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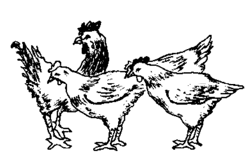

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Editorial

Poultry genetic resources in the context of HPAI

POUL SØRENSEN

Dept. of Genetics and Biotechnology, Faculty of Agricultural Sciences, University of Aarhus, Blichers Allé 20, P.O. Box 50, DK-8830 Tjele, Denmark

Tel: (+45) 8999 1303 (Office), Fax: (+45) 8999 1300, E-mail: poul.sorensen@agrsci.dk

Since 1995, Poul Sørensen has participated as a poultry specialist on short term missions to Bangladesh, Malawi, Kenya, Uganda, Benin, Niger and Burkina Faso and along with this he participated in workshops on research and development of poultry in developing countries. Since 1997, he has been a member of the Board of Directors of the "Danish Network for Poultry Production and Health in Developing Countries" and taught a course on breeding and genetics in a two year MS Course on "Rural Poultry Production and Health" for 30 students from 12 developing countries. Recently he wrote a chapter for an upcoming FAO book on the fate of local breeds in developing countries under the risk of HPAI".His research career was in poultry breeding and genetics and at the start he participated and was later the leading person in developing the Danish poultry breeding.

Following the outbreaks of highly pathogenic avian influenza (HPAI) in Asia and later in Africa, there has been a call for the restructuring of family poultry production systems to improve disease control measures. To fully understand the consequences of such a restructuring, it is imperative to understand how family poultry systems contribute to income generation, food security, rural development and the sustainability of poultry genetic resources.

family poultry production utilizes local or indigenous breeds, which differ from commercially bred poultry in several respects:

1. The birds are genetically adapted to a harsh environment facing limited resources and severe challenges from climatic conditions, pathogens and predators.
2. They are often utilized for several purposes simultaneously, and may outperform specialized commercial breeds when scored for multipurpose productivity including incubation and brooding, meat and egg production, and cultural demands.
3. Many indigenous poultry breeds have been isolated from commercial breeds long time enough for substantial genetic divergence, and some contain special characteristics of potential interest to commercial breeders, such as the high shell thickness (0.58 mm) of the Nigerian breed Fulani, the high yolk proportion of the Fayoumi breed and the postponed intensive growth of the Mia breed from Viet Nam showing an inflexion point of growth around 12 to 14 weeks of age.

A successful plan to improve and restructure family poultry production requires all of the above points to be considered. During almost a year, I have been working on a paper entitled "Poultry genetic resources used by smallholder production systems and the opportunities for their developments" scheduled to appear in a FAO publication in near future I learned from reading hundred of publications, that local breeds have been shown to possess both superior levels of genetic variation relative to commercial breeds and unique phenotypic traits signifying valuable local adaptations. In the context of HPAI prevention, it is well established that a reduction in genetic variation leaves populations more vulnerable to epidemic outbreaks, whereas the more genetically diverse local poultry breeds, already adapted to higher levels of pathogen exposure, can provide a resource for selection for HPAI resistance. In Thai indigenous chickens, allelic diversity of the MHC class I haplotypes has been demonstrated to correlate with susceptibility to HPAI virus.

Also, I found ample documentation of the critical role which family poultry production plays in the livelihoods of most rural households in the developing world, and how it represents a nutritional resource not easily substituted by other kinds of animal production. Eradication of local breeds in order to control HPAI would therefore be a disaster, both for the smallholder farmer, and for worldwide biodiversity. Further, it would be a loss for the poultry industry as some of these local breeds carry genes of potential importance for the future development of commercial breeds.

It is also clear from this literature study that very little progress in the local breeds has occurred over the last 20 years since Peter Horst at the WPSA congress in Nagoya in 1988 presented a summary of the production capacity of poultry in family production systems.

Genetically based progress may be obtained by introgression of foreign genes or use of cross-breeding programmes, but such methods often require management improvements which are out of reach of smallholder farmers for economic, social or cultural reasons, and this is an obvious reason why most attempts so far have not been successful in improving family poultry systems.

Assuming that low input/output family poultry systems will continue in its present form in many parts of the developing world, I believe that sustainable progress in productivity of 2–4 percent per year is attainable by selection among the local chicken breeds. At the same time, this approach accounts for the need for hens that can incubate and brood, and for the cultural needs of the farmers.

Such improvement programmes would require regional breeding stations stocked with local breeds, from which genetically improved birds (mainly cocks) can be distributed to villages. Genetic improvements should be based on progeny testing on family poultry farms, using chickens from the stations. Such central facilities are often already in place: The challenge would be to organize the progeny testing at family poultry farms in ways that provide good data for breeding value estimations of the cocks at the central station. The personnel undertaking the breeding programme should be educated in quantitative genetics, animal breeding theory, statistics and electronic data processing. A bottleneck might be posed by the lack of younger students with sufficient training in these necessary disciplines. Most academic staff at universities and research institutes in developing countries working with farm animals have a veterinary background, and their knowledge and interests in genetics will tend to focus on molecular genetics, which is of limited relevance in these circumstances. Therefore, relevant education programmes should be initiated at one or more universities with the required capacity.

The approach described above would preserve the valuable genetic resource which family poultry represents, while the progress in production contributes towards the millennium development goal of the UN to reduce the number of poor by half before 2015. The perceived need to restructure family poultry production in response to threats of HPAI is also addressed by this approach, since central breeding stations can be managed with a sufficient bio-security program perhaps supplemented with a satellite station for further security. In case of infection or eradication in an area/district the family poultry farm can after the quarantine period be restocked with the local breed.

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RESEARCHES REPORT No 1:

Improving the brooding management of local guinea fowl (*Numida meleagris*)

H.K. DEI[1*], I. ALIDU[1], E.O. OTCHERE[1], A. DONKOH[2], K. BOA-AMPONSEM[3] & I. ADAM[4]

[1]Department of Animal Science, University for Development Studies, P. O. Box TL1882, Tamale, Ghana

[2]Department of Animal Science, Kwame Nkrumah University of Science and Technology, University Post Office, Kumasi, Ghana

[3]Animal Research Institute, Council for Scientific and Industrial Research, Achimota, Accra, Ghana

[4]School of Agriculture, University of Cape Coast, Cape Coast, Ghana

[1]*Corresponding author: hkdei@yahoo.com

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Summary

Two experiments were conducted on-farm (0-8 weeks) to determine liveability and growth performance of local guinea fowls (*Numida meleagris*) in confinement. Nineteen farmers in 3 villages in Tolon-Kumbungu District in the Northern Region of Ghana were involved. In Experiment 1, ten farmers confined 115 keets in cages and kept 66 keets on free-range (control group). In Experiment 2, nine farmers confined 166 day-old keets solely in cages. Data collected were analysed using SPSS. In Experiment 1, mortality of confined keets (10.6%) was lower (P <0.001) than that of free-range keets (82.2%). Mean liveweight of keets confined (379.2 g) was higher (P<00.1) than that of keets on free-range (102.2 g). In Experiment 2, mean values recorded were liveweight (388.1±19.1 g), feed intake (45.6±1.9 g/day), feed/gain (6.7±0.5) and mortality (17.5±3.9%). Cost-benefit analysis for Experiment 2 showed a net profit of $27.85. Artificial brooding of local guinea fowl improved their liveability and growth performance, and cost effectiveness.

Keywords: artificial brooding, guinea fowl, mortality, growth

Introduction

Rural poultry, including guinea fowl (*Numida meleagris*), play an essential role in the supply of poultry meat and eggs in most parts of Ghana. They are source of income for meeting household needs including food for the farm family, particularly during the dry season (Karbo and Bruce, 2000). However, the production of rural poultry faces daunting problems associated with management, housing, feeding and diseases (Osei and Dei, 1998).

The local guinea fowl in northern Ghana is kept traditionally under an extensive system just as the local chicken. The birds fend for themselves by scavenging. As a result of this management system, mortality of keets (very young guinea fowl) in particular has been very high. Keet mortality figures range from 63% (Karbo *et al*., 2002) to 80% or even 100% (Adam, 1997) between 0 and 10 weeks of age. The causes of the mortality include adverse weather conditions, predation, poor nutrition, accidents and diseases. All this has to do with environmental management of the birds.

The high keet losses can be addressed through artificial brooding (i.e. confinement of birds as practised in the commercial poultry sector). Artificial brooding could eliminate or reduce the effects of some of the causes of keet death. On-station trials have reduced keet mortality to as low as 10% (Teye *et al*., 2001).

The trend of high keet losses poses a serious threat to food security and livelihood systems of many rural farm families. Thus there is a need for on-farm research to address this problem. Therefore this study was undertaken to determine the effect of confining keets between 0 and 8 weeks of age on their survivability and growth performance.

Materials and Methods

Location and duration of the study

The on-farm experiments were conducted in three villages near the Nyankpala campus of the University for Development Studies, Tamale, Ghana. These villages are in the Tolon-Kumbungu district of the Northern Region of Ghana, within the Guinea Savanna Zone. This zone is characterised by a wide range of diurnal temperature variation during the dry season (November-April). The annual mean temperature and rainfall are 28.3 °C and 1,060 mm respectively (NAES, 1998). The study area suffers from the full effect of the ‘harmattan’ winds during the coolest months of December and January with mean minimum and maximum temperatures of 15 °C and 30 °C respectively. The temperature rises to a minimum of 23 °C and a maximum of 45 °C in the hottest months of February and April (Kasei, 1988). The study was conducted between November 2002 and February 2003.

Brooding cage

The cage was constructed using hardwood, wire-mesh and aluminium roofing sheet. It has floor space of 1 m^2 that could house between 20 and 40 keets. It was raised 0.25 m from the ground. It was constructed in such a way that it could be opened from the top or side and fitted with a padlock to prevent stealing of the birds. The cages were covered with paper or sack to prevent draught.

Experimental design

The local breed of the helmeted guinea fowl (*Numida meleagris*) was used in both experiments. A total of 19 farmers were purposively selected from those who rear guinea fowls in the three villages. In all, 347 day-old keets were used for the experiments. The farmers were divided into 2 groups. Ten of the farmers confined 155 birds in the brooding cages provided by the project team, and they also kept 66 birds on free-range with brooding hens (domestic fowl) that hatched them as control group in Experiment 1. Nine of the farmers kept 166 day-old keets in cages only in Experiment 2. The total numbers of keets kept in the cages ranged between 7 and 38, whereas those kept on free-range were between 7 and 12 per hen. These experiments were conducted in the dry season, thus hatching eggs obtained by farmers were not many for a large sample size. The mean initial live weights of day-old keets in Experiment 1 were 25.0 g (cage) and 27.5 g (free-range), while that of Experiment 2 was 30.0 g.

Management of experimental birds

The caged birds were fed broiler chicken starter mash (210 g/kg crude protein) made of 300 g/kg broiler starter concentrate (Agricare Ltd, Ghana), 500 g/kg maize and 200 g/kg wheat bran. The ingredients composition of the concentrate feed include fishmeal, soybean meal, copra cake, wheat middling, calcium carbonate, vitamin A, vitamin B_{12}, vitamin D_3, vitamin E, vitamin K, riboflavin, niacin, folic acid, ethoxyquin, calcium propionate and sodium chloride. Feed and water were provided *ad libitum*. No medication or vaccination was provided. Heat was provided in the night as well as during the cooler periods of the day using kerosene lanterns. No regular feed was given to birds kept on free-range, but were occasionally given handfuls of ground maize or sorghum as well as termites as supplements. The free-range keets were kept at night in coops with the brooding hens. Water was supplied but no medication.

Data collection

In both Experiments, mean live weights of the birds were measured at first, fourth and eighth weeks of age. Each bird was weighed individually using Salter scale. Mortality was recorded as it occurred for each treatment. However, weekly feed intake per bird was measured and feed/gain ratio calculated in Experiment 2. Also, economic analysis of the caged birds was carried out by estimation of all inputs used and income to be derived from the sale of eight-week old birds. Feed cost was calculated as the product of feed intake and cost of kilogram feed. The costs of transporting the feed, cleaning and disinfection of the cages were included in the cost-benefit analysis.

Statistical analysis

Data of Experiment 1 were analysed by SPSS (10^{th} version) of unbalanced samples and means separated using t-test. Standard deviations were calculated for the means of growth variables determined in Experiment 2.

Results

Growth performance of keets

Table 1 shows mean live weights and mortalities of the birds. The mean live weight at the end of the brooding period in Experiment 1 was higher ($P < 0.001$) for confined keets (379.2 g/bird) than that of their counterparts kept on free-range (102.2 g/bird). In both experiments the confined keets exhibited steady growth at similar rates. In Experiment 2, feed intake generally increased with age. The efficiency of feed utilisation was good up to week 4, but deteriorated during week 8.

The mortality of confined keets (10.6%) was significantly lower ($P < 0.001$) than that of the free-range keets (82.2%) in Experiment 1. However, mortality was relatively high in keets (17.5%) confined in Experiment 2; due particularly to suffocation from the smoke of malfunctioning kerosene lanterns used for heating and lighting in the cages.

Table 1: Mean live weight, cumulative mortality, feed intake and feed/gain ratio of keets confined or kept on free-range (0-8 weeks).

Variable	Age of bird (wk)	Experiment 1 Cage	Free-range	±*SED*	Experiment 2 Cage	±*SD*
Mean liveweight (g/bird)	1	36.6[a]	34.7[b]	*1.58*[ns]	30.0	*1.5*
	4	134.3[a]	72.0[b]	*11.70***	147.8	*6.0*
	8	379.2[a]	102.2[b]	*46.36****	388.1	*19.1*
Mortality (%)	1	5.1[b]	23.8[a]	*10.31**	9.8	*1.2*
	4	8.6[b]	67.7[a]	*9.86****	15.9	*3.2*
	8	10.6[b]	82.2[a]	*8.78****	17.5	*3.9*
Mean feed intake (g/bird/day)	1	nd	nd	-	16.6	*1.3*
	4	nd	nd	-	18.8	*0.6*
	8	nd	nd	-	45.6	*1.9*
Feed: Gain (g/g)	1	nd	nd	-	4.0	*0.5*
	4	nd	nd	-	3.6	*0.2*
	8	nd	nd	-	6.7	*0.5*

*SED-standard error difference, SD-standard deviation, nd-not determined, ns-not significant (P>0.05)a,b: Means with different superscript letters in the same row are significantly different *(P<0.05), **(P<0.01), ***(P<0.001)*

Economic evaluation of artificial brooding

Table 2 shows economic analysis of confining keets during brooding in cages. Revenue obtained when the keets were confined was higher than total expenditure including investment in the cages. The mean live weight of the experimental keets (0.4kg) was similar to that of keets sold in the local markets in northern Ghana. The net profit of $27.85 showed viability of artificial brooding.

Table 2: Cost-Benefit analysis of brooding of local guinea fowl (0-8 weeks) in Experiment 2.

Expenditure and income	Amount ($)[1]
Variable costs	
Feed	71.15
Transportation of feed	2.00
Hatching eggs (180)	9.00
Kerosene (61L)	12.15
Labour ($0.22/day)	12.60

Disinfection of cages	3.22
Interest (28%/year) on operating capital	0.72
Fixed costs	
Depreciation of fixed assets[2]	11.43
Interest (28%/year) on fixed assets	0.30
Total costs	122.57
Total revenue (138 keets * $1.09/keet (0.4kg)	150.42
Net profit (total revenue-total costs)	27.85

[1] GH¢1.00=$1.00 [2]Fixed assets depreciated over 5 years for 4 brooding cycles per year

Discussion

The superior growth performance of the confined keets was expected because of adequate feeding and nutrition of the birds. The commercial broiler chicken starter mash used for the artificial brooding of the keets was a balanced diet. The birds kept on free-range scavenged for their own feed though often supplemented by the farmer. Moreover, the experiment was conducted in the dry season when shortage of feed on the range or food in the barns of farmers was usually experienced. Thus their feed intake was inadequate and imbalanced in terms of essential nutrients such as protein and vitamins. However, at one week of age, both confined and free-range keets had similar live weights. This was due to adequate feeding of the free-range keets by the farmers. Birds are always fed termites and ground cereal grains (e.g. maize) in the first week of life before allowed to scavenge under the care of the brooding hen with occasional cereal grain supplementation. Several studies have shown positive impact of proper nutrition on the growth performance of guinea fowls (Nwagu and Alawa, 1995; Sales and Pareez, 1997; Teye *et al.*, 2001).

This study supports the view that artificial brooding of local guinea fowl under traditional system of management can ameliorate the adverse effects of environmental conditions on bird's health and welfare. Mortality rates in confined birds were reduced drastically during the brooding period (Table 1). The low level of mortality of keets confined on-farm (10.6%) in Experiment 1 was similar to that reported for keets (9.8%) confined on-station (Teye *et al*., 2001). The causes of the death of birds kept on free-range were attributed by farmers to predation, bad weather conditions such as rainfall, missing, debilitation and accidents. On the other hand, deaths reported in confined birds were mainly associated with suffocation from the smoke of malfunctioning kerosene lanterns, debilitation and accidents during handling. Most of these causes of mortality when birds are kept on free-range have been reported in northern Ghana (Karbo *et al.*, 2002) and Nigeria (Nwagu and Alawa, 1995). These authors recorded mortality at 8 weeks of age that ranged from 60% to 100% under traditional system of management. This study shows that special care of young guinea fowls by way of proper housing, feeding and watering during the early stage of life can reduce the high incidence of keet mortality.

In Experiment 2, both growth rate and efficiency of feed utilisation recorded were similar to those reported by Teye *et al*. (2001) on-station. Also, the mortality in this experiment (17.5%) was within the range (10-33%) recorded on-station during artificial brooding of local guinea fowls. This implies that artificial brooding on-farm under traditional system of management could be as good as on-station intensive management, thus farmers should be encouraged to adopt this practice.

The importance of artificial brooding of local guinea fowls has been demonstrated further by its economic viability

(Table 2). Despite the high initial capital outlay for the procurement of the cages and cost of feeding birds in confinement, the cost-benefit analysis of the practice showed that it was profitable.

Conclusions

Artificial brooding of local guinea fowls improved their liveability and growth performance, and cost effectiveness. Therefore, farmers should be encouraged to improve the health and productivity of their birds through artificial brooding. It is recommended that farmers should be assisted by both governmental and non-governmental organisations through provision of credit facilities to boost the production of guinea fowl at the village level.

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References

ADAM, M. (1997) The constraints and the prospects for guinea fowl production in the Northern Region of Ghana: a case study of the Damongo Area. *BSc. Dissertation*, Faculty of Agriculture, University for Development Studies, Tamale, Ghana.

KARBO, N. and BRUCE, J. (2000) The contribution of livestock production to food security in Northern Ghana: an overview. *CIDA-Ghana Food Security Programme Report*.

KARBO, N., AVORNYO, F.K. and ATIIGA, S. (2002) Preliminary studies on the pattern and causes of guinea fowl (*Numida meleagris*) keet losses in Garu and Bawku of the Bawku East District. *Savanna Farmer* 3: 15-17.

KASEI, C.N. (1988) The physical environment of semi-arid Ghana. *In*: Challenges in Dryland Agriculture - A global perspective (Unger, P.W., Sneed, T.V., Jordan, W.R. & Jesen, R., Eds.). *Texas Agricultural Experiment Station*, Amarillo/Bushland, Texas, USA, pp: 350-354.

NWAGU, B.I. and ALAWA, C.B.I. (1995) Poultry production in Nigeria. *World's Poultry Science Journal* 51: 261-269.

NAES (NYANKPALA AGRICULTURAL EXPERIMENTATION STATION) (1998) *Annual Report*, Tamale, Ghana

OSEI, S.A. and DEI, H.K. (1998) Poultry production on small scale farms in developing countries. *Proceedings of the 8th World Conference on Animal Production*, Seoul, South Korea, Symposium Series 2, pp. 376-384.

SALES, J. and PAREEZ, J.J. (1997) Protein and energy requirements of the pearl grey guinea fowl. *World's Poultry Science Journal* 53: 381-385.

SPSS (STATISTICAL PACKAGE FOR SOCIAL SCIENCE) (1998). User's Guide, SPSS Inc, Chicago, Illinois, USA.

TEYE, G.A., GYAWU, P. and AGBOLOSU, A.A. (2001) Growth potential and carcass yield of exotic and indigenous guinea fowls in Ghana. *Development Spectrum* 1: 43-40.

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Effect of charcoal of some plants on the production performances of broiler chickens in Cameroon

J.R. KANA*, A. TEGUIA, B.M. MUNGFU & J. TCHOUMBOUE

Département des Productions Animales, Faculté d'Agronomie et des Sciences Agricoles, Université de Dschang, B.P. 70, Dschang, Cameroun

*** Corresponding author: kanajean@yahoo.fr**

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Summary

A study was carried out on the effect of feed supplements based on charcoals from black fruits kernels (*Canarium schweinfurthii* Engl.) and maize foray (*Zea mays* L.) on the production performances and carcass traits of broiler chickens. Therefore, 120 male chicks from Hybro breeds were allocated to 12 experimental units of 10 chicks per units, and reared on litter. Each unit was randomly assigned to one of the 3 experimental diets which consisted of a control (R_0), a mixed feed containing 1% of black fruits charcoal (Rc) or charcoal from maize rafles (Rr) in a completely randomized design with 3 treatments (R_0, Rc, Rr), and 4 replications per treatment. During the whole study period, the charcoal inclusion in the diet significantly reduced feed intake and weight gain of the birds compared to the control treatment ($P < 0.05$). Except for the liver, no significant difference was recorded between the different treatments on the carcass output and the relative weight of the organs selected ($P > 0.05$).

From this study, it was concluded that the inclusion of charcoals from black fruits kernel and maize foray had no beneficial effect on the growing performance and carcass traits of broiler chickens regarding the perspectives of an additional supply in essential minerals for development and growth in chickens.

Key words: *Canarium schweinfurthii* Charcoal, Cameroon, Broiler Chicken, *Zea mays*

Introduction

The poultry sector is looking for new feed additives which can stimulate growth and play an important role in the population control of some pathogenic microorganisms such as salmonellas and coliforms, and promote the development of some beneficial microorganisms in the gastrointestinal tract. The research of alternative compounds to antibiotiques, which showed however some beneficial effects is justified by the fact that their regular utilisation as growth stimulators has developed bacterial resistances with potential consequences on human health (Jensen, 1998; Doyle, 2002; Wages, 2002; Al-harthi, 2006).

Pro-biotics made from live microbes and that play beneficial role in the equilibrium of the intestinal flora of the host animal (Kyung *et al.*, 2006; Gunal *et al.*, 2006), and organic acids are among the most utilized ones (Ahmad, 2006; Kyung Woo *et al.*, 2006; Gunal *et al.*, 2006; Soltan, 2008). The microbes colonize the intestinal inner side and prevent the installation of pathogen microbes, thereby protecting animals against some gastro-intestinal diseases (Irshad Ahmad, 2006). Organic acids are able to inhibit the growth of micro-organisms in feeds and to ensure the equilibrium of the intestinal bacterial flora. Furthermore, by modifying the intestinal pH, these organic acids improve feed solubility, digestion, absorption of nutrients and reduce the activity of adverse microbes enzymes in the intestine (Gunal *et al.*, 2006; Soltan, 2008). Nevertheless, the abundant use of live microbes as pro-biotics could lead in the future to some public health problems. In addition, farmers from lower income countries cannot afford the cost of these pro-biotics. It would be interesting to find other natural substances with low cost and without danger for farm animals and consumers as well. Therefore, studies have shown that charcoals have the capacity to fix toxins (Ramos *et al*,. 1996), to facilitate intestinal transit, and play and important role as gastric dressing (Cooney, 1980; Neuvonen and Olkkola, 1988). These qualities improve growth performance in chickens. This study was conducted to evaluate the effect of two plant charcoals (*Canarium schweinfurthii* Engl. and *Zea mays* L.) as feed additives on the performances of broiler chickens.

Materials and methods

Trial site and charcoal preparations

The study was done in the Application and Research Farm (ARF) of the University of Dschang in the upland of West Cameroon. This location is between latitude 5°26’ N and longitude 10°26’ E and has a mean altitude of 1,420 meters above see level. The climate is of equatorial Cameroonian type, with a rainy season from mid-March to mid-November and a dry season from mid-November to mid-March. The rainfall vary between 1,500 and 2,000 mm per year, and the mean temperatures are around 14 ºC (July-August) and 25 ºC (February).

Mature black fruits and maize foray were collected in rural areas around the city of Dschang, were burnt and crushed in a mill to produce powdered charcoal.

Experimental animals

A total of 120 day-old male chicks (Hybro breed) with mean body weight of 37.5 g were distributed to 12 experimental units with 10 chicks per each. The chicks were reared in deep litter with a density of 20 /m^2 up to 3 weeks of age, then with a density of 10/m^2 until 49 days of age. During the starting as well as the finishing period, 4 experimental units were randomly allocated to one of the 3 experimental diets (Table 1) with the basic diet as the control (R_0) and the basic diet mixed with 1% of black fruits charcoal (Rc) or 1% of maize rafles charcoal (Rr) in a completely randomized design with 3 treatments (R_0, Rc and Rr) and 4 replications per each.

The chicks were vaccinated against Newcastle disease (ND) and Avian Infectious Bronchitis (AIB) the eight day, with a reminder in day 23, and vaccinated against Infectious Bursitis (IB) in day 10. Vitamins and a coccidiostat were given in drinking water during 3 consecutive days per week.

Table 1: Chemical composition of the experimental diets (%).

Ingredients	Starter	Finisher
Maize	62	68
Oil	0.5	/
Cottonseed cake	8	10
Soybean cake	20	11.5
Fishmeal	3	4.2
Bone meal	1.2	1
Ion sulphate	0.3	0.3
Premix 5%*	5	5
Total	100	100
Calculated chemical composition		
CP (%)	22.01	20.16
ME (kcal/ kg)	2969.5	3007.72
Ca (%)	1.02	1
Available phosphorus (%)	0.58	0.57
Lysine (%)	1.27	1.13
Methionine (%)	0.50	0.43

**Premix 5% : CP =40%, Lysine =3.3%, Methionine =2.40%, Ca =8%, P =2.05%, ME =2078kcal/kg*

Data collection and statistical analysis

Feed intake and chick growth were recorded every 7 days until 49 days of age. At this age, two birds from each experimental unit were scarified for carcass evaluation. Feed intake, mean weight gain, feed conversion ratio, carcass output and the proportions of internal organs were subjected to ANOVA in a completely randomized design. The Duncan test was used to separate means in case of significance (Vilain, 1999).

Results

Table 2 shows the cumulated data about the effect of diets on growth performance, feed intake and feed conversion ratio (FCR) of the birds during the different phases of the experimental period. Considering the starting period (from day 1 to 21) no significant difference was recorded on the above parameters in the control group compared to the groups that received the diets containing the plant charcoals ($P < 0.05$).

Table 2: Effect of charcoals from maize rafles and from black fruits on some production parameters of broiler chickens (n = 40).

Parameters	**R_0**	**Rc**	**Rr**
Initial weight	37.5±0.4[a]	37,6±1,54[a]	37,25±1,19[a]
Weight gain (g)			
1 – 21 days	550.42±38.12[a]	515.20±34.14[a]	514.47±32.47[a]
22 – 49 days	1784.57±38.12[a]	1636.70±42.36[b]	1576.89±76.91[b]
1 – 49 days	2284.13±227.84a	2076.61±108.17b	2037.49±130.48b
Feed intake (g)			
1 – 21 days	941.78±66.36[a]	892.80±27.49[a]	872.93±74.38[a]
22 – 49 days	4102.45±350.06[a]	3916.15±183.49[b]	3820.53±233.65[b]
1 – 49 days	5044.23±444.91[a]	4707.37±376.99[b]	4706.04±574.35[b]
Feed conversion ratio (FCR)			
1 – 21 days	1.58±0.34[a]	1.64±0.46[a]	1.60±0.27[a]
22 – 49 days	2.42±0.43[a]	2.49±0.46[a]	2.44±0.20[a]
1 – 49 days	2.06±0.57[a]	2.11±0.54[a]	2.13±0.54[a]

[a,b]: Means with different superscript letters in the same row are significantly different (p<0,05)

However, except for the FCR which was statistically the same between all the experimental units during the whole trial period (P > 0.05), mean weight gain and the cumulated feed intake were higher for the control group compared with the other group during the finishing period (22 – 49 days) and the whole study period (1-49 days) (P < 0.05). The evolution of the birds' mean weight in the 3 treatments shows higher value for the control group compared to the other groups during the whole study period (P < 0.05) (Figure 1).

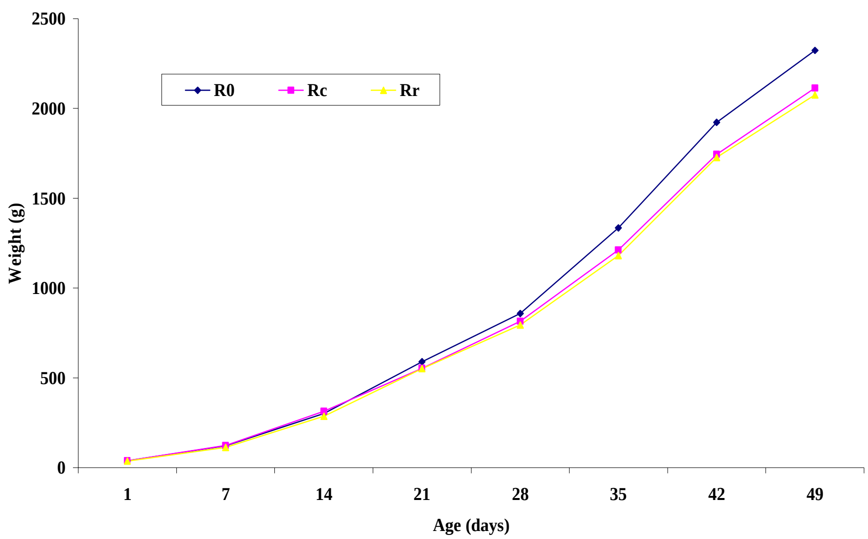

Figure 1: Effect of charcoal from maize foray and from black fruits on growth performance of broiler chickens

Table 3: Effect of charcoals from maize foray and from black fruits on carcass output, relative weight of some organs (%) and blood creatinin level (mg/l).

	R_0	Rc	Rr
Carcass output	76.91±2.02[a]	75.36±0.77[a]	71.96±3.24[a]
Liver	2.50±0.23[a]	2.68±0.33[ab]	3.11±0.21[b]
Kidney	1.05±0.13[a]	1.02±0.21[a]	1.22±0.24[a]
Heart	0.85±0.13[a]	0.82±0.24[a]	1.16±0.15[a]
pancreas	0.32±0.13[a]	0.44±0.13[a]	0.51±0.21[a]
Abdominal fat	1.95±0.34[a]	1.66±0.87[a]	1.74±0.61[a]
creatinin (mg/l)	2.64±0.12[a]	4.70±3.02[b]	2.48±0.41[a]

[a,b]: Means with different superscript letters in the same row are significantly different (p<0.05)

From Table 3, it appears that except for the liver, no significant difference was seen between the different groups concerning the relative weight of some organs studied and the output of the carcass ready for cooking ($P > 0.05$). In contrast, blood creatinin level was higher in the group fed the diet with the black fruits (*Canarium)* charcoals compared to the group given the diet containing the charcoals from maize foray and the control group ($P < 0.05$).

Discussion

The results in this study shows that 1% inclusion level of charcoal from black fruit or from maize rafles has a depressive effect on the growth performances of broiler chickens. In general, charcoal is known as an important source of minerals and some other essential nutrients for development and growth in chickens (Shelton and Southern, 2006). The results of this study are in contrast with the data found in supplementation of broiler chickens' diet with minerals by Wang *et al.* (2008). Indeed, these authors recorded a real improvement on feed intake, growth performance and feed conversion efficiency when supplementing with minerals. The present results are also different from other results found in supplementing broiler diet using some plants by-products or some parts of plant such as leaves (Al–harthi, 2006), some plants extracts (Gill, 1999; Prakash, 2006; Emadi and Kermanshahi, 2006; Songsak *et al.* 2008) and essential oils that have an antimicrobial power, stimulate palatability and digestive secretions (Oviedo–Rondon *et al.* 2006). Nevertheless, studies related to these fields are still limited, and the obtained results vary a lot. The low performances recorded in the present study could be due to the inclusion level (1%) of the charcoal which was visibly higher. It was reported that when feed additives are mixed to diets, most of them because of their chemical nature and their pathway can provoke deleterious effect to animals (Phillips, 1999). Emadi and Kermanshahi (2006) found that increasing the inclusion level (0, 0.25, 0.5 and 0.75%) of *Curcuma longa* in broiler diet induced negative performances regarding the relative weights of the heart, the abdominal fat and the live weight. The present study confirms the findings of Murry *et al.* (2006) who didn't recorded any beneficial effect of botanical pro-biotics on growth performance, feed intake and feed conversion efficiency in broiler chickens. Other pro-biotics such as yeast (*Saccharomyces cerevisiae*) from fermented cassava didn't induce any beneficial effect on feed intake, weight gain, carcass trait, but incited a deleterious effect on the intestine morphology (Songsak *et al.* 2008).

Conclusion

In the conditions of this study, the obtained results show that the inclusion of charcoal from black fruit and maize foray in broiler diet has a depressive effect on growth performances and carcass traits. These results were in contrast with the perspectives of an additional supply in essential minerals for the development and growth in chickens, and it was concluded that the inclusion level of 1% of charcoals was high.

References

AHMAD, I. (2006) Effects of probiotics on broilers performance. *International Journal of Poultry Science* 5 (6): 593-597.

AL-HARTHI, M. A. (2006) Impact of supplemental feed enzyme, condiments mixture or their combination on broiler performance, nutrients digestibility and plasma constituents. *International Journal of Poultry Science* 5 (8): 764-771.

COONEY, D. O. (1980) Activated charcoal: antidotal and other medical uses. *Marcel Dekker*, New York.

DOYLE, M. E. (2002) Alternatives to antibiotics use for growth promotion in animal husbandry. *FRI Briefings*, University of Wisconsin-Madison, WI 53706.

EMADI, M. and KERMANSHAHI, H. (2006) Effect of tumeric rhizome powder on performance and carcass characteristics of broiler chickens. *International Journal of Poultry Science* 5 (11): 1069-1072.

GUNAL, M., YAYLI, G., KAYA, O., KARAHAN, N. and SULAK O. (2006) The effects of antibiotic growth promoter, probiotic or organic acid supplementation on performance, intestinal microflora and tissue of broilers. *International Journal of Poultry Science* 5 (2): 149-155.

GILL, C. (1999) Herbs and plant extracts as growth enhancers. *Feed International,* April, 1999. 20-23.

JENSEN, B. B. (1998) The impact of feed additives on the microbial ecology of the gut in young pigs. *Journal of Animal and Feed Science* **7**: 45-64.

KYUNG, W., SOO, K. L. AND BONG, D. L. (2006) Aspergillus oryzae as probiotic in poultry – A Review. *International Journal of Poultry Science* 5 (1): 01-03.

MURRY, A. C., HINTON, A. and BUHR, R. J. (2006) Effect of botanical probiotic containing Lactobacilli on growth performance ond populations of bacteria in the ceca ; cloaca, and carcass rinse of broiler chickens. *International Journal of Poultry Science* 5 (4): 344-350.

NEUVONEN, P. J. and OLKKOLA, K. T. (1988) Oral activated charcoal in the treatment of intoxications. Role of single and repeated doses. *Medicinal Toxicology* 3: 33-58.

OVIEDO-RONDON, E. O., CLEMENTE-HERMANDEZ, S., SALVADOR, F., WILLIAMS, P. and LOSA, R. (2006) Essential oils on mixed coccidian vaccination and infection in broilers. *International Journal of Poultry Science* 5 (8): 723-730.

PHILLIPS, I. (1999) Assessing the evidence that antibiotic growth promoters influence human infections. *Journal of Hospital Infections* 43: 173-178.

PRAKASH, S. K. (2006) Effects of herbal extracts towards microbial activity against pathogenic *Escherichia coli* in poultry. *International Journal of Poultry Science* 5 (3): 259-261.

RAMOS, A-J., JOHANA, F-G. and HERNANDEZ, E. (1996) Prevention of toxic effects of mycotoxins by means of non-nutritive absorbent compounds. *Journal of Food Protection* 59 (6): 631-641.

SHELTON, J. L. and SOUTHERN, L. L. (2006) Effects of phytase addition with or without a trace mineral premix on growth performance, bone response variables and tissue mineral concentrations in commercial broilers. *Journal of*

Apply Poultry Research 15: 94-102.

SOLTAN, M. A. (2008) Effect of dietary organic acid supplementation on egg production, egg quality and some blood serum parameters in laying hens. *International Journal of Poultry Science* 7 (6): 613-621.

SONGSAK, C., ORAWAN, C., THASSAWAN, S., SATHIT, N. and SIRILAK S. (2008) Effect of dietary inclusion of cassava yeast as probiotic source on growth performance, small intestine (Ileum) morphology and carcass characteristic in broilers. *International Journal of Poultry Science* 7 (3): 246-250.

VILAIN, M. (1999) Méthodes expérimentales en Agronomie. Pratique et analyse. Editions Tec et Doc. Paris. 337p.

WAGES, D. (2002) what does science say about the future of antibiotics? *Poultry International*, July 2002. 44- 46.

WANG, Z., CERRATE, S., YAN, F., SACAKIL, P. and WALDROUP, P. W. (2008) Comparison of different concentrations of inorganic trace minerals in broiler diets on live performance and mineral excretion. *International Journal of Poultry Science* 7 (7): 625-629.

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Newcastle disease and infectious bursal disease among village chickens in Borno State, Nigeria

A.D. EL-YUGUDA[1*], S.S. BABA[1], U.I. IBRAHIM[2] and F. BRISIBE[3]

[1]Animal Virus Research Laboratory, Department of Veterinary Microbiology and Parasitology,

[2]Department of Veterinary Medicine,

[3]Department of Veterianary Public Health and Preventive Medicine,

University of Maiduguri, P. M. B. 1069 Maiduguri, Nigeria

[*]Corresponding author: elyuguda2000@yahoo.com or abduldahiru@gmail.com

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Summary

The prevalence of Newcastle disease (ND) and Infectious bursal disease (IBD) in village chickens in Borno State, Nigeria was carried out over a period of 12 months using serological and antigen detection techniques. A seroprevalence of 51 % and 48 % were observed for ND and IBD respectively, in the retrospective study. Significant percentage (63 %) of those positive for ND had low titre of ≤ 1:20 and the IBD positive samples had 58 % with low titres of 1:2. Fifty percent (50 %) of the samples reacted to combined ND and IBD infections.

The prospective sentinel survey for ND and IBD among village chickens in Borno State showed more than 50 % of positive samples having ND HI antibody titre of ≤ 1:10 and IBD precipitin antibody titre of 1:2. The percentage seroprevalence of the two diseases in the prospective study showed an inverse relationship in most of the months.

Newcastle disease virus hemagglutinating antigen was detected in two or more of these tissues: lungs, proventriculus, intestine and brain in 60 % of the 112 samples tested. Infectious bursal disease precipitin antigen was only demonstrated in the bursae of Fabricious in 42 % of the sampled birds. Thirty-eight percent (38 %) of the positive birds for either infection were found positive for the two diseases using antigen detection techniques.

Key words: Newcastle disease, Infectious bursal disease, village chicken, seroprevalence, Nigeria

Introduction

In rural household, farm court-yards and around dwelling places, there have always been poultry living freely in association with human beings. This form of husbandry is characterized by free ranging during the day and confined together during the night in a basic shelter, feeding is limited to what the birds can find for themselves with little supplementation by the farmer (Say, 1987; Moreki and Masupu, 2001), Birds were characterised by poor productivity and heavy losses due to diseases, predators, accidents, etc. (El-Yuguda *et al*., 2005). Yet village poultry outnumbers all other forms of livestock in Nigeria, cutting across tribes, regions and religions (Bourne *et al*., 1993). Rearing of village chickens is popular in the rural areas and serves as a means of providing supplementary food, in form of animal protein, and as savings in order to respond to emergencies and prime necessities (Andrews, 1990). They have diverse genetic resources and survive under various weather conditions sheltered or otherwise (Nel, 1996; Alders and Spradbrow, 2001), while providing meat with pleasant flavour and low fat content, which is preferred taste by the society (Guèye, 1998; Amin *et al*., 1999). Diseases have been identified as one of the major constraints to successful village chicken production because of the greater relative proportion of infectious agents due to poor sanitation and special climatic conditions (Eissa, 1985), and the lack of vaccination (Jagne *et al*., 1987).

Nigeria has the largest poultry population in Africa (Nawathe and Abegunde, 1980), with chicken population of about 120-150 million (10% are of exotic breeds on commercial farms around the cities) 45 million guinea fowls, and 1 million each of ducks and turkeys (Akoma and Baba,1995). This study was therefore aimed at studying the prevalence of Newcastle disease (ND) and Infectious Bursal Disease (IBD) viruses among the village chickens in Borno State, Nigeria.

Materials and methods

Serum sampling

Retrospective: A total of 1,790 serum samples were collected from the village chickens at the Maiduguri Monday market poultry slaughter slab from the month of March 2005 to February 2006. The sampling was carried out at an average of 150 serum samples per month for 12 months. The blood was collected at slaughter into sterile vacutainer tubes and allowed to clot at room temperature and the sera were separated using centrifuge and the sera were kept at -20°C until tested.

Prospective: In the prospective serum sampling, 6 houses were selected from each of the three local government areas (Maiduguri metropolitan council, Mafa, and Askira/Uba) used in the study. At least 10 % of all the birds in each of the houses selected were bled every month for 12 months. A minimum of 25 days interval was given between successive bleedings.

Antigen detection: One hundred and twelve (112) birds were sampled for detection of IBDV or NDV antigens from dead, sick and apparently healthy village chickens in the study area during the study period.

Hemagglutination inhibition (HI) test

The HI test for the detection of Newcastle disease virus antibodies in the village chicken sera was performed by a modification of the method described by Allan and Gough (1974). Newcastle disease antigen used for the test was obtained from the National Veterinary Research Institute (NVRI) in Vom, Nigeria. The positive control serum used for the test was a pooled positive NDV HI antibody positive serum with titres 1:640 from natural outbreak of ND in village chickens. Briefly, the test sera were diluted 1:10 in normal saline and heat inactivated at 56°C for 30 minutes. A two fold serial dilutions of the sera was made in microtitre plates and an equal volume of appropriately diluted ND virus antigen was added to all the test wells. A 1% suspension of chick erythrocytes was then added to serve as an indicator and the plates were incubated at room temperature for 45 minutes. Positive samples were identified by the formation of a button (of red cells) at the bottom of the microtitre plate.

ND virus antigen were detected by preparing 80 % suspension of the tissues in normal saline and centrifuged at 1,500 rpm for 10 minutes in cold centrifuge and the supernatant tested for the presence of hemagglutinating antigens. Positive samples were confirmed by running α-procedure of the HI test, which is constant antiserum against varying antigen (Allan *et al*., 1978).

Agar gel immunodiffusion test (AGID)

An agar gel immunodiffusion test was used for the detection of IBD virus antibodies in the test serum samples. The test was carried out essentially as described by El-Yuguda and Baba (2004). Briefly, molten agar was poured into Petri dishes and allowed to solidify. Wells were cut on the agar plates with an Ouchterlony template having a central well and surrounded by six peripheral wells. The samples were first screened for IBD precipitin antibodies by placing positive antigen in the central well and the positive and negative controls and test sera were placed diagonally in alternating pattern in the peripheral wells. And for antigen detection, the central well is filled with IBD virus positive serum, while the positive and negative control and test samples were placed in alternating pattern in the peripheral wells. The plates were placed in a humidified chamber. Positive samples were identified by the formation of white line of precipitate in between the test sample well and the central well. All positive samples (serum or organ homogenate) were further titrated to end-point titres by making a two-fold serial dilution of each positive sample in PBS using a microtitre plate and transferred into corresponding wells on agar gel. Samples that turn out to have titres above 1:64, were further titrated to obtain their end point titres.

Statistical analysis

The Geometric mean titres (GMT) of ND hemagglutinin and IBD precipitin antibodies were calculated using the formula described in "Descriptive statistics" (CDC Atlanta Georgia, 1988). The GMT was calculated using the formula $X_{goe} = \text{antilog}_{10} (1/n \sum f_i \log_{10} X_i)$ where f_i = frequency and X_i = reciprocal of dilution.

Results

The results of the retrospective survey for Newcastle disease (ND) and Infectious Bursal Disease (IBD) are summarized in Table 1. Fifty-one percent (51 %) of the samples tested were positive for ND HI antibodies with an overall annual GMT of HI antibody value of 5.1 (Table 1). The overall distribution of the HI antibody titres showed that significantly ($P < 0.05$) higher percentage (40 %) of the positive sera demonstrated low titres of ≤ 1:10. Forty-eight percent (48 %) of the samples were positive for IBD with an overall annual GMT value of precipitin antibodies of 1.8 (Table 1). The distribution of the positive samples according to titre revealed that significantly ($P < 0.05$) higher percentage (58 %) of the positive samples had titre of 1:2. More positive samples (50 %) reacted to both ND and IBD. Three peaks each (March, August and December) and (April, August and January) were exhibited by ND and IBD respectively (Figures 1 and 2). And when the positive samples were classified into those positive for single or multiple infections, an inverse relationship was observed between the ND only and the IBD only positive samples with those positive for the two diseases occupying central position but exhibiting rise and fall in seroprevalence associated more with that of ND only (Figure 3).

Table 1: Retrospective monthly distribution of seroprevalence of Infectious Bursal Disease and Newcastle disease with their GMT values among village chickens in Borno State, Nigeria.

Months	No. Tested	IBD		ND	
		No (%) positive	GMT	No. (%) positive	GMT
March	157	79(50.3)	**2.6**	131(83.4)	**13.2**
April	163	104(63.8)	**2.9**	98(60.1)	**5.3**
May	119	72(60.5)	**1.3**	60(50.4)	**4.8**
June	131	40(30.5)	**1.5**	34(26.0)	**2.7**
July	120	46(38.3)	**1.8**	85(70.8)	**7.8**
August	200	135(67.5)	**2.6**	152(76.0)	**12.8**
September	160	98(61.3)	**2.7**	105(62.6)	**9.6**
October	139	57(41.0)	**1.8**	43(30.9)	**2.5**
November	148	61(41.2)	**1.4**	39(26.4)	**2.6**
December	144	42(29.2)	**1.4**	81(56.3)	**6.3**
January	169	93(55.0)	**1.3**	36(21.3)	**1.7**
February	140	35(25.0)	**1.5**	50(35.0)	**3.2**
Total	**1790**	**862(48.2)**	**1.8**	**913(51)**	**5.1**

Fig. 1: Retrospective seroprevalence of ND and IBD among village chickens in Borno state Nigeria

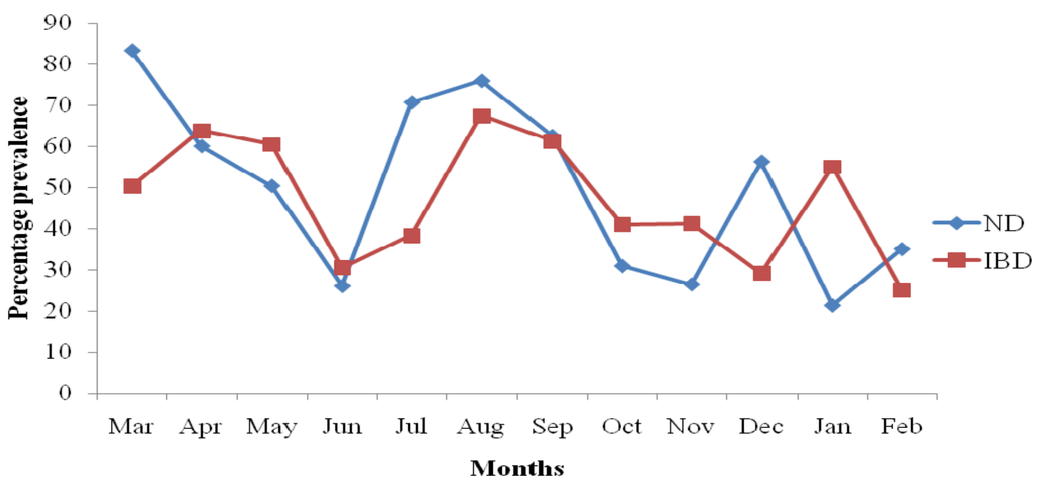


Fig 2: Prospective seroprevalence of ND and IBD among village chickens in Borno state Nigeria

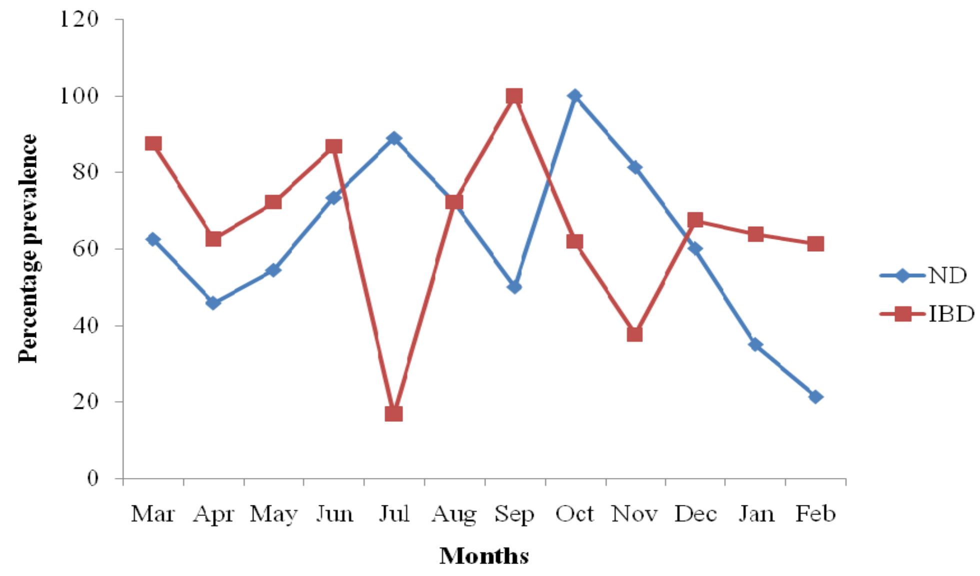
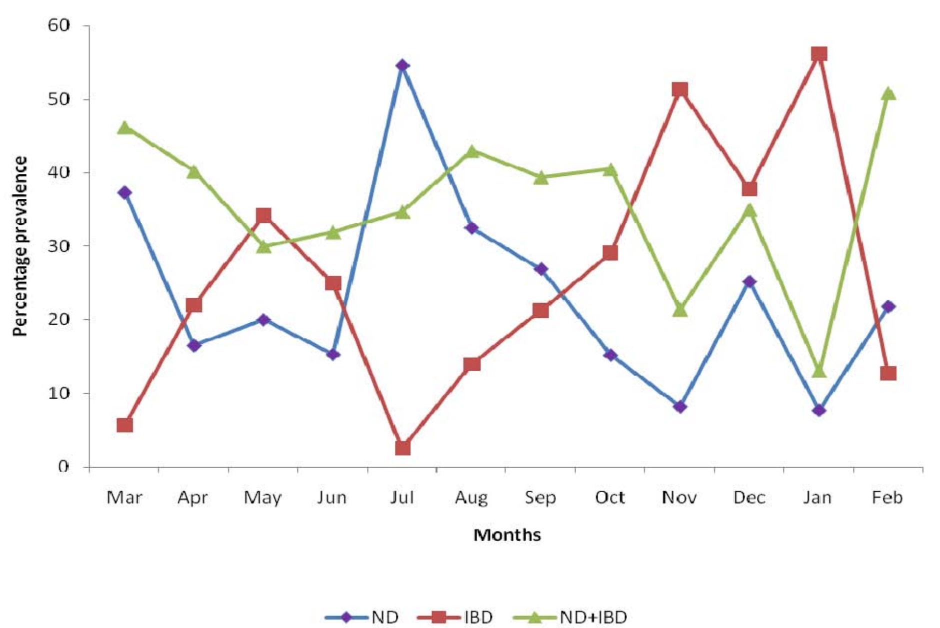


Fig. 3: Distribution of disease specific prevalence for retrospective study of ND and IBD among village chickens in Borno state Nigeria



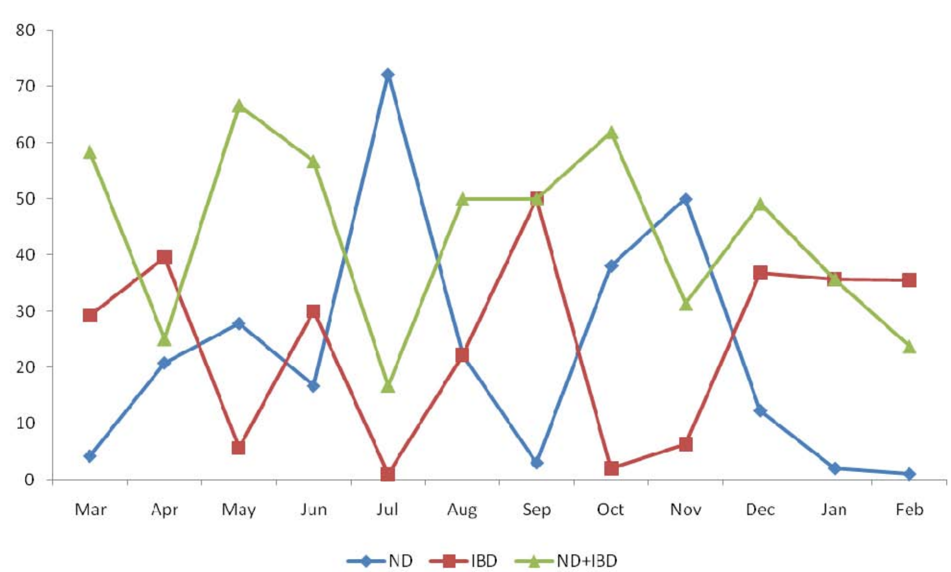
The prospective sentinel survey for ND and IBD among village chickens in Borno State is presented in Table 2. With the exception of the months of June and January, all the other months had ≥ 50 % of their positive samples having HI antibody titres of ≤ 1:10. Also the IBD precipitin antibody positive samples exhibited a similar pattern where all the months (except for August) had ≥ 50 % of their positive samples having titres of 1:2. The percentage seroprevalence of the two diseases in the prospective study showed ND has 3 peaks (March, July and October) and the IBD has four peaks (March, June, September and December) and the 2 diseases exhibited an inverse relationship in most of the months

(Figure 2). Distribution of the positive sera into single or multiple infections showed the ND only exhibiting 3 peaks (May, July and November) and the IBD exhibited 4 peaks (April, June, September and December) and an inverse relationship was also observed between the two diseases (Figure 4).

Table 2: Prospective monthly distribution of seroprevalence of Infectious Bursal disease and Newcastle disease with their GMT values among village chickens in Borno State, Nigeria.

Months	**No. tested**	**IBD**		**ND**	
		No. (%) positive	**GMT values**	**No. (%) positive**	**GMT values**
Mar	240	210(87.5)	**4.0**	150(62.5)	**6.1**
Apr	240	150(62.5)	**2.5**	110(45.8)	**2.8**
May	180	130(72.2)	**2.6**	170(54.4)	**12.9**
Jun	300	260(86.7)	**2.1**	220(73.3)	**8.9**
Jul	180	30(16.7)	**1.2**	160(88.9)	**11.8**
Aug	180	130(72.2)	**4.2**	130(72.2)	**6.4**
Sep	100	100(100.0)	**1.1**	50(50.0)	**3.4**
Oct	210	130(61.9)	**1.9**	210(100.0)	**10**
Nov	160	60(37.50	**1.0**	130(81.3)	**6.8**
Dec	163	110(67.5)	**2.6**	98(60.1)	**5.3**
Jan	140	89(63.6)	**2.9**	49(35.0)	**3.2**
Feb	169	104(61.5)	**2.7**	36(21.3)	**1.7**

Fig. 4: Distribution of disease specific prevalence for prospective study of ND and IBD among village chickens in Borno state Nigeria



Our attempt to isolate NDV or IBD viruses from clinical specimen collected at post mortem, sick or apparently healthy birds did not yield positive results. Instead we resorted to antigen detection using hemagglutinin (HA) and agar gel immunodiffusion (AGID) tests. Newcastle disease virus hemagglutination was demonstrated in the lungs, proventriculus, intestine and brain in 60 % of the samples tested. Infectious bursal disease was only demonstrated in the bursae of Fabricious of 42 % of the sampled birds. Thirty-eight percent (38 %) of the positive birds for either infection were found positive for the two diseases.

Discussion

The high ND HI and IBD precipitin antibodies and antigens observed in this study indicates high activity of the two viruses among the village chickens in this environment. The ND virus seroprevalence of 51 % observed in this study is higher than those reported by d'autres auteurs (Baba *et al*., 1998; El-Yuguda and Baba, 2002) among village chickens in the same environment. However, the retrospective IBD virus seroprevalence of 48.2 % observed in this study agrees with the reports of Ibrahim *et al*. (2001) and Mamza *et al*. (2001) among village chickens in the same environment. As the village chickens were never vaccinated against these diseases the antibodies detected could only have resulted from natural infections with the viruses. Birds whose immunity is sufficient to suppress clinical signs completely may still excrete virulent viruses. Also birds with suppressed immunity are more susceptible to virulent viruses and excrete greater quantities of viruses if they survive and are less responsive to vaccination (Spradbrow, 1987). High activity of the two viruses was found to occur all the year round, with 3 ND peaks each in the retrospective studies in the prospective study, while IBD in the prospective study gave four peaks. This disagrees with the report of Yongolo *et al*. (2002) who observed seasonal occurrence of ND among village chickens in Tanzania. The results of the retrospective and prospective studies for the two diseases are similar both in seroprevalence and percentage end-point titres. One phenomenon noticed in both the retrospective and prospective seroprevalence studies was that the two diseases exhibited an inverse relationship, when seroprevalence of one virus is rising that of the other virus is falling. The result of the antigen detection further supports the serological data on the activity of the two diseases in this environment. Although the samples may not be a true representation of the target population, this study provides baseline information on the epidemiology of the two diseases among the village poultry birds in Borno State, Nigeria.

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References

AKOMA, M. B. and BABA, S. S. (1995) Survey for infectious bursal disease virus antibodies in free and commercial birds in Borno State, Nigeria. *Studies and Researches in Veterinary Medicine 3:46-48.*

ALDERS, R. and SPRADBROW, P. B. (2001) Control of Newcastle disease in village chickens: a field manual. *ACIAR Monograph* 82.

ALLAN, W. H. and GOUGH, R. F. A. (1974). A standard haemagglutination test for Newcastle disease: a comparison of macro and micro methods. *Veterinary Records 95:120-123*.

ALLAN, W. H., LANCASTER, J. E. and TOTH, B. (1978) Newcastle disease vaccine: their production and use.

FAO Animal Production and Health series, 10 Rome FAO 1978.

AMIN, J. D., BUKAR, M. M., HASSAN S. U. and KIBON, A. (1999) A survey of management and disease problems of free range chickens in Borno and Yobe states of Nigeria. *Journal of Arid Agriculture, 9:125-128.*

ANDREWS, P. (1990) Rural poultry production development in the Gambia. In: *CTA-seminar proceedings small-holder rural poultry production*, Thessaloniki, Greecem: 81-85.

BABA, S. S., BABA, M. M. and EL-YUGUDA A. D. (1998) Serological evidence of mixed infection with Newcastle disease and egg drop syndrome 1976 viruses in village chickens in Borno State, Nigeria. *Tropical Veterinarian 16:137-141*.

BOURNE, D., WINT, W., BIENCH, R. and WOLLEY, E. (1993) Nigerian livestock resources survey. *World Animal Review*, 78 (1):49-58.

CDC, (1988) Descriptive statistics: measure of central tendency and dispersion. *Centre for disease control and prevention Atlanta Georgia USA*

EISSA, Y. M. (1985) Disease control problems in Middle East. *World Poultry*, Dec. 1985. 33-37

EL-YUGUDA, A. D. and BABA, S. S. (2002) Prevalence of selected viral infections in various age groups of village chickens in Borno State, Nigeria. *Nigerian Journal of Animal Production* 29 (2): 245-250.

EL-YUGUDA, A. D. and BABA, S. S. (2004) An outbreak of infectious bursal disease in eight weeks old IBD vaccinated commercial poultry flock in Maiduguri, Nigeria. *Tropical Veterinarian* 22 (3&4): 93-98.

EL-YUGUDA, A. D., DOKAS, U. M. and BABA, S. S. (2005) The effects of Newcastle disease and infectious bursal disease vaccines, climate and other factors on the village chicken population in North-eastern Nigeria. *Journal of Food, Agriculture and Environment* 3 (1):55-57.

GUÈYE, E. F. (1998) Village egg and fowl meat production in Africa. *World's Poultry Science Journal* 54: 73-86.

IBRAHIM, U. I., EL-YUGUDA, A. D. and TANYA, S. N. (2001) Antibodies to infectious bursal disease virus (IBDV) in village chickens in semi-arid zone of Nigeria. *Sokoto Journal of Veterinary Science 3(2): 40-43.*

JAGNE, J., AINI, I., SCHAT, K. A., FENNEL, A. and TOURAY, O. (1987) Vaccination of village chickens in The Gambia against Newcastle disease using the heat-resistant, food-pelleted V_4 vaccine. *Avian Pathology 20: 721-724.*

MAMZA, S. A., ABUBAKAR, M. B., EL-YUGUDA, A. D. and AMBALI, A. G. (2001) Prevalence of active and passive immunity against infectious bursal disease virus in village chickens in semi-arid zone of Nigeria. *Nigerian. Journal of Experimental and Applied Biolpgy 2(2):87-90.*

MOREKI, J. C. and MASUPU, K. V. (2001) Country report: Botswana. In: Alders R. G. and Spradbrow P. (eds) Southern African development community planning workshop on Newcastle disease control in village chickens. *ACIAR Monograph*, 103: 5-10.

NAWATHE, D. R. and ABEGUNDE, A. (1980) Egg drop syndrome 1976 in Nigeria: serological evidence in commercial farms. *Veterinary Records* 107: 466-467.

NEL, C. (1996) Return of the farmyard chicken. *Farmers Weekly*, December 1996: 6-1

SAY, R. R. (1987) Manual of poultry production in the tropics. *C.A.B. International publications.*

SPRADBROW, P. B. (1987) Newcastle disease – an overview. In: *Copland, J. W. (eds) Newcastle disease inpoultry*: a new food pellet vaccine. ACIAR Monograph 5: 2-18.

YONGOLO, M. G. S., MAEDA MACHANGU, A. and MINGA, U. M. (2002) Newcastle disease and Infectious bursal disease among free range village chickens in Tanzania. In: *Characteristics and parameters of family poultry production in Africa*. Results of a FAO/IAEA co-ordinated research programme: 107-116.

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Overview of research on poultry in Burkina Faso

S. POUSGA*[1] and H. BOLY[1]

Department of Livestock Production, Institute of Rural Development, Polytechnic University of Bobo-Dioulasso, 01 B.P. 1091, Bobo-Dioulasso, Burkina Faso

***Corresponding author: Salimata.P@gmail.com**

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Summary

There are two main poultry production systems in Burkina Faso, the extensive and the intensive system. The former is practised throughout the country, with virtually all rural farmers keeping a few birds (chickens, guinea fowls, ducks, etc.) in the household in order to satisfy the family's financial needs. The intensive system is restricted to some peri-urban areas of the major towns, using exotic breeds, and the main objective is egg production for sale.

Meat and eggs from local poultry are well preferred by consumers because of their flavour. Despite the constraints facing rural poultry production, such as diseases, and poor feeding and management, village poultry production is still important and widely distributed among smallholder farms. However, few studies were carried out in Burkina Faso on the effects of improved nutrition, and in general poultry production improvement and research represent only a minor part of the agricultural research and development programmes in the country.

Keywords: Poultry, research, Burkina Faso

Introduction

Burkina Faso, situated in West Africa , is one of the poorest countries in the world (PNUD, 2007). The surface area is 274 000 km^2, and the population was estimated to be around 14 million inhabitants in 2006 (UCLA, 2009). Approximately 94 % of the people under the poverty line live in rural areas, as reported by Ouedraogo (2002). Extensive crop and livestock production are the main activities of the population. These two activities play a key role in the economy, where livestock products constitute about 19 % of the exports, and more than 86 % of the population obtains at least part of their income from livestock production (MRA, 2003).

Poultry farming is an important part of the daily life of the population, especially for rural farmers, who raise village chickens for several purposes (Kondombo *et al.*, 2003), such as to supply meat and eggs and generate income. Chickens are also commonly used for gifts and sacrifices in social rites. The total poultry population in Burkina Faso was estimated at 32 million according to the census in the animal sector during 2002-2003 (MRA, 2004).

Poultry Production Systems and Constraints in Burkina Faso

It has been estimated that only 0.8 % of the total poultry population is found in the cities and towns (MARA, 1997). Two dominant production systems have been described, industrial and traditional (Bonkoungou, 2002). The industrial system is a well organised, intensive system with exotic day-old chicks or eggs imported for hatching. The main objective is egg production, with 200,000 layers and only 40,000 broiler chicks per year (Royer and Vidon, 2001) imported from Europe (France, Belgium, and The Netherlands) and from neighbouring African countries (Côte d'Ivoire and Ghana) (MRA, 2001). Compared with other West African countries such as Senegal, Ghana and Côte d'Ivoire, there are few industrial broiler units around the cities in Burkina Faso. The greatest proportion of the meat of exotic birds in Burkina Faso is from spent layers at the end of lay (Ouedraogo and Zoundi, 1999). Intensive production is still embryonic and is practiced in the peri-urban areas by a few relatively wealthy entrepreneurs from the cities. In this system, the production inputs concerning feeding, health care and housing conditions are higher, and the constraints such as losses due to diseases and predators are minimized. Importation of feed ingredients, medicines and equipment is coordinated by an organisation called "Maison de l'Aviculture", which is an association of producers who keep exotic breeds of poultry, mainly chickens.

The family or traditional system, which is widespread in rural, urban and peri-urban areas, is practiced mainly by resource-poor people and is based on indigenous breeds with poor production performances. However these breeds are characterized by a genetic diversity (Hoffmann, 2007), resistance to diseases in harsh environmental conditions, a greater brooding hability of the hens and their capacity to protect their offspring from bad weather and predators (Kondombo, 2005). The traditional system is characterised by the free-range production in which the birds have to scavenge to find most of their feed, which is constituted mainly by materials from the environment and household leftovers (Pousga *et al*., 2005; Kondombo, 2005), although cereal supplements are often distributed to the birds in the early morning and late afternoon. The poor genetic potential for production performances, in combination with the harsh environmental conditions and poor nutrition lead to a low production output. The losses are usually higher in the rainy season (Pousga *et al*., 2005), due to diseases and predators. This system is also characterised as a traditional farming system where poultry are integrated with crop and livestock production, and where several poultry species of different ages and of two sexes are mixed together in the flock. Although the traditional system is limited by a number of constraints, it provides the main urban centres with poultry products, such as live birds, meat and eggs from chickens and guinea fowls during the breeding season. Village chickens use at farm level was described by Yameogo (2003) (Figure 1).

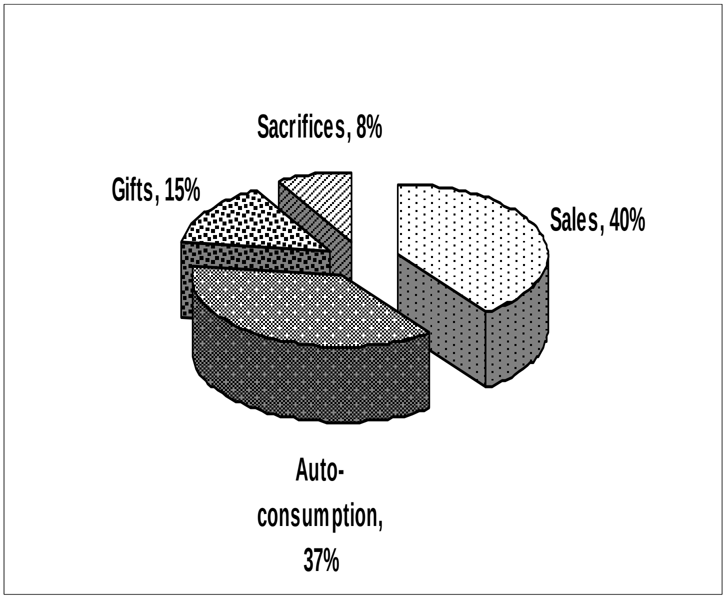

Figure 1.Village chicken uses at the farm level.

There is little information on the genetic make-up of local poultry in Burkina Faso. However, Kondombo (2000) characterised chicken phynotypes according to body size and feathers colour.

The following types were identified in local language in the central part of the country

- "Noa-liguidi", a chicken having black feathers in majority and some white points
- "Noa-sablaga" which is a chicken with black feathers
- "Noa-pelga" is a chicken characterised by white feathers
- "Noa-zinga" with reddish feathers
- "Noa-bégré" with white and black feathers

Chickens were also named according to their size: "Noa-rigré (dwarf), Noa-kondé (big size), Noa-kuiguiga (medium size) and Noa-ibrongo (naked neck).

The changes in the poultry (including chickens and guinea fowls) population in Burkina Faso from 1992 to 2005 are shown in Table 1.

Table 1. Poultry numbers of Burkina Faso in selected years between 1992 and 2005.

Year	Total number
1992	17 784 900
1996	19 920 000
2000	22 420 318
2003	31 007 000
2004	31 937 000
2005	32 895 000

Source: MRA (2002); Mission Economique (2006)

The keeping of poultry is widely practised throughout the country (MARA, 1997) (Figure 2).

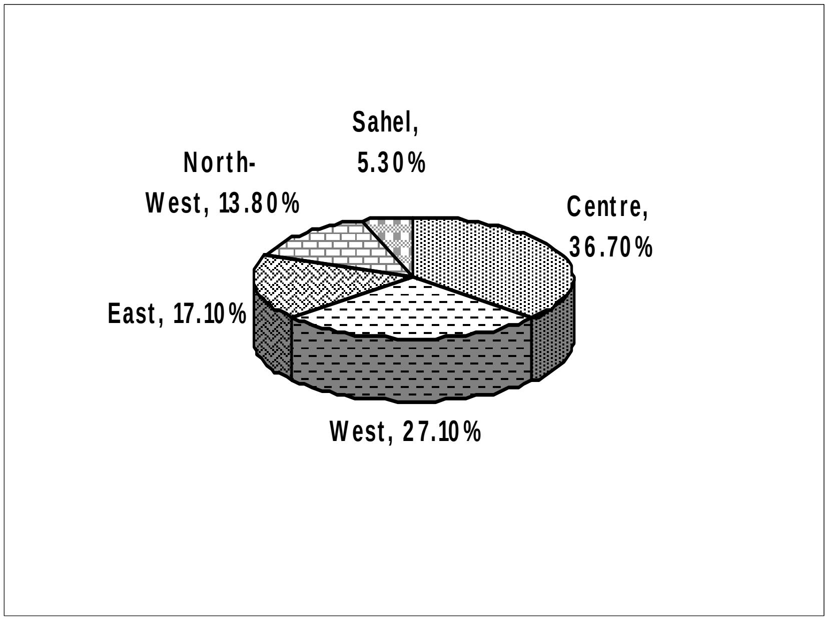

Figure 2: Poultry distribution in Burkina Faso.

The average number of birds per household was reported to range between 1 and 50, with only 5 % of the farmers having more than 50 birds (Yameogo, 2003) . The body weight of local chickens reared in scavenging conditions ranges from 1.2 to 2.0 kg for adult males and from 0.9 to 1.2 kg for adult females (MAE, 1991; Ouandaogo, 1997; Pousga *et al*., 2005 b). Some productivity parameters are presented (Table 2).

Table 2: Some productivity parameters of local chickens in Burkina Faso.

Parameter	Value
Onset of lay	170 ±15 days
Number of eggs per clutch	11 ±5
Number of clutches per year	2-3
Egg production / hen / year	30-45
Hatchability rate	79-85 %
Viability rate of chicks	89.3 %

Source: Yameogo (2003)

In the villages, natural incubation is done by the hens, which brood and hatch the eggs. It was shown that the hatchability of chicken eggs depends on the farming system. The hatchability was found to be higher in the crop-livestock system (70 %) compared to livestock based systems (46 %) (Kondombo, 2005).

Housing Conditions

In rural areas, the nature of the poultry house or shelter depends on the production system. Traditionally, young birds or chicks are generally raised in a large hut made with mud bricks and with a thatched roof. In some areas, farmers build small poultry houses with thatch (Boussini, 1995) to house laying hens and chicks at night, while other birds spend the night on trees. Different poultry species are generally mixed together in the same house. Only 11% of the farmers build improved poultry houses and 80 % of poultry houses are traditional, with 73 % built with mud brick and 7 % with thatch or straw (Boussini, 1995; Bessin *et al*., 1998).

Feeding Systems

In general, rural poultry find the main part of their diet by scavenging around the villages. Feeding systems adopted by farmers depend on the age of the birds. Kondombo (2000) reported that poultry farmers regularly supplement chicks, while mature birds receive supplementary feed only when there is a surplus of cereals. Chicks are often supplemented with termites, and the main energy feedstuffs used as supplements are maize, millet and red sorghum and their by-product from local processing, depending on location. These cereals are also staple foods for humans.

It was clearly demonstrated that confinement and supplementation can lead to better performance as well as improved bio-security (Pousga *et al.*, 2006; Pousga *et al.*, 2007).

Many feed ingredients are used in standard diets formulation in intensive production, and the main poultry feed company is coordinated by the Ministry of Animal Resources through the *Programme de Développement des Animaux Villageois* (PDAV, or Rural Animals Development Programme). Feed ingredients are also imported by a private structure called “Maison de l’aviculture”, an association of intensive chicken producers. A summary of the most important local and imported feedstuffs used in commercial feeds and the seasonal availability in Burkina Faso is shown in Table 3.

Table 3: Seasonal availability of some poultry feed ingredients in Burkina Faso.

Ingredients	**Rainy saison**	**Dry season**	**Remarks**
Maize	**	***	
Wheat bran	**	***	Local and imported
Maize bran	**	***	Local
Soybean	-	-	Mainly imported
Cottonseed cake	**	***	local
Fishmeal	-	-	Imported
Blood meal	-	-	Imported
Vitamin and mineral premix	-	-	Imported
Oyster shell	-	-	Imported
Bone meal	-	-	Imported sometime
Lysine	-	-	Imported
Methionine	-	-	Imported

Source: Analyzed Data from PDAV and “Maison de l’aviculture” in 2005

*Rare; **Less abundant; ***More abundant

Health and Mortality

The causes of losses in the traditional system were described by Kondombo *et al*. (2003) (Figure 3).

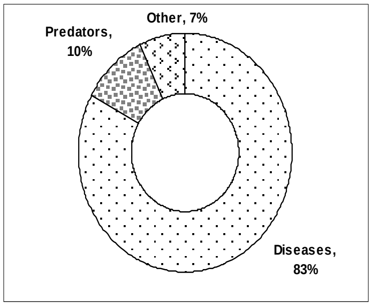

Figure 3: Causes of village poultry losses in Burkina Faso.

Disease control programmes have been adopted but results were generally not positive because these programmes require logistics, such as skilled manpower and the availability of cold chain facilities, and because they also require frequent travels to the villages, which is not feasible.

Burkina Faso was the fifth African country (after Nigeria, Egypt, Niger and Cameroun) to be affected by the Highly Pathogenic Avian Influenza (HPAI) virus in April 2006. The affected poultry stocks were the intensively reared chickens and guinea-fowls, and free-ranging chickens and ducks (OIE, 2006). Some of the measures taken to contain the HPAI included preventative culling of poultry in the infected areas and all suceptible poultry situated in 3 km radius from the infected farms. The smallholder poultry sector was blamed for the spread of the disease, and it was suggested that a higher degree of control should be enforced with respect to smallholder producers. For example the authorities required that smallholders prevent their birds from roaming freely by keeping them in confined. Taking into consideration their limited resources and the reality of village conditions, smallholders were not capable of respecting these instructions.

Conclusion

Inputs for poultry in the rural areas are low, mainly because of the high cost of conventional feeds and also due to competition between humans and chickens for potential feed ingredients such as cereals. Poultry is a class of small livestock that resource-poor people can afford, including disadvantaged social groups such as women and the landless, and therefore is one of the most important sustainable sources of income and capital accumulation available to the poor. However, rural poverty persists, due amongst other things to the rapidly increasing human population and natural factors, including diseases such as avian influenza, that negatively influence the expansion of village poultry.

Therefore, to promote poultry production in rural areas, the following recommendations are suggested:

- Measures to improve disease control
- Evaluation and promotion of confinement systems of rearing for small-scale producers
- Government policy should take into consideration the possibility of subsidising agro-industrial by-products for poultry producers in the rural areas.

References

BESSIN, R. BELEM, A.M.G., BOUSSINI, H., COMPAORE, Z., KABORE, Y. and DEMBELE, M.A. (1998) Enquête sur les causes de mortalité des pintadeaux au Burkina Faso. *Revue d'élevage et de médecine vétérinaire des pays tropicaux,* 51, 87-93.

BONKOUNGOU, G.F.X. (2002) L'amélioration de l'élevage traditionnel de la volaille locale en zone Saheélienne du Burkina Faso. *10th International Conference of AITVM*, Copenhagen, Denmark.

BOUSSINI, H. (1995) Contribution a l'étude des facteurs de mortalité des pintadeaux au Burkina Faso. *These de Medecine Veterinaire, EISMV*, Dakar, Senegal.

HOFFMANN, I. (2007) Vaccination as a tool to preserve poultry genetic resources ? Proceeding of FAO conference on: "vaccination: a tool for the control of avian influenza", Verona 20-22 March 2007.

KONDOMBO, S.R. (2000) Case study on production systems and feeding of village chickens in the central region of Burkina Faso. *MSc thesis, Wageningen University*.

KONDOMBO, S.R. (2005) Improvement of village chicken production in a mixed (chicken-ram) farming system. *PhD Thesis, Wageningen Institute of Animal Science, Wageningen University*, The Netherlands.

KONDOMBO, S.R., NIANOGO, A.J., KWAKKEL, R.P., UDO, H.M.Y.& SLINGERLAND, M. (2003) Comparative analysis of village chicken production in two farming systems in Burkina Faso. *Tropical Animal Health and Production* 35: 563-574.

MAE (1991) Etude prospective du sous-secteur élevage au Burkina Faso. *Ministère de l'Agriculture et de l'Elevage,* Tome 1, Rapport de synthèse, Ouagadougou, Burkina Faso.

MARA (1997) Etude statistique du sous-secteur élevage au Burkina Faso. *Ministère de l'Agriculture et des Ressources Animales,* Annuaire Statistique, Ouagadougou, Burkina Faso, 64 pp.

MISSION ÉCONOMIQUE (2006) Situation de l'Agriculture et de l'Elevage au Burkina Faso. In: P. Berger & V. Traore (eds) *Ambassade de France au Burkina Faso*. Fiche de Synthèse, MINEFI-DGTPE/AFAQ ISO 9001, Ouagadougou, Burkina Faso.

MRA (2001) Les statistiques du secteur élevage au Burkina Faso. *Ministère des Ressources Animales*, Annuaire statistique, Ouagadougou, Burkina Faso.

MRA (2002) Les statistiques du secteur élevage au Burkina Faso. *Ministère des Ressources Animales*, Annuaire statistique, Ouagadougou, Burkina Faso.

MRA (2003) Méléagriculture au Burkina Faso: Diagnostics et axes d'amélioration, *Ministère des Ressources Animales*, Ouagadougou, Burkina Faso.

MRA (2004) Deuxième enquête nationale sur les effectifs du cheptel, résultats et analyses. *Ministère des Ressources Animales*, Tome II Ouagadougou, Burkina Faso.

OIE (2006) Avian Influenza in Burkina Faso. Follow-up report No 1 [online]. *OIE, Disease Information,* 19, No 21. Available from: http://www.oie.int/eng/info/hebdo/AIS_17.HTM [Accessed 2009-10-13].

OUANDAOGO, Z.C. (1997) Aviculture rurale et développement des femmes en milieu rural. *PROMELPHA, Ouagadougou*, Burkina Faso, 36 pp.

OUEDRAOGO, C.L. (2002) Le developpement de l'aviculture familiale: cas du Burkina Faso [online]. *Second FAO/INFPD Electronic Conference on Family Poultry, Report PROMELPHA.* Available from: www.fao.org/ag/AGAinfo/themes/en/infpd/documents/econf_bang/africa2.html [Accessed 2009-10-13].

OUEDRAOGO, S. & ZOUNDI, J.S. (1999) Approvisionnement de la ville de Ouagadougou en poulet de chair. *Agriculture Urbaine en Afrique de l'Ouest, IDRC, Canada.*

PNUD (2007) Rapport Mondial sur le developpement humain 2006. *PNUD, Burkina Faso.*

POUSGA, S., BOLY, H., LINDBERG, J. E. and OGLE, B. (2007) Effect of supplements based on fishmeal or cottonseed cake and management system on the performance and economic efficiency of exotic hens in Burkina Faso. *African Journal of Agricultural Research* 2: 496-504.

POUSGA, S., BOLY, H., LINDBERG, J. E. and OGLE, B. (2006) Effect of supplementation on feed intake and performance of confined and Scavenging crossbred growing chickens in Burkina Faso. *Tropical Animal Health and Production* 38: 323-331.

POUSGA, S., BOLY, H., LINDBERG, J. E. and OGLE, B. (2005) Scavenging chickens in Burkina Faso: Effect of season, location and breed on feed and nutrient intake. *Tropical Animal Health and Production* 37: 623-634.

ROYER, V. and VIDON, E. (2001) Maison de l'aviculture: Cas de la prise en charge des services par les éleveurs eux-mêmes. *Agrodoc.*

UCLA (2009) African studies center, Burkina Faso country profile 2009. [online]. Available from: http://www.international.ucla.edu/africa/countries/article.asp?parentid=96717 [Accessed 2009-10-16]

YAMEOGO, N. (2003) Etude de la contribution de l'aviculure traditionnelle urbaine et péri-urbaine dans la lutte contre les pathologies aviaires au Burkina Faso. *Université de Ouagadougou, Ouagadougou, Burkina Faso, UFR/SVT, IDRC, Rapport AGROPOLIS* .

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INFPD gets IFAD grant to support "Smallholder Poultry Development"

Background

Small-scale and backyard poultry production provide meat and eggs for rural poor households, a small and fairly regular source of cash, manure for crop production, feathers, items for traditional rituals and gifts for friends. In the context of increasing food cost in developing countries, rural poultry keeping and marketing offer one of the few opportunities that rural poor can join for enhancing household food security and income generating activities, especially if they lack access to land, training and capital.

Simple, affordable interventions based on good husbandry practices can have a substantial impact on productivity, primarily by reducing mortality and losses. Useful information, lessons learned, success stories but also failures related to backyard poultry production and its role in improving livelihood need to be better shared and analyzed. These can then be taken up by development projects, supported by the International Fund for Agricultural Development (IFAD) and others or by private producers. This programme addresses directly Millennium Development Goals (MDGs) 1, 3, and 6 and indirectly MDGs 2, 4 and 5. Greater awareness is also needed within the private sector, governments and NGOs regarding the potential and limitations of household poultry's contribution to family income, food security, poverty alleviation and to mitigating the impact of HIV/AIDS. Decision makers often see industrial poultry production as the only way to meet national food security requirements. They are not always fully aware of the information available on small-scale poultry production and its potential for household food security. Moreover, the Highly Pathogenic Avian Influenza (HPAI) crisis has focused attention on the poultry sector. Fears have been expressed that extensive poultry production systems contribute disproportionately to the spread of HPAI. Data, related to control measures for HPAI in both commercial and backyard production systems do not however support this claim.

The programme aims to build local capacity to develop, lead and implement initiatives related to small-scale poultry production which is the livestock of the poorest and the landless. This grant will result in a stronger INFPD which will be well placed as a source of expertise and to share and disseminate information related to smallholder poultry production.

Expected outputs and benefits

A cadre of Associate Poultry Advisors (APA) from developing countries and who are members of INFPD or the International Rural Poultry Centre (IRPC) of the KYEEMA Foundation will directly benefit from this project. Skills acquired and materials produced by the APAs through the programme will benefit i) themselves and their organization (government, private sector, research, NGOs, etc), ii) the IFAD/FAO projects they will be assigned to, and iii) the wider poultry development community.

Indirect beneficiaries are vulnerable households and in particular women poultry producers who can benefit from enhancement of their capabilities in animal disease prevention and control, animal production and management, product marketing that take account of the prevailing social, cultural and economic conditions and aim to minimise loss of livelihood. Further indirect beneficiaries are decision makers, planners, technicians in public and private sectors, and development agencies.

Programme outputs will include:

Output 1: The capacity to implement innovative smallholder poultry projects and activities is strengthened in targeted countries of Asia and Africa

Promising, young poultry specialists (poultry graduates, researchers or poultry development workers) will be offered a six to twelve months assignment as Associate Poultry Advisors working in the household poultry sector. These assignments will consist of 4-6 weeks orientation and training at FAO in Rome, followed by a field assignment on an FAO, IFAD or INFPD partner agency poultry programme. In addition to a technical component, the training at FAO/IFAD will also include exposure to the Household Economy Approach (HEA) and to the importance of gender aspects. APAs will acquire the skills to apply efficiently their technical expertise into the broader context of sustainable development and will play an active technical supporting role in the implementation of rural poultry activities and value chain development in on-going IFAD/FAO projects by providing training and advisory services to beneficiaries, especially women. INFPD will be responsible for identifying and screening suitable candidates and the candidates will then be approved by the Programme Steering Committee. The acquired experience and capacity will be an asset for national countries of APA's origin since they will be expected to make a major impact in guiding smallholder poultry development both directly and indirectly by influencing decision makers, technocrats and development agencies. Each APA will provide six monthly post-assignment evaluation reports to INFPD for up to two years to assist in monitoring their impact. Key indicators are as follows:

- 12 APAs having completed assignments in IFAD/FAO projects.
- 12 documents (concept notes, strategy papers, survey reports, reviews relating to smallholder poultry development, etc) developed by APAs.
- 12 follow-up post assignment evaluations.

Output 2: Validated decision tools and training materials for household poultry production development are available as public good and disseminated through INFPD website

Studies and the interaction with various field project stakeholders will contribute to generate decisions tool and training material for household poultry production development. Key indicators are as follows:

- Fact sheets with practical information and descriptions of techniques on various other aspects of smallholder poultry production – housing, processing and marketing, microfinance, etc. that would assist in increasing the efficiency and productivity of women smallholder family poultry producers are available.
- Technical decision support system (checklists) for project officers in donor agencies, international and national NGO and their counterparts in the recipient countries are available.
- Technical guides/manuals, specifically for (i) the management of family poultry projects (ii) the prevention and control of HPAI and other diseases of family poultry, (iii) the preservation of poultry genetic resources used in family poultry production, and (iv) the assessment of feed resources for the supplementation of family poultry, are available.

Output 3: The International Network for Family Poultry Development (INFPD) is strengthened and disseminates tools and information for safe and more efficient household poultry production

Creating awareness, selling the benefits of smallholder poultry production in terms of improving livelihoods and gender empowerment is a prerequisite for making rational decisions regarding investment in this area. The programme through the INFPD newsletters, websites, workshops and information dissemination is expected to have a positive impact on increasing investment into smallholder poultry development. Increased investment would impact positively on the ultimate beneficiaries of the programme, the vulnerable poultry-keeping households and the supply chains that service them. Key indicators are as follows:

- Six editions of the bi-lingual INFPD journal;
- INFPD website including e-mail based bilingual newsletter updated and maintained;
- Three internet conferences on topics that concern smallholder poultry production are organised by INFPD;
- Three annual stakeholder workshops in selected regions for producers, researchers and academics to raise awareness among national policy-makers, NGOs, service providers and women on the importance and role of family poultry production in rural development;
- INFPD members participate in major regional and international poultry events; and
- A strategy and model whereby INFPD becomes financially independent are available.

Implementation arrangements

The INFPD will be the umbrella organization responsible for the coordination and management of the programme through a Programme Steering Committee which will consist of representatives from IFAD, INFPD, FAO, and IRPC. FAO will provide the official link with IFAD accounting for the project funds and all the interim and final reports while it also provides office and support facilities for the project leader.

FAO will be responsible for the technical backstopping. IFAD will supervise this programme.

The basic requirements for the APA candidates are (i) University Education in Animal Husbandry or Health, (ii) previous working experiences in poultry production, and (iii) a permanent position in an institution (University or Research Institute).

The programme is planned to have two groups of six APAs each. The training will include a theoretical part of 4-6 weeks in Rome at FAO HQ and then the assignment to field projects. The training in Rome will include both technical and social components and experienced practitioners will be invited as trainers. The locations of field training for the first group are envisaged in Senegal, Bangladesh, Laos, Mozambique, Afghanistan and Ethiopia. Candidates for this training should either come from these countries or similar (neighbouring) countries. Further information on application procedure will be available soon on the INFPD, FAO and IRPC websites.

The programme runs from November 2009 to October 2012.

Professor Funso Sonaiya, INFPD Coordinator

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International Conference on "Sustainable Rural Life - Engineering Solutions for Neo-Rural Areas" in Hämeenlinna, Finland *[16-18 June 2010]*

Organiser: EurAgEng Working Group RD27

Venue: HAMK University of Applied Sciences, Hämeenlinna, Finland

The conference is intended to be a forum where you will gain experiences on how to adopt various sectors of engineering to solving problems in rural areas.

The sessions of the conference include: sustainable production and saving of energy, waste-management, recirculation of nutrient substances, water supply, wired and wireless communications, sustainable logistics, automated processes, technology in social services, remote services and controls, etc.

Target group

Developers, teachers and researchers who work with or are interested in developing rural living and livelihoods. The conference is focused on applied engineering.

For more information, please contact:

Mr. Antti Peltola, LicSc (Agr), Principal lecturer

Bioeconomy Education and Research Centre / HAMK University of Applied Sciences

Fax: +358 3 646 4520, E-mail: antti.peltola@hamk.fi

Full details are also available on the Conference website: www.hamk.fi/sustainableruralllife

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XII International Exhibition for Management & Production of Poultry & Livestock in Cairo, Egypt *[1-3 July 2010]*

Dates: 1-3 July 2010

Venue: Cairo International Conference Center (CICC), Cairo, Egypt

The last edition witnessed more than 570 exhibitors and over 50,000 visitors from Middle East, Africa, Europe, China and India spreading over 4 halls.

For more information please see the following website:

http://en.engormix.com/agrena_middle_east_2010_e_products1093-3643.htm

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Turkey Science and Production Conference in Cheshire, UK *[11-12 March 2010]*

UK - The next Turkey Science and Production Conference will take place on 11 and 12 March 2010 at its usual venue near Macclesfield.
The 2010 Conference will be the fourth of these conferences, which were formerly known as the 'Technical Turkeys' conference series.

It will be held on 11 and 12 March 2010 again at Shrigley Hall, Macclesfield, UK.

Plans for speakers are well under way with presentations on new diseases in turkey's management, genetics, meat quality and nutrition already agreed and other relevant topics being pursued.

Details will shortly be available on the special web site (www.turkeytimes.co.uk) or contact the organiser, Dr James Bentley (james@jsbentley.co.uk) for further information.

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XIII European Poultry Conference in Tours, France *[23-27 August 2010]*

Please note the following important key dates:

- 15 January 2010: deadline for abstracts reception
- 15 May 2010: Deadline for full papers reception
- 25 May 2010: deadline for early birds registrations

Registration will be open soon.
For further details, please visit the Conference website (www.epc2010.org) or contact the organizers at:
Conference Secretariat, Paragon Conventions, 18 Avenue Louis Casai, 1209 Geneva, Switzerland
Tel: +41 (0)22 747 79 30; Fax: +41 (0)22 747 79 99; E-mail: <secretariat@epc2010.org>

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XXIV World's Poultry Congress in Salvador-Bahia, Brazil *[05-08 August 2012]*

The Organising Committee has great pleasure in extending a warm invitation to everyone with interests in the poultry and allied industries to attend the 24th World's Poultry Congress (WPC2012), which will be held at the Bahia Convention Center in Salvador-Bahia, Brazil, 5 to 8 August 2012. The Congress will have a technical-scientific program with lectures on several fields of poultry production, with renowned speakers from all over the world. Scientific studies will also be presented.
This will ensure an outstanding event!
The 24th edition of the WPC will also celebrate the 100th anniversary of the foundation of WPSA – World's Poultry Science Association.

Updated information about the scientific program and registrations will regularly be made available at the Congress website: www.wpc2012.com

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"Forage" vs "Scavenge"

Rural village "free-range" chickens are known by a number of different names including 'indigenous', 'family, 'traditional' or just 'local chickens'. They are also called 'scavenging chickens'. I would like to suggest that "foraging" is a better word to use: the dictionary says that "scavenging" means to clean or remove refuse/garbage or to search for or collect anything usable among discarded materials, while to "forage" means to rummage or search (for something – fodder). It seems to me that the latter covers more accurately what village chickens do. Besides, a scavenger in the wildlife context has a rather negative connotation. So should we continue to call them scavenging chickens, foraging chickens, or both?

Dr Ed Wethli, P.O. Box 171, Ifafa Beach 4185, KwaZulu-Natal, South africa