

FARMER-DRIVEN RESEARCH ON VILLAGE CHICKEN PRODUCTION IN SANYATI, ZIMBABWE

C.V. PEDERSEN

The Royal Veterinary and Agricultural University,
Department of Animal Science and Animal Health,
Copenhagen, Denmark

Abstract

FARMER-DRIVEN RESEARCH ON VILLAGE CHICKEN PRODUCTION IN SANYATI, ZIMBABWE.

Studies on village chicken production in Sanyati, Zimbabwe, were initiated in 1998. The objective was, in cooperation with the farmers, to find means to improve chicken production by decreasing mortality and increasing growth. The aim is that more chickens should reach slaughter weight. Thus, household consumption and income can be increased. The improvements will facilitate women empowerment since women traditionally are responsible for chicken management. The studies are primarily carried out as on-farm trials but on-station support trials are also conducted. The approach has been practical and multi-factorial, while improvements in management and feeding have been subjects for research. The studies are on-going and, thus, no final results are presented in this paper. All figures shown on mortality and growth should be considered as indications and trends only. However, the results so far have shown that high mortality among young chickens is a major constraint. The causes of mortality are numerous, e.g. predation, diseases, parasites and accidents.

1. INTRODUCTION

Poultry production in most developing countries is based mainly on scavenging systems. This low input/output practice has been a traditional component of small farms all over the developing world for centuries and is thought to continue as such in the future. Approximately 20% of the protein consumed in developing countries originates from poultry. In spite of the importance of the scavenging poultry systems, few activities have been initiated in this field in order to improve the output.

A review of existing literature has shown that little information is available on the management and productivity of scavenging chicken flocks in Africa. The target area of this project; Sanyati, is no different although the majority (80%) of farmers keep poultry, predominantly chickens of indigenous breeds [1].

Poultry are an important component of the farming system in Sanyati communal area. When asked to indicate which livestock species they would like to see more researched in the future, farmers chose poultry second to cattle [2]. However, when asked to rank livestock species on the basis of their contribution to total farm income, farmers ranked chickens first followed by goats and cattle [3].

Poultry production in Zimbabwe is two-dimensional. There is a large-scale poultry production and a smallholder poultry production. Large-scale poultry production units are characterised by huge capital investments, intensive management, mechanisation and specialisation. The smallholder poultry sector can be intensive, semi-intensive or extensive. Most intensive poultry units in the smallholder sector are dominated by hybrid broiler and layer breeds. Extensive systems are dominated by indigenous poultry breeds, which are not classified into specific breeds and to some extent have been crossed with broiler or layer breeds. Hence, the birds in the extensive system shall be referred to as village chickens. The number of village chickens in Zimbabwe is estimated to be between 15 and 30 million, the estimate being based on about one million communal farmers each keeping an average of 20 birds [4]. Although village chickens are characterised by low productivity (30-80 small eggs per hen per year, high chick mortality rates, low body weights, etc.), they are hardy: tolerant to diseases and used to poor nutrition [3, 4]. The extensive (free-range) poultry production system can best be described as a low input-low output system in which the birds are given limited amounts of feed next to what they get from scavenging. This supplementation consists of household waste and some maize, sorghum, millet or sunflower seeds. The kitchen waste mainly consists of sadza, a thick maize porridge, which is the staple food in Zimbabwe.

2. MATERIALS AND METHODS

Emphasis on participation of the poultry farmers (mostly women) formed an integral part of the research project. The research priorities were not determined by the researcher, but in close cooperation with the local farmers.

Many farmers in the three villages selected as research areas in Sanyati were interested in participating in a research trial on chicken production. To select the 30 farms needed to conduct the research, PRA¹ methods were used [5]. On the basis of these methods farmers were selected taking into account their wealth and number of people in the household. The wealth of the household is assumed to have an impact on the amount of kitchen waste available for the chickens and on the management of the flock. The farmers defined three wealth groups, group 1 being rich, group 3 being poor and group 2 being in between. Farmers were then divided into two groups and asked to draw a map of the 3 adjacent villages in the soil indicating the location of each household. Then farmers were asked to indicate with 1, 2 or 3 brown beans which wealth group each household belonged to. Furthermore, the number of cattle owned by each household was indicated with white beans. This was done as an additional indicator of wealth, since the major factor involved in determining whether a household was rich or poor was the amount of cattle owned. The number of people living in the household was relevant because it had an impact on how much kitchen waste was given to the chickens. Thus, the number of adults and children in the household were indicated by white and yellow maize, respectively. To reflect the same proportion of selected farms in the three wealth groups as was found among all the interested farmers, 17%, 70% and 13% were chosen from groups 1, 2 and 3, respectively. The number of people in the household was chosen so that 3–4 were adults and 4–6 were children (adults = 15 years or above). The farms were all situated within a radius of 2 km and they are all growing maize and cotton as the major crops. Hence a similar feed resource base in the form of scavenging feed and kitchen waste was secured and the effect of farm was limited.

Following the selection of farmers, they were asked to fulfil the conditions for participation in the research trial; they should all have some kind of overnight confinement for the chickens. Additionally, they needed to build two smaller cages to keep chicks in after hatching and until the age of three weeks. These conditions should be fulfilled within half a year. All but one farmer met these conditions and, thus, she was dismissed and substituted by another farmer. In 80% of the households selected, a woman was responsible for the chickens.

2.1. Preliminary survey

During the initial six months, in which farmers should construct chick cages and provide overnight confinement for the entire flock, 15 of the selected farms were randomly selected in order to record the production characteristics of village chickens. A total of 63 hens were registered and monitored.

2.2. On-station trial

To obtain some knowledge on the genetic potential for production of the village chickens an on-station study was carried out at Henderson Research Station. The study was run in cooperation with chief researcher Mr. J. Mhlanga. The objective of the trial was to establish the growth performance and the laying potential of village chickens given optimal feeding and management conditions. At random 26 eggs were collected from the farms in the research area and brought to Henderson Research Station in December 1998. The eggs were incubated and hatched and the chickens reared in a deep litter system with a commercial feed mixture and water given *ad libitum*.

2.3. Field trial

With the background knowledge from the PRA methods and the preliminary data collection a research trial was designed in May 1999 in cooperation with the 30 selected farmers.

The 30 farmers were allocated at random to one of six treatment groups (Table I).

¹ Participatory Rural Appraisal

TABLE I. TREATMENT GROUPS AND PRODUCTION INDICATORS MONITORED IN THE FIELD TRIAL

Group	Treatment	Farmers	Hens/farm	Production indicators*
1	Control	5	6	Egg production
2	Supplementation with sunflower meal	5	6	Egg weight Hatching ratio Clutches/year
3	Supplementation with crushed maize	5	6	Mortality
4	Supplementation with crushed maize and sunflower meal	5	6	Growth performance Feed intake/flock
5	Anthelmintic treatment	5	6	Health performance
6	Supplementation with crushed maize and sun-flower meal + anthelmintic treatment	5	6	Eggs per gram (epg) Age at slaughter Age at point of lay Sales prices

* All of the production parameters were measured in each treatment group.

It was not practically possible to carry out more than one treatment per farm at one time. Furthermore, there was a limit to how many birds could be kept on each farm. Village chicken flocks generally consist of 20–25 birds. Since little supplementary feeding took place flock size should be equivalent to what the natural feed resource base could sustain and, thus, should not be exceeded. In order to partly overcome the problem of the differences between farms it was decided to change the treatment on each farm after half a year. In that way all farms would carry out two treatments and thus some effect of farm on treatment would be eliminated. Thus, the statistical design of the trial was an incomplete balanced block design.

From hatching and until 3 weeks of age the chickens were kept with the hen in cages, mainly to protect them against predators. When 3 weeks old, the chicks were allowed to scavenge during daytime hours. When 6 weeks old the chickens were moved to the common chicken house for overnight confinement. This excluded the chickens given treatment 1 and 2 where no supplementation took place. These chickens were kept in the traditional way, which in most cases meant scavenging during the day and kept in the kitchen overnight until a couple of weeks old when they would join the rest of the flock in the common fowl run for overnight confinement.

In groups 4 and 6 the chickens were supplemented with both maize and sunflower meal. This supplementation provided the birds with a choice of two different feeds. The intention was to offer the chickens a choice between a high energy low protein feed and a high protein feed.

Various authors have suggested that poultry through scavenging meet their requirement for vitamins and minerals, partly for protein but not for energy [6, 7, 8]. Thus, two feedstuffs with different protein contents were chosen. It is believed that poultry to a large extent successfully can compose their own diet [7, 9]. Furthermore, it has been suggested that commercial broilers under a free choice feeding system out-perform broilers fed complete mash diets in both body weight and food conversion efficiency [10]. Gous and Swatson [11] showed that broilers, when offered three diets differing in protein quality, chose to maximise weight gain and feed conversion efficiency.

Supplementation of chickens in this trial was *ad libitum* until three weeks of age. Thereafter feed was available to the chicks for two hours every evening. Supplementation was continued until the chickens reached point of lay, were slaughtered or sold. Water was at all times available to the birds. All birds in the trial were vaccinated against Newcastle disease, which regularly caused great losses among poultry flocks in Zimbabwe (up to 100% mortality). The vaccine used was the V4, when available, otherwise the La Sota vaccine was used. Additionally all young chicks were vaccinated against Gumboro disease.

During the supplementation trial production indicators as listed in table I were monitored by the farmers themselves with assistance from the ENRECA project assistants on a daily, weekly and cumulative basis. All records sheets were translated in Shona, the local language.

At a later stage several socio-economic (soft) indicators will be investigated, such as accessibility to market, market demand and farmer's adaptation of chicken management and feeding improvements as well as an investigation in the expenditure of the expected increased income from poultry production.

3. RESULTS

3.1. Preliminary survey

The results on mortality and growth of chickens in the preliminary on-farm study are presented in Figures 1–3.

The results showed 55% mortality among chicks. According to farmers 27% of these deaths were due to predators, 18% due to diseases, 17% due to external parasites, 9% due to rains, 15% due to accidents and 14% of deaths were unspecified. Determination of the cause of death was only an approximation since no veterinary examination of the birds took place. Moreover, the results showed that at any time during this period only 40–50% of the hens were productive (laying, incubating or brooding).

The mortality was highest during the first three weeks (Fig 1). Predation was the major cause of mortality (Fig. 2). Predation by dogs and birds of prey accounted for most of the deaths. Diseases and external parasites also caused great losses in the chicken flocks. It is expected that chickens will be stronger and more resistant to diseases and parasites when improved feeding is implemented.

Figure 3 shows a low growth rate during the first 16 weeks of age. Data from beyond 12 weeks old are not as accurate as below 12 weeks of age since only very few clutches were more than 12 weeks old. At 12 weeks old the chickens weighed on average 640 g. In confinement and fed *ad libitum* a chicken of a layer strain would weigh 1000 g at 12 weeks old (growth rate = 11.9 g/day). This growth rate is more comparable with the growth rate of the female chickens at Henderson Research Station.

In summary, the most visible constraints to village chicken production in Sanyati were high mortality caused by diseases, pests, predators, weather fluctuations and lack of veterinary services. Inadequate management as well as limited feed supply, causing few eggs per clutch and few clutches per year and long brooding periods were suspected to be major reasons for the low production per hen. However, the genetic potential of the local hens for egg production under improved management and feeding was unknown.

3.2. On-station trial

The chickens reached point of lay when 27 weeks old and at this age the females weighed 1756 g and the males 2714 g (growth rate = 9.2 and 14.4 g/day, respectively). Their feed consumption was for the females 10.2 kg/kg body weight and for the males 6.6 kg/kg body weight. Mortality among the chickens was 0 up to 8 weeks of age. From week 9–28 the mortality was 15.2% (3 chickens died of pneumonia).

An age of 27 weeks at point of lay is fairly high compared to birds of a layer breed, which would normally reach point of lay at 20–22 weeks old. However, for village chickens it is often seen that they reach maturity at an older age [12]. The age at maturity is genetically determined as well as dependent on the weight of the chicken.

The production results on growth are good and indicate that village chickens have a higher potential for growth than what is found on-farm. During the preliminary on-farm study it was found that an average chicken weighs 640 g when 12 weeks old (growth rate = 7.6 g/day). The on-station study will continue and data on egg production will be collected and provide useful information on the village chicken's potential for egg production.

3.3. Field trial

Data collection from the supplementation trial has been running since May 1999 but since data analysis is still limited no figures on mortality and growth are included in this paper. So far the data are indicating a total mortality close to the one found during the preliminary survey. Predation by dogs and birds of prey still accounts for most of the deaths. It was assumed that keeping the chickens enclosed during the first three weeks would improve the survival rate considerably during the growth period. However, while mortality was lowered considerably during the first three weeks (23%) it was somewhat higher during the following weeks and thus total mortality is still around 55%.

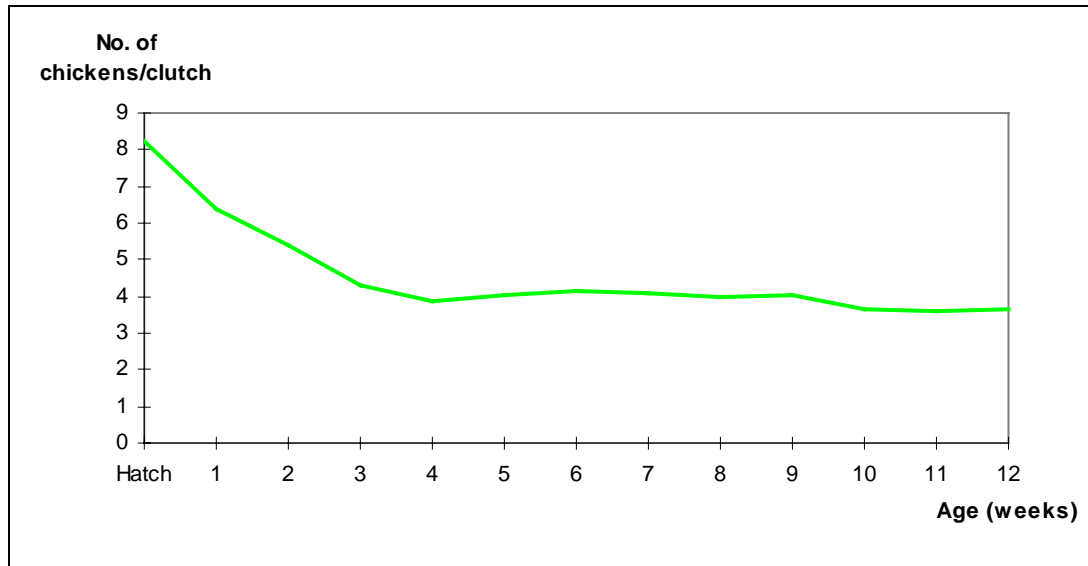


FIG. 1. Average number of chickens per clutch surviving during the first 12 weeks.

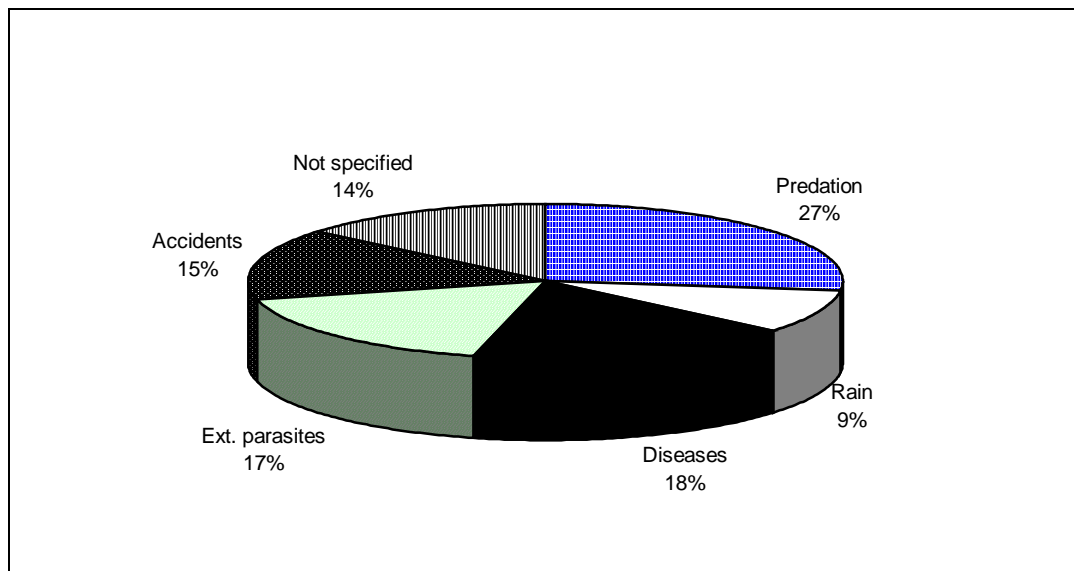


FIG.2. Causes of mortality as indicated by farmers.

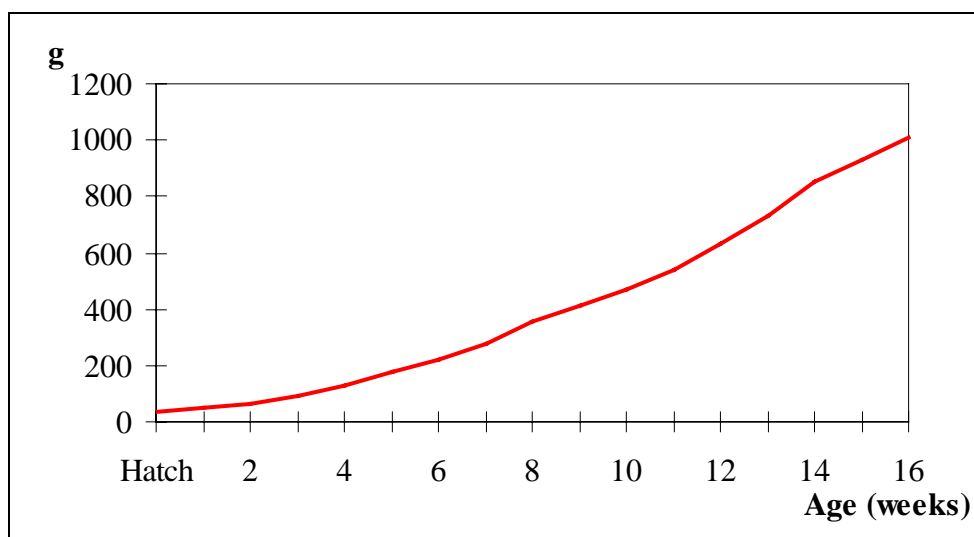


FIG.3. Average weight in grams (g) of chickens up to 16 weeks of age.

4. DISCUSSION

Planning and carrying out on-farm research is not easy. There have been many changes to the original plan and constantly new problems were faced. That is the dilemma and challenge, which will always exist when working with people and their livestock.

From the beginning the difference between farms caused by variations in housing and management was apparent. The incomplete balanced block design was chosen to partly overcome this problem. However, during the first months of the trial it became clear that the control group was not a true control group. The trial itself resulted in an increase in awareness and interest in chicken production. Consequently, the farmers in the control group changed their traditional way of keeping chickens and many started supplementing their chickens with grains.

The mortality of the chickens was still very high (50%). It was expected that solely by keeping the chicks enclosed for the first three weeks after hatching, mortality would drop considerably. Unfortunately, this does not seem to be the case. During the first three weeks 23% died. This is much lower compared to the 50% mortality during the same period in the preliminary study. However, it seems that the mortality continues at a high rate after 3 weeks of age and this was not the case during the preliminary study where only few of the chickens older than three weeks died. No thorough data analysis has yet taken place and the only thing that can be concluded at this stage is that mortality is very high and causes a huge loss in the production system. It is also evident that mortality is caused by multiple factors and any interventions should take this into account. Thus, improved production of scavenging chickens is only obtained through multiple interventions. It is, therefore, obvious that on-farm trials and studies are needed to obtain a holistic knowledge of traditional chicken production and to suggest practical interventions.

ACKNOWLEDGEMENTS

The present study of village chicken production in Zimbabwe forms part of a Ph.D. project, which was initiated in December 1998. It is carried out in connection with the ENRECA² project: "Improved Livestock Production", which is a research project involving three institutions: The Royal Veterinary and Agricultural University in Denmark, the Danish Institute of Agricultural Sciences and the University of Zimbabwe.

REFERENCES

- [1] PEDERSEN, C.V., Constraints and opportunities for improved milk production and calf rearing in Sanyati communal farming area, Zimbabwe. Master thesis. The Royal Veterinary and Agricultural University, Copenhagen, Denmark (1997) 69 pp.
- [2] MUTISI, C., KUSINA, N.T., Draft Report - Role of livestock in Sanyati communal area. Unpublished (1996) 28 pp.
- [3] MUCHENJE, V., SIBANDA, S., Informal survey report on poultry production systems in Chivhu and Sanyati farming areas. UZ/RVAU/DIAS/Danida Project. Unpublished (1997).
- [4] LAMBROU, L., Indigenous Poultry in Zimbabwe, *Farming World* **19** (1993) 11-12.
- [5] PEDERSEN, C.V., Report on visit to Zimbabwe in November 1998. Working paper (1998) 5 pp.
- [6] HUCHZERMEYER, F.W., Free ranging hybrid chickens under African tribal conditions. *Rhod. Agric. J.* **70** (1973) 73-75.
- [7] CUMMING, R.B., The Advantages of Free Choice Feeding for village chickens, Proceedings of The Nineteenth World's Poultry Congress, 20-24 September 1992, Amsterdam, The Netherlands **3** (1992) 627-630.
- [8] ROBERTS, J.A., Utilisation of poultry feed resources by smallholders in the villages of developing countries. Paper presented at Development Worker's course 22-26 March, Tune, Denmark (1999) 19 pp.
- [9] CUMMING, R.B., Exploiting the appetites of the hen, Australian Poultry Science Symposium. Poultry Research Foundation, University of Sydney and World's Poultry Science Association (1989) 38-44.
- [10] CUMMING, R.B., Choice feeding poultry (Unpublished) 4 pp.

² enhancement of research capacity funded by Danida (Danish International Development Agency)

- [11] GOUS, R.M., SWATSON, H.K., Mixture experiments: a severe test of the ability of a broiler chicken to make the right choice. *British Poultry Science* **41** (2000) 136-140.
- [12] GUNARATNE S.P., CHANDRASIRI, A.D.N., HEMALATHA, W.A.P.M., ROBERTS, JA., Feed resource base for scavenging village chickens in Sri Lanka. *Trop. Anim. Hlth Prod.* **25** (1993) 249-257.