in the markets, healthy birds are mixed up with unhealthy ones and this increases diseases and pest risks. The lack of quarantine creates problem as diseases from the birds got from the markets could be spread to the healthy ones at home.

4.1 Rearing Systems and Seasons Effect on Survivability

4.2 Rearing Systems Adopted by Rural Poultry Farmers in Kogi State

The distribution of rural poultry farmers in Kogi State based on the rearing systems adopted is presented in Table 7.

Table 7: Distribution of rural poultry farmers based on the rearing methods

Rearing Methods	Frequency	Percentage
Extensive	120	54.5
Semi-Intensive	80	36.4
Intensive (Deep-litter)	20	9.1
Total	**220**	**100**

Source: Field data

Table 7 revealed that the predominant method of poultry production in rural areas was the extensive system. Farmers adopting this system constituted 54.5%, followed by semi-intensive system (36.4%) and the intensive system (9.1%). This result is in agreement with the report of some authors who observed that housing or shelter was usually not provided in rural poultry (Atumbi and Sonaiya, 1994; Yongolo, 1996). Available report (Roberts, 1992) indicated that Sri Lankan villagers reared hybrid chickens in a semi-scavenging system.

4.3 Disease Incidence in Poultry Farms

The extent to disease incidence in rural poultry farms in Kogi State during the various seasons of the year is presented in Table 8. The Table 8 shows that poultry disease occurred most during the late dry seasons (47.7%) and late rainy season (34.1%) respectively. Poultry disease occurrence was relatively less during the early dry season (13.6%) and early rainy season (4.6%) respectively.

Table 8: Distribution of poultry disease incidence in consulted farms by Seasons

Seasons	Frequency	Percentage
Early rainy season	10	4.6
Late rainy season	75	34.1
Early dry season	30	13.6
Late dry season	105	47.7
Total	**220**	**100.0**

Source: Field data

4.4 Distribution of specific diseases by Season

The distribution of poultry diseases by season based on farmers' response with respect to observed symptoms is presented in Table 9. The Table 9 shows the pattern of diseases under the various rearing methods and at various seasons of the year. The highest incidence of the disease was observed in the extensive system (53.6%) followed by the semi-intensive system (39.05%) and the intensive system (7.36%). Most of the diseases occurred during the late rainy season and late dry season; except coccidiosis which occurred cross seasons and irrespective of rearing methods. Less incidence of the diseases were observed during the early rainy and early dry seasons, probably because during these seasons, the free-ranging and semi-intensive birds find enough feed to sustain their resistance to these infectious as the seasons are more favourable for searching for feed.

The high incidence of diseases during the late rainy season and late dry season in the semi-intensive and extensive systems could be because, these seasons favours the growth of the infective forms of the pathogens. It is also likely that there is a decline in resistance of the birds to infections due to extreme cold weather. Also, birds reared under semi-intensive and extensive systems find it difficult to source enough feeds during the late rainy season.

Table 9: Distribution of poultry diseases based on response of farmers with respect to observed symptoms by Season

Rearing methods	Seasons of the Year		Poultry Disease Observed													
			Newcastle Disease	Coccidiosis	Chronic respiratory	Infectious	Gumboro disease	Infectious Bronchitis	Fowl pox	Salmonello	Helminthia	Ectoparasit	Total percentage
Intensive system	Early season	rainy	√	√									
			√	√	√	√	√		√				
	Late Season	Rainy	√	√									7.36
			√	√	√	√	√	√					
	Early Season	Dry											
	Late Season	Dry											
Semi-Intensive System	Early season	Rainy		√			√				√		
				√						√	√	√	
	Late Season	Rainy	√	√	√			√					39.2
			√	√	√	√	√	√					
	Early Season												
	Late Season	Dry											
Extensive system	Early season	Rainy		√				√	√	√	√	√	
				√		√	√	√	√	√	√	√	
	Late Season	Rainy	√	√	√			√	√	√			53.4
			√	√	√	√	√	√	√	√			
	Early Season	Dry											
	Late Season	Dry											
													100

Source: Field data

Also, fatal respiratory diseases like Newcastle disease, chronic respiratory disease, infectious bronchitis and infectious coryza were very rampant during the late dry season. This could be as a result of the fact that at this time of the year, the pathogenic forms are easily airborne (especially for respiratory diseases) and spread very easily aided by the harmatta. The prevalence of these diseases in the African rural poultry industry has been reported many times (Adene, 1996). In line with the findings of the present study, Chabeuf (1990) reported that the most devastating disease of village chickens in Cameroon is the Newcastle disease whereas, in commercial poultry, coccidiosis, Marek's Disease (MD) and IBD (Infectious Bursal Disease – Gumboro) are more prevalent. Other authors in Africa such as Chrysostome *et al.,* (1995), in Benin Republic, Bourzat and Saunders, (1990); in Burkina Faso, and Yongolo, (1996) in United Republic of Tanzania, all support the view that Newcastle disease is the most devastating disease of rural poultry industry. The results obtained in this study showed that in intensive, semi-intensive and extensive systems, these diseases cause problems in all the seasons of the year. It can be said that regular veterinary surveillance especially with respect to the rural poultry industry notably in the late dry and late rainy seasons in Nigeria is a necessity. It is noteworthy that ecto-parasite infestation occurred mainly in the semi-intensive and free-range systems mostly in the early rainy and late rainy seasons. This result agreed with the report of Zaria *et al.* (1993) that the external parasite problem in the rural poultry industry was associated with season, being prevalent in the rainy season.

The researchers in an attempt to confirm the existence of these poultry diseases based on observed symptoms from farmers applied their background knowledge of Animal Health by carrying out post-mortem examinations on some samples of the dead birds in the various locations during the seasons. It was observed through pathogenic evidence that the symptoms of observed/reported by farmers relate to the disease suspected in a majority of cases.

In general, the high incidence of the diseases under the extensive system is due to the uncontrolled exposure of the birds to environmental influences

resulting from the absence of housing, lack of routine vaccination and adequate feeding which are typical characteristics of extensive system of poultry production.

4.5 Reactions of Farmers to Increased Disease Incidence During the Various Seasons

The reactions of farmers to increased disease incidence during the various are presented in Table 10.

Table 10: Reactions of Farmers to Increased Disease Incidence During the Various Seasons

		Reaction of Farmers at any season of the year+			
No. of farmers	Rearing methods *	Bird are sold immediately	Veterinary assistance is sought	Local remedies are used	Birds are left to recover untreated
20	Intensive system	Nil	20 (100%)	Nil	Nil
80	Semi-Intensive System	60 (75%)	10 (12.5%)	10 (12.5%)	Nil
120	Extensive system	80 (66.7%)	Nil	10 (8.3%)	30 (25%)

* Values in parenthesis are the percentages of farmers' response for each method respectively

+Seasons are: Early rainy season (ERS), Late Rainy Season (LRS), Early Dry Season (EDS), and Late Dry Season (LDR).

Source: Field data

Table 10 shows the reactions of rural poultry farmers to increased disease incidence under the various rearing systems. It can be deduced from the Table that, in the intensive system of poultry management where twenty (20) farmers were interviewed, their reaction to increased disease incidence was usually to solicit for the assistance of veterinary or par veterinary personnel to arrest the situation.

Under the semi-intensive system where eighty (80) farmers were interviewed, sixty (60) farmers which constitute 75% in semi-intensive system reacted to increased disease incidence on their farms by selling the infected birds immediately, ten (10) farmers which constituted 12.5% sought veterinary assistance while the remaining ten (10) constituting the remaining 12.5% sought local remedies.

The reactions of the one hundred and twenty (120) farmers interviewed under the extensive system of poultry production revealed that, eight (80) farmers which constitute 66.7% of farmers practicing extensive system reacted to increased disease incidence by selling the infected birds, ten (10) farmers which constitute (8.3%) sought local remedies, while the remaining thirty (30) farmers which constitute (25%) left the birds to recover untreated. This can explain the high degree of morbidity/mortality of birds under the extensive system since the untreated birds contaminate the environment with their infected droppings and discharges.

4.6 Number of Birds Reared Per Farmer Per Year in Kogi State Under Various Management Systems and Seasons of the Year

The number of birds reared per farmer in Kogi State under various management systems and seasons of the year are presented in Table 11. The overall mean number of domestic chicken irrespective of seasons reared in Kogi State per farmer per year under the various systems differed significantly ($P<0.01$)

between systems of management with the lowest number of birds (205.35 ± 1.72) reared under the extensive system and the highest (1006.88 ± 21.87) reared in the semi-intensive system.

Table 11: The Means and SEM of Number of Birds Reared Per Farmer Per Year in Kogi State Under Various Management Systems and Seasons of the Year

Seasons	Extensive system	Intensive system	Semi-Intensive system	Interaction Mean
Late Rainy Season	205.20±3.22^{a}	1009.00±45.18^{c}	499.5 ± 9.6^{b}	384.49±17.14
Early Rainy Season	205.92± 3.41^{a}	1000.00± 44.52^{c}	499.66 ± 9.98^{b}	384.11±17.00
Late Dry Season	205.98± 3.57^{a}	1008.00± 42.63^{c}	500.06 ± 10.04^{b}	385.02±17.10
Early Dry Season	204.30± 3.37^{a}	1010.50±46.00^{c}	499.96 ± 10.03^{b}	384.29±17.23
Overall	205.35± 1.72^{a}	1006.88±21.87^{b}	499.81 ± 4.94^{c}	

a,b,c – Row and column means with different superscripts are statistically different ($P < 0.01$); **SEM** is standard error of mean

Source: Field data

The value for the total number of birds reared per farmer, per year significantly ($P < 0.01$) varied among systems within seasons with number of birds reared in the extensive system being considerably lower than average values obtained for semi-intensive and intensive systems in each season. The value for the total number of birds reared in the extensive system being considerably lower than average values obtained for semi-intensive and intensive systems in each season. The total number of birds (205.35± 1.72) reared in the

village free-range system in Kogi State was lower than 634 birds reported by FAO (2008) from Sall's findings in 1990 for Senegal but higher than 110 birds reported for Ghana by El Hadaji (1997) from Vanveluw's work in 1987. The interaction means (season x management system) were not significantly ($P > 0.05$) different. The values reported in Table 11 did not exclude losses by infection or other causes.

4.7 Mortality rate of birds reared under three Management Methods during the Seasons

The means and standard error of means (SEM) of mortality rate of birds reared under three management methods during the seasons are presented in Table 12.

Table 12: Mean and SEM of mortality rate of birds reared under three management methods during the seasons

Managements	Extensive system	Intensive system	Semi-Intensive system	Interaction Mean
Late Rainy Season	119.58± 3.23^{b}	26.75 ± .932^{ac}	208.59 ± 2.99^{bc}	143.40± 4.28^{a}
Early Rainy Season	99.48 ± 1.97^{ab}	5.45 ± .578^{a}	92.84 ± 2.57^{ab}	88.56 ± 2.28^{b}
Late Dry Season	122.44± 3.48^{b}	36.90 ± .684^{ad}	207.34 ± 2.87^{bc}	145.43± 4.14^{a}
Early Dry Season	96.58 ± 1.85^{ab}	13.55 ± .624^{ab}	92.43 ± 2.60^{ab}	87.56 ± 2.09^{b}
Overall	109.51± 1.46**	20.66± 1.40**	150.30± 3.51**	

a,b,c, d – Row and column means with different superscripts are statistically different ($P < 0.01$); SEM is standard error of mean, Source: Field data

The Table above shows that the rates of mortality differed significantly

(P <0.01) between seasons within management methods. However, taking into account the average number of birds reared in each system, the rates of mortality was highest in the extensive system (53.6% of total) followed by the semi-intensive (39.05% of total) and the least was the intensive system (7.36% of total). Thus, the overall mean rate of mortality differed significantly (P < 0.01) among management methods. It is important to note that the rates of mortality in all the management methods were highest in the late rainy season and late dry season. This appears evident in the highly significant (P < 0.01) season x management method interaction effect which suggest that mortality rate in each management method may vary with season. Saidu *et al*. (1994) and Thitisak (1992) in their reports on mortality of birds in the village chicken production in Northern Nigeria and Thailand noted that the trend of chicken mortality is mostly seasonal. In Thailand, Thitisak (1992), reported that mortality occurring during the rainy season was mainly due to fowl cholera, colibicilosis and pseudomonas infections while mortality in the dry season was often as a result of Newcastle disease, Coryza and Streptococcal infections. In Nigeria, of the 522 cases of infection studied ND accounted for 30% of all cases with more of these cases occurring from October to December and others from July to September (Sai'du *et al*., 1992). These authors noted that the most vulnerable stage of growth when these diseases cause much havoc is when birds were below two months of age. Thitisak (1994) noted that in Thailand the most catastrophic mortality occurred in March of 1987 and 1988 (Late dry season) when early storms cause sudden drops in temperature which chill the birds especially those under two months of age. In the present study, the two major seasons were re-classified to determine with certainty the months of the season(s) when farmers sustain losses most from bird mortality.

4.7.1 Survivability rate of birds reared under three management methods at various seasons

The means and SEM of survivability rate of birds reared under three management methods at various seasons are presented in Table 13.

Table 13: Mean and SEM of survivability rate of birds reared under three management methods at various seasons

Seasons	Extensive system	Intensive system	Semi-Intensive system	Interaction Mean
Late Rainy Season	86.25± 3.59^{a}	968.25 ± 44.7^{c}	291.44 ± 9.91^{ab}	240.34± 17.7^{a}
Early Rainy Season	102.57±3.99^{ab}	994.55 ± 44.2^{c}	409.12 ± 10.39^{b}	294.26± 18.7^{b}
Late Dry Season	84.40 ± 3.77^{a}	963.25 ± 44.5^{c}	292.92 ± 10.37^{ab}	239.42± 17.7^{a}
Early Dry Season	108.60±4.02^{ab}	986.45 ± 44.4^{c}	400.64 ± 10.92^{b}	293.76± 18.4^{b}
Overall	95.45 ± 1.98^{a}	978.13±21.85^{b}	348.53 ± 6.06^{c}	

a,b,c – Row and column means with different superscripts are statistically different ($P < 0.01$); SEM is standard error of mean.

Source: Field data

The result showed that the between seasons and within system of management means of survivability was significantly different ($P < 0.01$) for extensive and semi-intensive systems but not in the intensive system. Significantly ($P < 0.01$) more birds survived in the ERS and EDS (291 ± 9.91 and 292.92 ±10.37 respectively) than other seasons under the extensive and semi-intensive systems with the lowest category of numbers surviving in the LRS (86.25 ± 3.59) and LDS (84.40 ± 3.77) in the extensive and semi-intensive. It is

apparent from the result that rural poultry farmers in Nigeria sustain tremendous losses each year during the late rainy season and late dry season under the traditional free-range and semi-intensive systems. The overall mean (summed over seasons) indicates that significantly more birds survived ($P < 0.01$) in the intensive that either of the extensive and semi-intensive systems. The most vulnerable system is apparently the extensive system. This is not unexpected since little or no care is given to the birds under this system. They simply scavenge on daily basis and are prone to disease, parasites, predators and vagaries of the seasons day by day. Also, the season and management system interaction means for survivability were also significantly ($P <0.01$) different with the fewer birds surviving in the late rainy (240.34 ± 17.70) and late dry (239.42 ± 12.7) seasons compared to early rainy (294.26 ± 18.7) and early dry (293.76 ± 18.4) seasons. This seems to show that the survivability of birds in the management systems largely depend on the season of the year especially with respect to semi-intensive and extensive systems.

5.0 CONCLUSION AND RECOMMENDATIONS

The study has been able to show that more women were involved in rural poultry production than men and these rural poultry producers were mostly within the ages of 50 and 59 years. They were mostly uneducated though with reasonably long experience in rural poultry rearing. The size of flock in the rural system that had between 100 and 200 birds per annum were very few. The management system largely adopted was extensive followed by semi-intensive. None of the farmers adopt the intensive rearing system for the local birds; the few adopting this system reared improved breeds. Disease incidence was mostly noticed in the late rainy and late dry seasons with more cases recorded by farmers during the late dry season. Majority of the infections and symptoms described by farmers and verified by the researcher during vulnerable seasons were Newcastle disease, coccidiocsis, chronic respiratory diseases, infectious

coryza, Gumboro, infectious bronchitis, fowl pox and salmonellosis. Parasites that cause problems were worms and ectoparasites mainly fowl bug and lice. The rate of incidence in the free-range was 60% while it is 30% and 10% respectively in the semi-intensive and intensive systems. Farmers' reaction to disease incidence in the free-range and semi-intensive systems is largely to sell sick birds or wait for them to recover. Farmers that seek veterinary assistance are low. Number of birds reared per farmer per year was found to be generally low in the rural poultry system especially in the extensive system. High rate of mortality within system was mostly recorded in the late rainy and late dry season (with the exception of the intensive system) which coincided with the period disease incidence were mostly noticed. A high mortality of 53.3% was recorded under the extensive system and the disease pattern is all year round with higher rate of mortality during the late rainy season and late dry season. This was followed by the semi-intensive system (39.05%) and lastly by the intensive system (7.36%). Newcastle disease, chronic respiratory disease was rampant during the late dry season. Newcastle disease was mainly spread by inhalation of droplets from sick birds and a large number of birds can be infected within a short periods aided by the harmattan weather that occur in this season. Thus survivability of birds per farm per year is mostly low in the extensive and semi-intensive systems as a result of high disease incidence that occur in the late rainy and late dry seasons. The issue of high mortality in the village poultry programme is rather worrisome and the attitude of farmers to disease incidence is not helping matters as they prefer to sell the sick birds to recover part of the value of the birds than to look for veterinary services. On the other hand, trained veterinary personnel are absent in most of the localities or far from the immediate reach of the farmers. This is usually a source of disillusionment to the farmers and the major reason why they prefer to sell sick birds instead of treating them is to enable them survive and grow to full market size.

It can therefore be concluded that the extensive system of poultry management where the birds roams about and scavenge for their feeds with

complete absence of housing, medication, vaccination, feeding and other routine management techniques encourage the spread of diseases among rural flocks mostly in the late rainy and dry seasons resulting in high mortality and low survivability of the birds. This system is predominant among rural poultry farmers in the area of study. Strict adherence to the recommendations will in a large way ensure high survivability of rural poultry enterprises in developing countries.

Recommendations

Based on result of the study, the following recommendations were made:

1. There would be need for Animal Scientists who serve as extension agents and also veterinary staff to educate the rural poultry farmers on improved rearing methods and its importance, importance of vaccination, maintenance of high level of hygiene and sanitation to ensure high rate of survivability and low rate of mortality of the rural flocks.
2. Vaccination programmes should be thoroughly designed to cover these diseases which although, obviously known to occur but were left to ravage and devastate poultry production in the state.
3. The government should employ enough Animal Scientist and Para-veterinary personnel so that there will be enough animal scientists to oversee the problem of rural poultry farmers.
4. Farmers should source their breeding stock from reputable sources that have no disease problems among their flocks instead of the open market where both sick and healthy birds are mixed up. This will help in reducing disease incidence and/or mortality.
5. Agricultural agencies in the state and local governments should consider establishing well managed poultry farms in rural areas to serve as demonstration farms so that the rural farmers can have practical knowledge of what modern or what improved poultry farming entails.

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