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Characterisation of local chicken in low input - low output production systems: Is there scope for appropriate production and breeding strategies in Malawi?

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Characterisation of local chicken in low input – low output production systems: Is there scope for appropriate production and breeding strategies in Malawi?

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DEDICATION

To my beloved mum and dad
for kick-starting my life to success

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List of Abbreviations

ADB	African Development Bank
ADD	Agricultural Development Division
AIDS	Acquired Immune Deficiency syndrome
AIREML	Average Information Restricted Maximum Likelihood
BA	Black Australorp
BAHS	Basic Animal Health Services
BCA	Bunda College of Agriculture
BW	Body weight
CP	Crude protein
CRD	Chronic respiratory disease
DAHI	Department of Animal Health and Industry
DANIDA	Danish International Development Agency
DMI	Dry matter intake as percentage of bodyweight
dw	Dwarf
EGR	Exponential growth rate
EMP	Efficiency of protein metabolism
EPA	Extension Planning Area
F	Frizzled
FAO	Food and Agricultural Organisation
FC	Feed cost
FI	Feed intake
G x E	Genotype by Environment Interaction
GMOFC	Gross margin over feed cost
FCR	Feed conversion ratio
FEWSNET	Famine Early Warning Systems Network
GDP	Gross Domestic Product
GE	Growth efficiency
H	Heritabilities
HDI	Human Development Index
HI	Hatching interval
HIV	Human Immunodeficiency Virus
LADD	Lilongwe Agricultural Development Division
LC	Local chickens
LSD	Least significant difference
LW	Live weight
ME	Metabolisable energy
MK	Malawi Kwacha
Na	Naked neck
NCD	Newcastle disease
N_e	Effective population size
NID	Normally and Independently distributed
NORAD	Norwegian Agency for International Development
NSO	National Statistical Office
PER	Protein efficiency ratio
POH	Point of hatch
PPP	Purchasing Power Parity
R	Rate of return
RI	Reproductive Index
SAS	Statistical Analytical System
SAU	Small Animal Unit

SD	Standard deviation
SFRB	Scavenging feed resource base
SGR	Specific growth rate
SPIP	Smallholder Poultry Improvement Programme
TC	Transaction cost
UNDP	United Nation Development Programme
USAID	United States Agency for International Development
WG	Weight gain
WT	Live weight

1. General introduction

Poultry production constitutes of smallholder rural and commercial urban production in Malawi. In 1998 the poultry population was estimated as 11.5 million (Malawi Government, 1999a). The rural poultry sector forms the largest component with more than 80 % of the poultry population. Chickens constitute the majority (83 %) followed by pigeons (14 %) and ducks (2 %). Other species include turkeys, geese and, currently into domestication, guinea fowls. Most of these are indigenous[1] except in chickens where traces of the Black Australorp (BA) breed can be found. These BA chickens were introduced to cross breed with local chickens (LC), a program that has been in practice for over 40 years, with a goal to improve productivity of the LC (Malawi Government, 1999). In most households, women and children are caretakers of traditional poultry kept on free-range extensive system, a practice common in most African and Asian countries (Aini, 1990; Dessie and Ogle, 1996, Kitalyi, 1997; Aganga et al., 2000). Rural poultry (chickens in particular) is widely and equitably distributed among households that even the more poor and marginalized in societies own them. The urban sector, on the other hand, comprises of commercial chicken production, mainly for egg and broiler production, raised under intensive system and using exotic layer and broiler strains. Because of high cost of production due to feeding and capital inputs, urban poultry sector constitutes less than 20 % in Malawi and other developing countries (Safalaoh, 1997; Gueye, 1998).

Corresponding with human population and status, rural poultry sector forms an important component of human livelihood and contributes significantly to food security. LC offer broad spectrum of uses to the majority of Malawians. They are an inexpensive animal food (meat and eggs) and income to most resource poor rural people. Socio-cultural contribution includes slaughters to a welcomed guest, in marriage and funeral ceremonies, and in settling disputes in traditional courts presided by chiefs (Gondwe et al., 1999a). Their small size and fast reproductive rates allow easy conversion into food and money that, for example, women in households can manage without waiting for decisions from husbands. Rural poultry can therefore be used to empower women and marginalized groups socially and economically. LC production is an important component of livestock in the rural societies.

As in most developing countries, LC, interchangeably called village, traditional or rural chickens, are generally considered to be genetically producing low quantities of meat and eggs, are raised under free-range and survive on scavenging. LC are usually sidelined and considered a secondary occupation to other agricultural activities in households. This makes LC to be raised with minimal input and thus produce the output cost effectively (Aini, 1990). In Malawi, this generalisation led to introduction of exotic dual purpose BA chicken to cross breed with the LC as a breeding strategy to improve their performance (Upindi, 1990). The primary goal was to improve meat and egg production from the BA while getting adaptive features from the LC by exploiting heterosis displayed in crosses. Distribution of six-week old BA chicks from three government breeding stations (Mikolongwe, Bwemba and Choma) was initiated to smallholder farmers in the three administrative regions of

[1] Indigenous in this document shall imply local to the area, has lived with the people, breed and survive under adaptation from human and physical environment, management and breeding practices. The term also distinguishes local from other recently and purposely-introduced breeds so called exotic. Terms indigenous and local will be used interchangeably throughout the thesis.

Malawi, namely, the South, Centre and the North, respectively. The program however, lacked strategies to monitor implementation procedures and benefits (Safalaoh, 1992). It appears to have failed meeting the objectives but continues (Safalaoh, 2001).

The failure of the BA x LC cross breeding program is due to several factors and associated production constraints. The BA breed was introduced into the country without evaluating the breed under prevailing local conditions (diseases, low and erratic feed base, temperature, rainfall pattern). Production environments and systems, available genotypes, farmers' goals and functions of species were overlooked, as was the case for most developing countries, where such programs were implemented (Timon, 1993). BA were introduced into LC flocks that were non-characterised in terms of their production and husbandry practices. To establish a working base for present and future programs, there is need to carry out such studies under existing production systems if reliable information regarding their performance potentials and extent of benefits to get from any breeding program are to be achieved.

Studies on LC production, characteristics and their scavenging production systems are few and mostly done in northern Malawi (Ahlers, 1999; Hüttner et al., 2001). Yet scavenging is the sole system of raising LC. Meaningful development of genetic and non-genetic improvement programs requires valid scientific information but might be unsuccessful and unsustainable if failing to apply a holistic approach. For such programs to be initiated there is need to generate adequate information on production and reproductive parameters, husbandry practices, growth physiology and constraints under the prevailing environment. The current proposed study seeks to characterise chickens through research and monitoring.

The work on poultry is chosen because most rural people raise LC (Malawi Government, 1994). With the current land declining rate (average farm size estimated at less than one hectare per household), keeping of large species of livestock such as cattle is not viable to majority in rural areas. LC has potential to contribute to nutrition, poverty reduction, social, cultural, gender and household equity in rural areas. All previous studies, though not fully conclusive, show that the species has potential for improvement requiring definition of entry points and determination of levels for improvement.

In almost all past programs, especially in research, there has been virtually little or no farmer participation. This is particularly due to the fact that most research were on-station oriented, based on fewer demands than anticipated by researchers (Werner, 1993). Local knowledge of farmers remained untapped and farmers were receiving extension messages as prescriptions in a top-down system. In most cases such messages had problems of adoption or were not fitting into the farming systems and goals, and lacked feeling of ownership by farmers, leading to unsustainable development efforts. Involving farmers means they should participate in developing and implementing research and programs from the beginning (exploratory phase). This approach motivates farmers and provides incentives to developmental oriented research, enables proper understanding of the environment (both social and physical) into which animals will fit and allows programs to be tailor-made for their success and sustainability. The proposed study seeks to address this through a community based systems research approach.

The problem statement

Review of literature has shown that rural chickens have potential food and non-food contribution to human livelihood, especially in smallholder rural communities. Rural chickens have also been asset starters for most poor (vulnerable) groups in societies. Genetic and non-genetic factors and their interaction contribute to their potential and diversity; hence both management and breeding strategies could be used to improve productivity in rural chickens. The problem is that proportions and extent of each component (genetic and non-genetic) are currently not known. Priorities on strategies also depend on target groups, their goals and objectives, their socio-economic status and current production potentials, bearing in mind sustainability of programs. All these can only be identified and properly designed after thorough characterisation of the species within the context of their farming systems and farmer participation.

General hypothesis

Phenotypic variation in production and reproduction performance traits exist in local (indigenous) chickens in Malawi that provides potential to improve their productivity and contribution to food security through genetic and management strategies.

Objectives of the study

General

To evaluate phenotypic and genetic characteristics of local chickens, and their production system for sustainable utilisation, improvement and conservation of the species in a low-input crop/livestock mixed farming integrated system.

Specific

i. to characterise the low-input production and marketing systems and potential for LC
ii. to evaluate productive and reproductive parameters for LC under scavenging conditions
iii. to compare productive and reproductive performance of the species raised on-station and those evaluated on-farm under scavenging system
iv. to evaluate growth potential and nutritional parameters of local chickens
v. to determine efficiency of LC production system and to value flock output
vi. to compare growth performance of BA and LC under scavenging conditions
vii. to estimate genetic parameters for production traits for LC on free-range