HEALTH AND MANAGEMENT IMPROVEMENTS OF FAMILY POULTRY PRODUCTION IN AFRICA - SURVEY RESULTS FROM KENYA

S.W. NJUE, J.L. KASIITI, M.J. MACHARIA, S.G. GACHERU, H.C.W. MBUGUA
Veterinary Research Laboratories,
Kabete, Kenya

Abstract

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In Kenya the poultry population is about 25 million, 80% of which comprises local chicken and the rest, improved breeds. With the ever-increasing prices of red meat, local chicken has become the main source of animal protein in the form of meat and eggs for the rural population. Both egg production and egg size varies with season as the quantity and availability of feed varies. This paper describes work done during the wet season to identify constraints of family chicken production in the study area. The study was repeated on the same farms that were identified in work done earlier during the dry season. Data were gathered from 24 family poultry farms located in Kangundo and Kikuyu divisions. Through the Veterinary Officers and the Animal Health Assistants who assisted in the dry season fieldwork the farmers were contacted a week before the intended farm visits. Baseline and disease survey forms were administered again. The baseline survey achieved 100% response rate. During the farm visits, serum samples, blood and faecal samples were collected. Post mortem examination was also done on sick birds. The flock size in the two ecological zones decreased during the wet season, most probably due to the Christmas festivities. The percentage deaths in Ecological Zone III (ECZIII) were high because most farmers in this zone set their chicken free thus predisposing them to predators, disease and harsh weather conditions. Disease control information was scanty as most farmers were not keen about it. Worm infestation was not as prevalent in the wet season as compared to the dry season. Except for three farms, all the other twenty-one farms had been exposed to Salmonellosis at one time or another. Women were involved in aspects of poultry management, while the men were significantly involved in shelter construction. The local birds were free-range feeding on green grass, leafy vegetables and insects. Occasionally, the birds were supplemented with crushed maize grains or household refuse and food leftovers. There was no specialised housing for the birds. They were often provided with simple structures to protect them from the weather elements. Indigenous (local) chicken production is a worthy venture for farmers as long as they are taught about disease control and food supplementation. Since mainly women are the owners of local chicken, extension work focusing on the already existing women groups would be the most convenient and fastest means of channelling technology for improving local chicken production.

1. INTRODUCTION

The local chicken appears to be genetically heterogeneous. It has no specific colour or colour pattern like most modern breeds of chicken. It is nondescript both in phenotype and genotype. The local birds seen in villages in Kenya, or other countries of Africa, may have been crossed with exotic cocks in earlier years, but such genes have been dispersed and lost in the population because of unplanned breeding programmes and absence of selection. In essence the local chicken in rural Africa is still a local example of *Gallus gallus* [1].

Traditionally, poultry plays an important role in Kenya. The chickens have been and still are a major source of protein in the form of eggs and meat. In addition, poultry production improves nutrition of the rural people and provides cash money to the families. Nationally, the poultry industry contributes to the Gross National Product (GNP). Of the 25% of the annual GNP, 4% is from poultry sub-sector. The industry is also involved with wealth generation in the country. It is estimated that poultry along with other sub-sectors contributes 43% of the total labour force to the agricultural sector [2].

The poultry sector in Kenya can be divided into a modern sub-sector and a traditional sub-sector. Each of them has its own peculiarities that make them special in contributing to national food security. Waterfowl (ducks and geese), turkeys, game birds (guinea fowl and ostriches) and chicken are raised. Although there is a big potential to produce waterfowl, only a few farmers keep them on a commercial basis. A few farmers are raising ostriches although production of game birds is in its initial stages of development [3]. The traditional sub-sector largely dominates poultry keeping in Kenya. This sector is very important for the livelihood of many Kenyans and it is basically in the hands of women who happen to be the majority in rural areas. Despite all the potentials inherent to the traditional system, the local chicken is neglected. It feeds, houses and protects itself most of the times against all odds. Consequently, birds face hardship due to predators, little care from the producer, and

above all diseases. Disease outbreaks remain the greatest single cause of local chicken mortality and these include both infectious and parasitic diseases. While parasitic diseases appear to be a daily concern, causing little mortality but lower production, Newcastle disease occurs as outbreaks causing mortality as high as 100%.

The local chicken produce 71% of both egg and poultry meat, but only 10% and 40% of the eggs and poultry meat, respectively, is marketed. About 71% of poultry meat (local birds) and eggs are sold through the open-air market and retail shops. Marketing of the produce faces constraints such as small size of output per household at irregular times, lack of market information and high marketing margins. Control of ectoparasites is a major problem among smallholder producers due to poor housing and ineffective disinfection procedures [4].

2. MATERIALS AND METHODS

2.1. Location and description of the study areas

The work was done in areas located in districts situated around Nairobi. These were Kangundo division in Machakos district and Kikuyu division in Kiambu. The specific study areas were mainly chosen on the basis of the distribution of farmers keeping family poultry and their proximity to the Veterinary Laboratories at Kabete (at a maximum of two hours drive from the station).

Kangundo division, which was selected for the work, lies within ecological zone three (ECZIII). The major agricultural activity in this area is food crops (maize, sunflowers, etc.) and livestock production. Family poultry production is widely practised [5] and it contributes sustainability to overall poultry production.

The area chosen for the work in Kiambu disrict was Kikuyu division in ECZII which covers a small strip in the central part of the district. Dominant agricultural activities in the ECZII are dairy, cash crop (mainly tea, coffee and pyrethrum) and food crop production (mainly maize, potatoes). Commercial and family poultry production is practised in the area.

2.2. Sampling procedures

Sampling was carried out according to the guidelines discussed during the first Research Co-ordination Meeting. The primary sampling unit was the farm whereas the secondary sampling unit was the village. A stratified sampling procedure was used to select farms and villages. For the selection of ecological zones, purposive sampling was used.

TABLE I. FARMERS AND VILLAGES SURVEYED TO STUDY FAMILY POULTRY PRODUCTION

	Ecological zone II			Ecological zone III		
District	Kiambu			Machakos		
Division	Kikuyu			Kangundo		
Villages	Karai	Kabete	Nyathuna	Mbilini	Ngiini	Isinga
Farmers	4	4	4	4	4	4

2.3. Data collection

The baseline data were gathered from either the poultry owners (mostly women), their husbands or children. The farm visits were conducted in conjunction with veterinary officers in charge of Kangundo and Kikuyu Divisions. During the visits, various components of the research project were explained to the farmers because most of them expected to receive benefits immediately. Such information included the survey, sampling techniques and the interventions at a later stage to improve food security and training. Subsequently, farm visits were made jointly with the animal health assistants who are the veterinary staff in charge of the villages. On average, six questionnaires were administered per day. During the dry season, they were administered between 22 and 25 October and for the wet season between 24 and 27 January 2000. Additional information was gathered on the disease status of the flocks. This was done using a disease survey questionnaire, which was administered whenever there were sick birds in the farm. The animal health assistants in charge of the villages provided additional information on disease occurrence.

2.4. Sample collection and handling

Blood was collected from the wing vein using disposable sterile syringes (3mL) and needles (21G 11/2). The syringe with the blood was recapped and let to stand in a cool box during the fieldwork. On arrival at the laboratory, the tubes were left to clot on the bench overnight. The serum was harvested the following day and aliquoted into 2mL cryovials and stored at –20°C and –80°C. If the birds on the farm showed signs of disease, EDTA blood was collected and (thick and thin) blood smears were made. Two fresh faecal samples were collected from each farm and put in nylon casings. They were transported to the lab in a cool box and stored at 4°C.

2.5. Data management and storage

Questionnaire-derived variables and other data were verified and entered in a computer programme (EXCEL). The data were analysed to determine the factors constraining family poultry production in each ecological zone.

3. RESULTS

3.1. Baseline survey

The results of the statistical analysis of the questionnaire-derived variables are summarised in Tables II, III and IV.

TABLE II. STATISTICAL ANALYSIS OF POULTRY FLOCK SIZE IN TWO ECOLOGICAL ZONES IN TWO SEASONS

	Ecological zone II					Ecological zone III				
	Wet season		Dry season			Wet season		Dry season		
Variable	Mean	SD	Mean	SD	Student T	Mean	SD	Mean	SD	Student T
Flock size	22	11.52	28	16	0.3041	16	11.46	17	8.15	0.8712
Number of cocks	3	1.83	1	1.14	0.0152	5	3.34	2	1.04	0.0057
Number of hens	5	6.92	8	11.15	0.4641	4	6.39	3	4.11	0.9701
Number of growers	5	8.33	4	5.22	0.7724	4	5.76	4	4.29	0.9688
Number of chicks	3	5.74	4	7.99	0.6855	3	5.21	3	4.86	0.9043

Tables II shows the results of the analysis of family poultry flock size. The average number of chicken kept in ECZII was 22, while that in ECZIII was 16. The mean number of hens kept in ECZII was 10, while that in ECZIII was 7. The result of the student T test was not significant ($P<0.05$) indicating that there was no significant statistical difference in the means of the variables, when analyzed by zone or by season.

Table III summarizes the results of the analysis of production data obtained from the 24 family poultry farms in ECZII and ECZIII.

TABLE III. PRODUCTION DATA OBTAINED FROM FAMILY POULTRY FARMS IN ECOLOGICAL ZONES II AND III

	Ecological zone II		Ecological zone III	
Variable	Total	Mean	Total	Mean
Clutches per year	106	2.2	113	2.4
Eggs per clutch	390	8	340	7
Eggs per year	588	12	486	10
Chicks hatched	484	10	388	8
Chicks reared	356	7	217	5

Table IV shows the mortality figures (in percentage) for the poultry flocks. The mean percent deaths during the wet season was higher in ECZII (40.8%) than in ECZIII (15%), while the mean percent deaths during the dry season was 59.2% in ECZII and 85% in ECZIII (Table IV).

TABLE IV. MORTALITY FIGURES FOR FAMILY POULTRY IN TWO ECOLOGICAL ZONES

Variable	Ecological zone II	Ecological zone III
Mean % deaths wet season	40.8	15
Mean % deaths dry season	59.2	85
Mean % deaths of chicks	74.5	62.5
Mean % deaths of growers	15	22.7
Mean % deaths of adults	10.4	14.7

Table V summarizes the results of production and economic parameters of family poultry kept in the two ecological zones. Seventy five percent of farmers in ECZII and 83% in ECZIII housed their chicken in chicken houses. The remaining farmers either housed their chicken in the kitchen/store or in the main house. In ECZII and ECZIII, 92% and 83% of the farmers, respectively, cleaned the chicken houses either once a week or more than once a week. All farmers in the two ecological zones used chicken manure as fertiliser. The birds scavenged on insects, grass and green vegetables. Insects were scavenged by 67% of the birds in ECZII and 83% in ECZIII. Farmers in the two zones used supplements of different types. The supplements were either commercial feeds, maize products or kitchen leftovers. The most commonly used supplement in ECZII was commercial feed (67%) while that in ECZIII was maize products (55%). All farmers provided water to their birds. The water came from various sources such as tap, well, river, rain and dams. The most commonly used water source was well water (58% of the farmers in ECZII and 50% of the farmers in ECZIII).

TABLE V. PRODUCTION AND ECONOMIC PARAMETERS OF FAMILY POULTRY FARMS

Variable	Ecological zone II		Ecological zone III	
	Frequency	Percentage	Frequency	Percentage
Housing				
Chicken house	10/12	83.3	9/12	75
Other	2/12	16.7	3/12	25
Frequency of cleaning house				
Weekly	2/10	20	9/11	81.8
More than once a week	8/10	80	2/11	18.1
Feeding supplementation				
Commercial	10/12	83.3	5/12	41.7
Maize	6/12	50	8/12	66.7
Vegetables	3/12	25	4/12	33.3
Kitchen by-products	1/12	8.3	2/12	16.7
Maize husks			5/12	41.7
Water source				
Well	7/12	58.3	6/12	50
Tap	3/12	25	5/12	41.7
Other	2/12	16.7	1/12	8.3
Source of stock				
Market	1/12	8.3	5/12	41.7
Commercial farmer	-		2/12	16.7
Neighbour	3/12	25	2/12	16.7
Market				
Source of cocks for mating				
Own	11/12	91.7	8/12	66.7
Incoming from neighbours	1/12	8.3	4/12	33.3
Marketing	10/12	83.3	5/12	41.7
Same village	4/10	40	3/5	60
Neighbouring village/shopping center/town	3/10	30	4/5	80

The frequency distribution of labour division among household members involved in family poultry production in Kenya is shown in Figure 1. The main activities in family chicken production considered in the analysis were shelter construction, feeding, watering, cleaning, sale of chickens and eggs, disease control and treatment. The work showed all gender categories were involved in family chicken management. Shelter construction was mainly done by the men (75%). Cleaning activities were mainly done by the women (42%), or by women and children (28%) as was the case with feeding and watering.

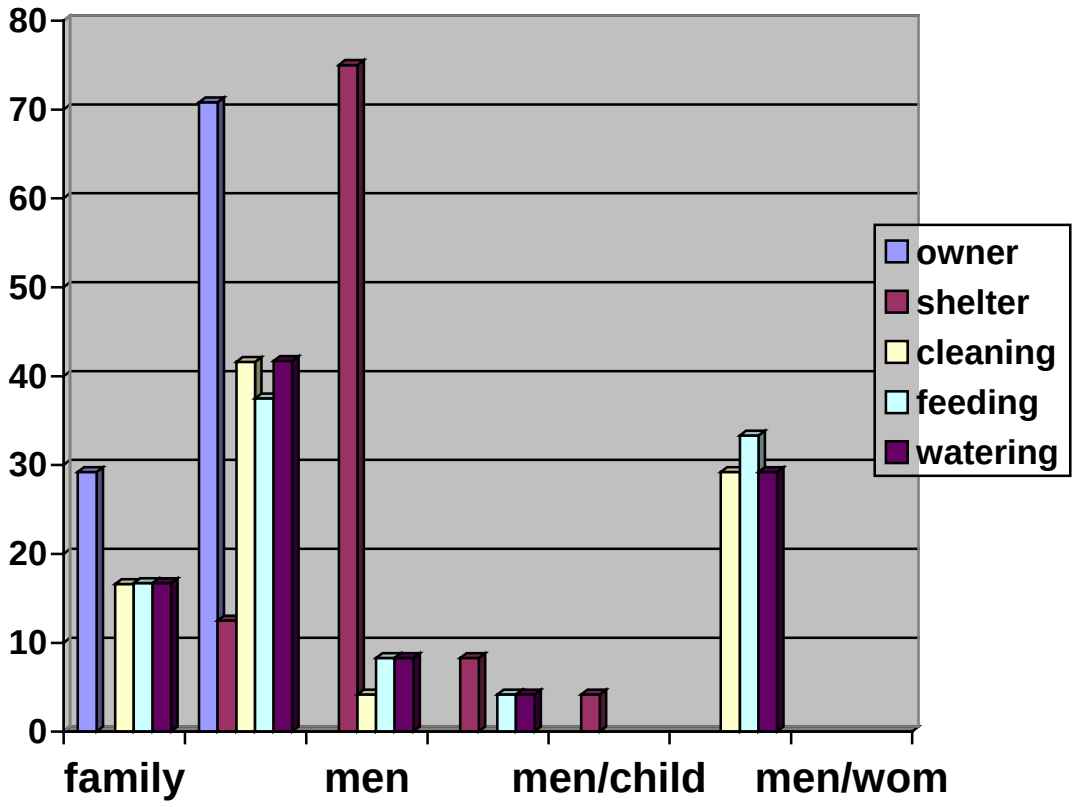

FIG. 1. Division of labour among household members in family poultry production in Kenya.

3.2. Disease surveillance

Table VI shows the results of a test to detect antibodies against *Salmonella pullorum*. All farms, except three, had birds, which contained antibodies directed against *Salmonella pullorum* (Table VI). There was no history of any previous vaccination of the chicken. The result of the chi-square statistical test was 0.762, which was not significant at the 5% significance level.

TABLE VI. RESULTS OF TESTING FOR *SALMONELLA PULLORUM* ANTIBODIES DURING THE WET SEASON

Ecological zone	Positive	Negative	Total
ECZII	10	2	12
ECZ III	11	1	12
Total	21	3	24

Table VII shows the results of the faecal egg worm counts. During the wet season farms 1, 4, 6, 10, 15, and 19 were free of worm infestations as opposed to the dry season when helminth eggs were detected in the faeces (results not shown). Farms 2, 3, 8, 12, 14, 17, 18, 20, 22 and 24 were free of helminth eggs in both seasons. Farms 9, 21 and 23 did have a worm infestation during the wet season, but were clean during the dry season.

TABLE VII. PRESENCE OF WORM EGGS AND COCCIDIAL OOCYSTS IN FAECAL SAMPLES

Region	Household	Strongyle eggs*	Coccidial oocysts
Karai	1 Karanja Kago	-	-
Karai	2 Mary Ruguru	-	-
Karai	3 James Muriuki	-	-
Karai	4 Esther Kanini	-	-
Kabete	5 Charles Mugane	100 (moderate infestation)	-
Kabete	6 Nancy Wanjiru	-	-
Kabete	7 Julius Tetu Hinga	100 (moderate infestation)	-
Kabete	8 Pauline Mwaura	-	-
Nyathuna	9 Eunice Kihika	100 (moderate infestation)	+
Nyathuna	10 Benson Njunge	-	-
Nyathuna	11 Naomi Wamuhu	300 (moderate infestation)	-
Nyathuna	12 Zippora Wairimu	-	-
Mbilini	13 Jedida Maingi	100 (moderate infestation)	-
Mbilini	14 Benedetta Wambua	-	-
Mbilini	15 Esther Kisuke	-	-
Mbilini	16 Margret Wambui	1200 (heavy infestation)	-
Ngiini	17 Fransisca Mung'oka	-	-
Ngiini	18 Fransisca Musyoka	-	-
Ngiini	19 Mutheu Kivaya	-	+
Ngiini	20 Josephine Mumbua	-	-
Isinga	21 Rael King'o	400 (heavy infestation)	-
Isinga	22 Esther Nzioka	-	-
Isinga	23 Mutisya Kasu	100 (moderate infestation)	-
Isinga	24 Regina Kituti	-	-

* Strongyle eggs per gram; + = presence of coccidial oocysts - = absence of Strongyle eggs or coccidial oocysts

4. DISCUSSION

There was no significant difference in flock size and structure between the two ecological zones during the dry or the wet season (Table II). This might have been due to the unusually short duration caused by the el niño/la niña phenomenon. However, mortality figures during the dry season were higher in ECZIII (85%) than in ECZII (59%). This could be attributed to the different farming systems practised in the two zones. In ECZIII, families own big pieces of land so farming is less intensive. Hence, all farmers in ECZIII free-range their birds during the dry season. As a result the birds move long distances and mix with other birds in the neighbourhood thereby getting exposed to various diseases. In ECZII, farmers practise intensive farming and many of them prefer keeping exotic breeds of chicken because they believe they bring in more economic returns per land area. This may explain why 65% of the farmers in ECZII supplement their birds with commercial feed while only 45% do so in ECZIII.

There was scanty information regarding diseases and their control. This could be due to the fact that most farmers do not know much about the health of their birds despite the fact that they have access to veterinary and extension services. During the wet season, a number of farms were free of worm infestation as opposed to the dry season when helminth eggs were detected in the faecal samples (Table VII). Other farms were free of helminth eggs in both seasons, while three farms had worm infestations during the wet season, but were clean during the dry season. Salmonellosis was prevalent in both ecological zones, although most farmers had no idea that at one time the chicken had been infected (Table VI). Newcastle disease (NCD) was prevalent in both ecological zones and was more common from June to August in ECZIII and December to February in ECZII. Most farmers were ignorant about the disease and some were arguing that it was associated with feeding chickens pumpkin fruits. The period of pumpkin fruit ripening incidentally coincided with outbreaks of NCD. It was noted that at the onset of an NCD outbreak many farmers indiscriminately gave the birds antibiotics for veterinary use and sometimes for human use to arrest the disease. Thus, flocks at such farms were not completely wiped out during NCD outbreaks. A few farmers used herbs such as red pepper and *Aloe vera*. One farmer was using cow's milk whenever he had the disease problem, but

admitted it was not very effective. Only three farmers in ECZII vaccinated their birds against NCD and infectious bursal disease (IBD), because they were also keeping exotic types of chicken and vaccinated all birds on the farm.

The division of labour among family members was biased (Fig. 1). Women owned most of the chicken and they were also involved in all aspects of poultry management. Men were only significantly involved in shelter construction. It is worthy to note that women were heavily involved in decision-making with regard to the sale of chicken products as well as the consumption at home. Marketing of poultry products was a major problem as most farmers either sold their birds to neighbours who offered low prices or to the nearest market where they did not have control over prices. An elderly farmer in ECZII did not know what to do with her six cocks she wanted to cull.

In summary, scavenging birds survive in a harsh environment, but production levels are low. They have the capacity to produce more, but this remains unrealised until new management strategies are introduced providing stricter control over incubation and harvesting and administration of supplementary feeds. At present, not much effort is being put in village chicken production but farmers, in most cases women, are willing to improve production methods and, consequently, the family income. The women manage the birds and decide what to do with the products. Therefore, they are the most suitable targets through which technology improvements can be channelled. Strengthening of already existing women groups dealing with issues other than poultry production could be the most effective way to implement family poultry production improvements.

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