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With globalisation will low-input production systems prevail in Malawi? The case of rural chicken.

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ABSTRACT

Local chickens are owned by almost all households in rural areas of Malawi. Commercial poultry production supplies meat and eggs to less than 14 % of the human population in urban areas. 134 rural households were monitored to provide information on adequate interventions to improve local chicken production.
The majority of farmers (78 %) supplemented maize bran (ME, 2896 kcal/kg; CP, 10.4 %; CF, 5.0 %) to scavenging chicken. Women (73%) were dominating management of chickens. Off-take was determined by mortality (30 %), household consumption (28 %), social (14 %) and income (9 %) needs, predation and theft (14%) and breed stock exchange (4%). Human dwellings were used for roosting (85 %). Newcastle disease vaccination was applied, however, coryza (5 %), chronic respiratory disease (27 %), coccidiosis (8 %) and internal and external parasites (41 %) caused losses in 84 % of the flocks. Due to deforestation and loss of indigenous knowledge farmers lacked traditional medicines or treatments. Uncontrolled mating was common practice. Estimated average effective population sizes were low (Ne = 14.9, SD 8.1).
Concluding local free-range low input system chicken production will prevail in the future. A multidisciplinary approach is required to develop and apply optimised technologies. Adopted multi-tier breeding of exotic chickens for crossbreeding have failed. Single tier breeding system allowing full farmer participation is recommended.

INTRODUCTION

Local chicken (LC) production is common in almost all households in rural areas that have 86 % of total human population in Malawi. LC are widely and more equitably distributed among both rich, poor and marginalized members of rural society than any other livestock (Gondwe and Wollny, 2002). These are solely kept under free-range, scavenging system, with minimal input and usually sidelined, as is the general situation for most developing countries (Aini, 1990; Gueye, 1998). Their output is low but substantial in providing animal protein and cash to households, socio-cultural values to societies and many other non-tangible values (Safalaoh, 1997; Gondwe et al., 1999). Similar functions and the production system have been reported in Burkina Faso (Kondombo et al., 2003), Ethiopia (Tadelle et al., 2003), Zimbabwe (Maphosa et al., 2004), among others where intensive on-farm studies were done. Despite the low output per bird or per flock size of 5 to 20 chickens of mixed age groups (on average), their minimal or zero cost of production makes LC production system cost effective and therefore, efficient. Constraints include high mortality especially in chicks, diseases, parasites and predation, insufficient scavenging feed resource, slow growth rates and low egg production. As also reported by Panda and Mohapatra

(1993) in India, these constraints are not mutually exclusive, but complexly interrelated and different from constraints faced by the commercial poultry farming, a sector that supplies meat and eggs to less than 14 % of the human population in urban areas of Malawi. There is therefore, need to find ways of improving LC production holistically and in line with changing society needs and globalisation. The current information on LC and their production system is limited and in most cases generated by snapshot surveys. To justify efforts to improve LC under low-input system, the current study was conducted to monitor LC production and production system, constraints and potentials in rural households.

MATERIALS AND METHODS

Study area and sample households

An on-farm monitoring study was carried out on 134 Village Poultry Project (Gondwe et al., 2003) participating households in 27 villages of Mkwinda and Mitundu Extension Planning Areas (EPA) of Lilongwe Agricultural Development Division (LADD). These villages surround Bunda College of Agriculture, and are located within the coordinates 14.10^{o} S, 33.47^{o} E and altitude is approximately 1200 m asl (Garmin GPSMAP 76CS, Garmin Ltd, www.garmin.com). Over the past four years, annual precipitation for Lilongwe averaged 932 mm (National Statistical Office, 2003). Two seasons are distinct; a wet warm season (December to April) and a dry season (May to November). In this study, the dry season was further split into cold-dry (May to August) and hot-dry (September to November). Most of the smallholder farmers belong to the *Chewa* tribe and practice subsistence agriculture in a crop-livestock integrated system. About 80 % of these farmers own local chickens that are also more equitably distributed among rural households than other livestock (Gondwe and Wollny, 2002). Farmers were communally vaccinating their chickens against Newcastle disease (NCD) using La Sota live vaccine (1000 oral doses cloned, Lohmann Animal Health GmbH) at three monthly intervals, between May and December. Costs of the vaccination were shared. Through a community participatory approach, farmers organised into village poultry groups.

Study animals and their management

Local chickens on these household flocks were monitored from August, 2002 to August 2003 in order to identify their management practices and constraints. Farmers themselves, who also did recording of observations and helped research technicians in weekly weighing and recording, managed their chickens. Free-range, scavenging system was common for all household.

Data collection and analysis

Data collected included flock sizes, feeding and housing management, occurrence of diseases, parasites and predation and their management, output from flocks and breeding system. All the data were analysed qualitatively using Proc Freq procedure and quantitatively using Proc Means and GLM procedures of SAS (SAS 1999).

RESULTS

The results presented here are from preliminary analysis of the data and field observations. On monthly average, flock size was 12.9 (median of 12.0) (Table 1). For those flocks with cocks and hens, sex ratio constituted 4.70 (median of 4.00) hens per cock. It was observed that 52 % of households did not own cocks and depended on cocks from other flocks to mate with their hens. This led to suggestions that LC breed in a community. Breeding hens and cocks were traced based on number of flocks that scavenge together. This produced an actual breeding population size and sex ratio shown in Table 1. Based on this information, an effective population size was estimated assuming random mating of hens and cocks.

Table 1. Characteristics of rural chicken production

Parameter	Mean	SD
Flock size per household	12.9	8.4
Household flock sex ratio (hens per cock)	4.7	3.1
Flock size per community of breeding chickens	37.9	14.7
Breeding flock sex ratio (hens per cock)	10.1	7.2
Effective population size (N_e)	15.2	8.6

LC were produced solely on scavenging (free-range) system. However, a significant ($P<0.001$, χ^2-test) majority of farmers provided supplement feed of unknown quantities (Table 2), mainly using maize bran *(madeya)*, a by-product from maize processing. Supplementing scavenging feed was seasonal and depended on availability of the feedstuff.

Human dwelling units and kitchens were commonly used for night roosting. Women were dominating in management of chickens, followed by children (Table 2). A large proportion of farmers (38 %) were illiterate, 35 % having attained lower primary education (up to standard five). 94 % of households were solely subsistence farmers growing crops and keeping livestock.

Table 2. Feeding and health management of rural chickens

Parameter	Frequency (%) of total
Proportion of farmers supplementing LC	78
Proportion of human dwellings used for roosting	85
Proportion of women solely managing LC	73
Proportion of flocks found infected with diseases	84

Despite participatory community NCD vaccination, 84 % of flocks were observed infected with other diseases and parasites. Infectious Coryza (5 %), chronic respiratory disease (27 %), coccidiosis (8 %), internal and external parasites (41 %) were common sources of infection. Except for coccidiosis, all these infections caused loss of growing and adult chickens (Table 3). No traditional remedies were observed practiced by farmers. When veterinary drugs could be provided to farmers, they applied and were effective. Consequently, disease recurrence occurred frequently. Farmers did, however, not follow the prescriptions.

Table 3. Outputs of rural chicken flocks

Purpose of off-take	Frequency (%) of total
Diseases, parasites, predation and theft	44
Household consumption	28
Sales and barter	9
Funerals, weddings and other socio-cultural ceremonies	14
Gifts and sharing breeding stock	5

Predators wild cats (*Felis sp.*) locally called *Vumbwe*, *Msangala*, *Likongwe;* hawks *(Accipiter sp.),* African Kites (*Chelictinia sp.*) called *Kamtema;* and domestic dogs (*Canis familiaris*) contributed to loss of chickens.

Exit out of flock, which represented flock off-take, was the most important component of flock dynamics for growing and adult birds. These constituted 38.74 % (median, 40.00; SD, 2.39, of household flock sizes excluding chicks or 16.89 % (median, 16.67; SD, 2.47, n = 370) of flock size including chicks. Of these exits (Table 3), 56 % was effective off-take for household and community functions.

DISCUSSION

Household flock sizes, structure and sex ratio observed in the study fall within the ranges reported by Ahlers, (1999) in Malawi, Dessie and Ogle, (2001), Mwalusanya et al. (2001), Ekue et al. (2002), Tadelle et al. (2003) in other countries. In Zimbabwe, Maphosa et al. (2004) reported larger flocks sizes of 23 chickens in a communal area and 35 chickens in a small-scale commercial area than flock sizes observed in this study.

The observation that majority farmers supplemented their local chicken flocks agrees with what Sonaiya et al. (2002) observed in Nigeria. The use of by-products from human food processing as supplement to scavenging chickens was also reported by Ahlers, (1999); Kitalyi, (1998); Roberts, (1999); Dessie and Ogle, (2001) and Kondombo et al. (2003). Nature and seasonality of supplementing shows that farmers will supplement when by-products are available that have no human use.

Migrants out of flocks demonstrated primary functions of local chickens. The findings agree with those of many authors in different countries in Africa and elsewhere. Despite differences in order of importance of roles local chickens play to rural communities, multifunctional use of local chickens remains obvious.

Proportion of migrants out of flocks due to diseases, parasites and predation was significant. Despite successful NCD prevention, prevalence of other diseases and parasites, and subsequent mortality revealed presence of health constraints in free-ranging chickens in addition to Newcastle disease (NCD). It appears farmers lacked traditional medicines or treatments, probably due to loss of indigenous knowledge and deforestation. Health problems cause losses in flocks and reduce their productivity (Magwisha et al., 2003), hence require interventions.

Majority of households depend on breeding cocks from neighbouring flocks for reproduction. Scavenging system offered an opportunity for neighbouring flocks to mix and breed. Farmers were benefiting from breeding cocks from other flocks. Unlike hens, the cocks from neighbouring flocks were communally used in breeding and exchange of genetic material. This depicts a structure of a traditional breeding system in scavenging chicken production. With this structure where neighbouring flocks breed together, sex ratio determined per household flock appears to be of little relevance. Rather sex ratio of a community breeding population should be used in designing breeding programs.

The effective population sizes were below 50 % of the actual population sizes. This implies that local chickens breed as communal populations of small sizes and not as individual household flocks. With such observed small population sizes, consequences of dispersive process, especially inbreeding, require further analysis.

Summing up all characteristics above, LC production system is complicated and can not be defined only at household level, but also at community level. For example, breeding structure concerns both individual household flocks and community flocks, same for disease problems and management. Management is mostly in hands of women who are mostly less educated and therefore, depend more on indigenous knowledge of raising LC. Any supplement to scavenging is based on availability of by-products, especially maize bran. The whole system is therefore, sustaining itself with minimal non-cost inputs and balances with the socio-economic and demographic structure of farmers. As reported elsewhere (Ramlah, 1996), LC production is likely to prevail under current scavenging system and human demographic status in Malawi. Introducing single technologies from elsewhere into this production system will most likely be of little relevance. The FAO Village Poultry project (Gondwe et al., 2003) tried to adopt a multi-tier breeding strategy to promote and multiply LC but failed due to disease pressure as flock size increases. Government adopted a multi-tier breeding and multiplication of dual purpose Black Australorp (BA) to cross breeding with LC since 1960 (Upindi, 1990, Kampeni, 2000). This program has failed (Safalaoh, 2001). Diseases constraints contributed to failure of BA to survive in villages under scavenging (Christensen, 1986). This means there is need to improve production and productivity of LC under prevailing conditions of production using a multidisciplinary approach. This need also arises based on the fact that LC provide a genetic resource that is threatened global pressures to commercialise industry including poultry production. This brings about policy changes that disfavour LC for introduced exotic breeds that unfortunately, do not fit in rural communities. Optimized technologies need to be developed and applied by both farmers, researchers and extension workers. Single tier breeding system allowing full farmer participation and following a community approach is strongly recommended. This will provide a base enabling stakeholders to look at improving individual household flocks while exploiting community health and breeding strategies.

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