International Network for Family Poultry Development
Réseau International pour le Développement de l'Aviculture Familiale
Red Internacional Para El Desarrollo de la Avicultura Familiar

http://www.fao.org/ag/againfo/themes/en/poultry/home.html
www.infpd.net

IFAD
Enabling poor rural people to overcome poverty

FAO FIAT PANIS

Family Poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints

E-conference of the International Network for Family Poultry Development in collaboration with FAO and supported by the International Fund for Agricultural Development (IFAD)
16 January - 3 February 2012

Recommended Citation

INFPD/FAO/IFAD. 2012. Family Poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints. *Proceedings of an e-conference 16 January - 3 February 2012*

E-conference Moderators:

Professor Dr. S. D. Chowdhury, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

Dr. Dibungi Luseba, Department of Animal Sciences, Tshwane University of Technology, Pretoria 0001, South Africa

Dr. Olaf Thieme
Livestock Development Officer, FAO

Contents

E-conference of the International Network for Family Poultry Development (INFPD) in collaboration with FAO and supported by the International Fund for Agricultural Development (IFAD)

Family Poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints.

PART I

Background document

Prepared by
S. D. CHOWDHURY[1] and D. LUSEBA[2]

Contents

[1] Bangladesh Agricultural University, Mymensingh 2202, Bangladesh, [1]Department of Poultry Science,
[2] Department of Animal Sciences, Tshwane University of Technology, Pretoria 0001, South Africa

1. Introduction

The International Network for Family Poultry Development (INFPD) is a network of researchers, policy makers, educationists, students and development workers. It was established with the assistance of FAO to promote and facilitate the development of the small scale poultry sector in developing countries. FAO is implementing the IFAD-funded INFPD project, entitled "*Smallholder Poultry Development Programme*", which has the main objectives: to raise the international profile of family poultry production and to strengthen and further develop the INFPD. The overall goal of this project is to have an increased knowledge, awareness and recognition of smallholder poultry production as an effective tool in poverty alleviation, household food security and the empowerment of women. Among the activities of the project is the organization of three electronic conferences (e-conferences) to discuss specific issues of family poultry development. The second e-conference will discuss issues of family poultry feeding under the title" **Family poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints"**. The e-conference will be managed by a moderator and a co-moderator who will be guided by a Conference Organizing Committee (COC). The languages of the e-conference will be English and French. The following sections are developed to facilitate contribution in terms of submission of short papers and messages and stimulate discussions on both contributed papers and messages on related issues: The e-conference will address the following topics:

1. Climate change and the future availability of the scavengeable feed resource base for family poultry
2. Recent development in assessing feed resources for family poultry production including the scavengeable feed resource base (SFRB).
3. Nutritional opportunities and constraints of integrating family poultry with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc).
4. Opportunities and constraints of using commercial feed for family poultry.
5. Developing and promoting improved family poultry feeding systems.

E-conference discussion for **themes 1 and 2** will be held between **16 January and 22 January 2012**; those of **themes 3 and 4** between **23 January and 29 January 2012** and **that of 5** between **30 January and 3 February 2012.**

Family Poultry Production Systems

Before addressing the above-mentioned themes, the production systems that exist for family poultry need to be briefly reviewed. Family poultry are kept under a wide range of conditions, known as production systems. The four broad well recognized production systems as identified from Sonaiya and Swan (2004) and Singh *et al*. (2011) are:

(a) Free-range extensive system

(b) Backyard extensive system

(c) Semi-scavenging system

(d) Small scale intensive system

(a) Free-range extensive system: In this system, the birds are not confined and can move over a wide area for scavenging. Shelters may or may not be used. The

birds usually roost in trees and nest in the bush. This production system is nowadays getting less common.

(b) Backyard extensive system: In this system, poultry are housed at night and are allowed to scavenge during the day. Farmers usually provide grains, grain byproducts and kitchen waste etc. in the morning and/or evening to supplement scavenging. This is the system most widely followed by the farmers of Africa, Asia and Latin America.

(c) Semi-scavenging system: Birds are confined to a certain area with access to shelter. They are allowed a part of the day, for instance, six to eight hours for scavenging. Supplementary feeding is a must which is usually carried out with homegrown grains, grain byproducts, kitchen waste etc. This system has become an issue for debate since achieving biosecurity of the birds reared under the system is difficult and they may contribute to the spread of diseases like Avian Influenza (AI).

(d) Small scale intensive system: Birds are kept totally confined under this system. Home-made feeds or commercial feeds are supplied in the poultry house. Small scale commercial layers and broilers are produced within this system. In some countries, productive native breeds or cross-breds are also reared. This system is important for self-employment, maintenance of livelihood and to ensure food and nutrition security. The number of birds to be raised (flock size) in this system varies depending on perception and priorities, financial capacity and facilities of the poultry producers (Singh *et al.*, 2011).

In fact climate change and future availability of the scavenging feed resources, development in assessing feed resources including SFRB, nutritional opportunities and constraints of integrating FP with other production systems, use of commercial feeds to enhance FP productivity and developing and promoting improved FP feeding systems all have relationships directly or indirectly with the production systems mentioned above.

2. Topics of the conference

2.1. Climate change and the future availability of the scavengeable feed resource base (SFRB) for family poultry

Climate change has become a global issue. The current world average temperature is 15° C and this is increasing at an alarming rate. The destruction of forest areas, carbon emissions, methane output, industrial activities, an increase in the concentration of harmful green house gases, increase in sea level etc. are continuously contributing to global warming. There is a possibility of increasing world temperature by 3-5° C within the near future resulting in a further increase of sea level by 1.5 meter. The impact of climate change is detrimental for agricultural production. Although world leaders are thinking to find ways to reduce the negative impact of climate change, little progress has been made so far. The most vulnerable groups to such climate change are the developing countries and its consequences are many and quite visible. The agricultural production including poultry can be threatened by its detrimental effects. Taking the example of Bangladesh, millions of people from southern coastal areas whose main occupation is agriculture have been uprooted due to a loss of homestead areas by sea/river erosion and every year cyclone, tidal surge and flood damage are quite common resulting in innumerable sufferings of the people. In many African countries, deforestation, soil erosion and decreasing fertility and even desertification are major challenges to agricultural

production. Moreover, the competition between human and animal nutrition exacerbates the feed shortage. As pointed out by Nellemann et al. (2009) there is a growth in food demand and need as a result of the combined effects of world population growth, rising incomes and dietary changes towards higher meat intake that is particularly demanding in terms of energy, cereal and water with nearly half of the world's cereals being used for animal feed. Indeed, with an increasing population in developing countries, the pressure on land for building houses, roads and high-ways, schools, colleges and universities is increasing. The urban and industrial areas are also increasing with a consequent decease in homestead areas. People are moving towards urban and industrial areas for employment. According to Steinfeld (1998) "the rapidly increasing demand for livestock products pushes against a traditional resource base for livestock production that cannot expand at the same pace". De Haan (1998) suggests that most likely, the major growth would therefore have to come from the industrial system, and mostly among others, the intensive poultry production. So, there is a clear relationship between impact of climate change, population growth and future availability of the scavengeable fed resource base (SFRB).

Feed resources available for scavenging poultry in South-east Asia were identified and classified by several scientists (Roberts and Senaratne, 1992; Gunaratne *et al*., 1993; Gunaratne *et al*., 1994; Roberts, 1999). Some of the African studies include those of Olukosi and Sonaiya (2003) and Sonaiya *et al*. (2002). According to Sonaiya and Swan (2004) the Scavengeable Feed Resource Base (SFRB) is the total amount of food products available to all scavenging animals in a given area. In fact, the homestead area, the types of food crops grown and cultivated and processing methods of different crops as well as climatic conditions that determine the rate of decomposition of the food products are the factors affecting the total available SFRB for scavenging poultry. SFRB is also influenced by the season of the year due to periods of fallow or flooding, monsoon, cultivation, harvesting and processing. Depending on country and seasons, SFRB includes termites, snails, worms, insects, grains, harvesting by-products, seeds, grass, fodder and tree leaves, aquatic weeds and plants and non- traditional feed materials. The SFRB can only be harvested by scavenging animals, of which poultry are the most versatile, although this varies with species. Several types of poultry scavenging together can make most effective use of this resource. Keeping poultry under the free-range and backyard systems and obtaining production depends to a large degree on the quality of feed available from scavenging.

Having said the above, the impact of climate change in terms of global warming, monsoon, disasters etc. on the availability of SFRB for family poultry production need to be discussed. The following points may help with analyzing the situation and assessing the availability of SFRB in developing countries:

(a) How and to what extent may climate change affect FP production and the availability of the SFRB and which may be influencing factors like seasons and other circumstances ?

(b) What will be the future availability of SFRB under changing circumstances such as urbanization, industrialization etc?

All these factors can affect the future availability of SFRB and consequently FP production and it will therefore be worthwhile to analyze these developments.

2.2 Recent advances in assessing feed resources for family poultry production including the scavengeable feed resource base (SFRB).

Efforts have been made in the past and are still in progress in some Asian and African countries on the quantitative and qualitative assessment of locally grown/marketed feed ingredients as well as those of SFRB. The value of the SFRB can be estimated by weighing the amount of daily food product/household waste generated by each family as parameter "H", which is then divided by the proportion of food product/household waste found in the crop of the scavenging bird (assessed visually) as parameter "p" (Roberts, 1999). This is then multiplied by the percentage of households that keep chickens (parameter "c"): SFRB=H/p(c). SFRB so measured was found to range from 300 to 600g on a dry mater (DM) basis, containing 8-10% of vegetable protein and 8.8 to 10.4 megajoules of metabolisable energy (ME) i.e. 2100-2500 kilocalories (kcal) ME per kg in Southeast Asia (Prawirokusumo, 1988; Gunaratne *et al*., 1993 and Gunaratne *et al*., 1994;). However, Sonaiya (2011) recently expressed the view that the methods for estimating SFRB are not exact enough and can only be used as guidance for supplement feeding. It is generally observed that the locally grown/marketed items are mostly conventional feed ingredients while those of the SFRB are less commonly utilized except under scavenging conditions. The assessments of SFRB are carried out either to identify potential feed ingredients for inclusion in the diets and/or to find out their deleterious effects, if any, on productivity of both industrial and family poultry. Feed ingredients with higher nutrient profile without deleterious effects on production are the major target of such an endeavor. Dhar *et al.* (2007) utilized both conventional and unconventional Bangladeshi feed resources in formulating diets for *Sonali* (RIR male X Fayoumi female) chicken and were able to achieve favourable growth responses.

Analysis of crop and gizzard contents (CGC) of scavenging poultry for identifying types and composition of SFRB is the most common approach although accurate data is difficult to obtain due to some limitations. Season, variation in availability of SFRB in a particular locality, time of sacrifice of the birds, supplementary feeding by the farmers and many other factors affect the results of such approach. Chemical analyses of CGC of scavenging ducks covering winter, summer and rainy reasons of a year revealed deficiency of protein and energy with high fibre content (Biswas *et al.*, 2005). Sonaiya (1995) pointed out that the productivity of scavenging chickens could be improved by quality and quantity of feed. Sarkar and Bell (2006) concluded that the egg production of Bangladeshi indigenous chicken could more than double if some changes are made in their husbandry practices. Obviously, feeds and feeding system are the most important determining factors. Similarly in Ethiopia, Mengesha *et al.* (2008) reported that the majority of farmers in the study area suggested that primarily egg production, chicks-survival rate and growth rates of village flocks were improved due to supplementation. In terms of feeding managements of village chickens, households did adjust flock number with feed resources and supplied ground bone and even meat to their chickens.

SFRB, in general, is deficient in protein and energy but high in fibre (Biswas *et al.*, 2005). Prospects for the use of many unconventional feedstuffs are sometimes overshadowed by the presence of some anti-nutrient factors that not only limit the quality of feed but also constitute serious health hazards for the birds. Whilst kitchen leftovers could be unspoiled if given to birds shortly after the meals, this is not the case if they are supplied many hours later; Grains that are moldy constitute together with the cracked ones the basis of the feed supplied to birds. These materials are

often spoiled by fungi and subsequently contain different strains of mycotoxins that are harmful to birds but also constitute a public health hazard (D. Luseba, personal observation). High tannin levels in sorghum lower protein and energy digestibility; rancidity and the presence of phytic acid in rice bran have deleterious effects on feed conservation and phosphorus metabolism respectively; and high levels of fibre and cyanogenic glucosids in cassava meals are all matters of concern for feed safety and birds' health (Ravindran, no date). It is, therefore, essential to know not only which feed resources are available but also the quality in terms of nutrient value and anti-nutrient factors and put in place strategies that will increase the productivity of FP. For instance, Riise *et al*. (2005) reported that the cost of feed supplemented to scavenging poultry could be cut by feeding 40 g / day or less and still maintain the some productivity if the birds are left to scavenge for scraps and feeds during the day. In some countries (Bangladesh, Burkina Faso and Benin) small-scale farmers were taught how to mix semi-balanced feeds themselves and techniques to collect termites and growing maggots out of manure and wastes.

Any improvement in nutritional status of FP should be aimed at a proper assessment of the feed resources. This assessment should be related to the system of production adopted. The differences of feed resources provided to FP including that of SFRB as already mentioned above in relation to production systems are to be taken into account in assessing feed resources appropriate for production. The following important points are opened for discussions on the assessment of feed resources for family poultry including SFRB:

(a) What are the nutrient requirements of various types of scavenging poultry in terms of energy and amino acids and the contribution of SFRB to minimize cost of feeding?

(b) What is the amount of daily food product/household waste generated by each family and that found in the crop and gizzard contents of scavenging bird?

(c) What is the nutrient composition of major feed components and SFRB and those ingested by birds as found in crop contents?

(d) What is your opinion on the assessment of deficiency of nutrients in SFRB and the contribution of supplementary feeds to meet up such deficiency?

(e) With regard to the assessment of feed and the SFRB and its methodologies and uses: what is done and how it can be improved considering a practical situation?

(f) What is the impact of the quality/safety of the SFRB on birds' health and the consumer?

2.3 Nutritional opportunities and constraints of integrating family poultry with other production systems.

FP by its nature has interactions with other production systems. In this respect, forestry, tree crops, annual crops, large animal farming and fish culture constitute the major areas of agricultural production systems. Integrating family poultry with such production systems has nutritional opportunities and constraints. Many of the crops of forestry and agricultural origin, particularly the unconventional agro-industrial products/byproducts are yet to be established as potential ingredients in order to brighten their prospects and explore nutritional opportunities for feeding FP. Given that the availability of crop residues for animal feed does not increase with rising yields, increasing the traditional feed resource base is limited (Steinfeld,

1998). Moreover, the exploration of these prospects has some natural and man-made constraints, for example, climate change, utilization of maize and rice polishing for purposes other than livestock or poultry feeds. It can be concluded that feed supplementation protocols will vary according to production system, ecological zone and the availability and cost of foodstuffs.

It is therefore essential to make an inventory of the opportunities and constraints and to determine how best such opportunities can be explored effectively to gear up FP production. The following points could be helpful in the discussion:

(a) What is the nature of integration that exists between FP and other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc)? How can we assess the risks that pesticide/insecticide from such integration can have on poultry production and the safety of its products.

(b) What are the nutritional opportunities for FP that have can result from such integration?

(c) What are the constraints to exploit such opportunities?

(d) How best can we exploit such nutritional opportunities for FP?

(e) How can the existing constraints be overcome?

2.4. Opportunities and constraints of using commercial feed for family poultry

With the development of industrial poultry, feed mills are now in operation in many countries of the world. The feed mills are producing and marketing commercial feeds for commercial broiler and egg production. Although these feeds are costly and usually meant for high yielding strains of chicken, sometimes small-scale scavenging FP reared under intensive or extensive system, irrespective of their type, also use such feeds. On the contrary, many of the urban and rural backyard producers use commercial feeds for small-scale commercial layer and broiler production. Nutritional requirements of scavenging or other crossbred birds are seldom taken into account while using such feeds. As a result, the diets most likely do not correspond to the requirement of the birds depending on their age, type, production system etc. In addition, there is complaint in developing countries about the lack of quality control of commercial feeds that are marketed which can pollute meat and eggs and therefore become a public health concern. USAID (2008) reported high price of feed as being a major problem in Bangladesh due to raw materials (maize, wheat, soya meal) being imported from other countries. This is also the case in many African countries since grains constitute major staple foods for many of their population. Worse, in many African countries feed manufacturers do not even exist. Chad depend with 99% and Niger with 97% of their poultry production on scavengeable feeds and have not any feed mill (Idi and Ganda Ide, 2009; Mopaté Logtene, 2010). Therefore, there is a need to examine the opportunities and constraints of using commercial feed and its economics for family poultry. The following points may be considered in this respect

(a) What is your opinion on the knowledge and attitude of FP farmers towards commercial feeds, including the economic factors, e.g. feed price and return on investments?

(b) Which types of commercial feeds are normally purchased/used for FP?

(c) What is the source of raw materials or ingredients used in feed formulation?

(d) Is using commercial feeds for FP profitable? If so, what circumstances and production system permit such profitability?

(e) What are the constraints of using commercial feeds for family poultry? How can these constraints be overcome?

2.5. Developing and promoting improved family poultry feeding systems

FP in developing countries varies widely depending on age and type of bird, SFRB depending on season of the year and the management system followed by the farmers. Traditional feeding systems are in practice, except in areas where donor funded GO/NGO projects have made a breakthrough. Supplementary feeding to scavenging or semi-scavenging birds is quite common to improve productivity. Although the concept of improved feeding of FP in terms of supplemental feeding is known to many producers, its practice depends on what resources the farmers have, particularly the financial capacity. Hence many projects and entire programmes are not sustainable since they disappear with the withdrawal or the end of the funds (Idi and Ganda Ide, 2009; Mopaté Logtene, 2010). Traditional feeding systems are based on available resources; farmers usually rely on the type of ingredient and not necessarily on the nutritional requirements of birds resulting in low production. Improved feeding is also practiced to some extent by the trained farmers and where both extension and technical supports are extended to the farmers. It is generally agreed that higher productivity of family poultry can be achieved by following improved feeding systems (Hasan *et al*., 2006; Chowdhury *et al*., 2006) taking the local situation into consideration. The question remains what should be the correct approach to develop and promote improved feeding system for FP? The answers to this question may be explored by considering the following points:

(a) Which feeding systems are used by the family poultry keepers?

(b) Which sort of improvement in feeding system is required to augment production?

(c) What are the extension methods and approaches that are appropriate for developing and promoting improved feeding system in relation to production systems?

3. Invitation to INFPD members and interested persons to participate in the e-conference

All INFPD members and other interested persons are invited to actively participate in the conference. We hope that the e-conference will provide opportunities for an open constructive exchange of views, ideas and experiences. The comments and suggestions from researchers, policy makers, educationists, students and development workers should help FP keepers to improve their feeding practices by exploring new options for using efficient and low cost rations and supplementation This is to augment production in a cost-effective manner so that the ultimate objectives of the self-employment, additional income, food and nutrition security to combat malnutrition is ensured. Participants can contribute to the e-conference by submitting messages or full papers relevant to the respective topics.

The participants can contribute to the discussion by submitting short papers that address the topics of e-conference. Contribution should be not more than 500 words

(12 font size, Times New Roman) and send to PoultryDevelopment-l@mailserv.fao.org. The contribution should be preferably in English. The contributors must make sure that they include their name, affiliations, e-mail address in their papers. If relevant to the e-conference, they will be forwarded to the participants for discussion and later published in the conference proceedings or in the INFPD newsletter "Family Poultry Communications".

4. Methods of running the e-conference

How will the e-conference run?

Contributions can be sent on selected topics as mentioned in this background paper at any time during the conference, but preferably during the week when the specific topics are being discussed. The messages can be submitted in English or French to: PoultryDevelopment-l@mailserv.fao.org. They will be forwarded to the participants after review by the moderators of the e-conference. The moderators may apply slight language editing and return contribution to the originators for clarifications, if needed. This is for reasons of clarity only and does not mean censorship or limiting the views expressed by the participants. Messages should be short and concise and normally in 300 words in 12 font Times New Roman. We welcome and encourage diversity of views and opinions and an open discussion. The INFPD retains the right to make copies of the messages for archiving the discussion. This will be forwarded to the registered participants in due course.

The following sequence of discussion will be followed in running the conference:

First week

Theme 1: Climate change and the future availability of the scavengeable feed resource base (SFRB) for family poultry.

Theme 2: Recent advances in assessing feed resources for family poultry production including the scavengeable feed resource base (SFRB).

Second week

Theme 3: Nutritional opportunities and constraints of integrating family poultry with other production systems.

Theme 4: Opportunities and constraints of using commercial feed for family poultry.

Third week

Theme 5: Developing and promoting improved family poultry feeding systems.

Check list before submitting a message

Before submitting a message, the participants are requested to check the following:

- The message should not be longer than 300 words including table, graphs and figures, if any.
- It should be written in double spaced Times New Roman Font Size 12.
- The participant should include his/her name and full address including e-mail to the messages.
- Participants should not send any unfounded, defamatory, obscene, violent, abusive, commercial or promotional, messages or links to such materials.

- The INFPD will not take any responsibility for the views expressed by the individual participant.
- Participants should be courteous at all times and exercise tolerance and respect toward other participants in spite of difference in opinion.

5. Acknowledgements

This document was prepared by Moderator Professor Dr. S. D. Chowdhury and Dr. Luseba Dibungi. The contributions made by Professor Dr. E. B. Sonaiya, Dr. M. A. Saleque and Dr. E. Gueye are gratefully acknowledged. The overall guidance of Dr. Olaf Thieme also contributed much in designing this background paper.

6. References

Biswas, M. S. A., Chowdhury, S. D., Mustafa, M. G. and Bell, J. 2005. Availability and nutrient status of scavengeable feed resources and in crop and gizzard contents of scavenging ducks in Bangladesh. In: *Proceedings of the Seminar. 4th International Show and Seminar,* World's Poultry Science Association, Bangladesh Branch, Dhaka, Bangladesh. pp. 167-172.

Chowdhury, S. D., Ahmed, S. and Hamid, M. E. 2006. Improved feeding of Desi chicken reared in confinement. *The Bangladesh Veterinarian* 23:29-35.

De Haan, C. 1998. Balancing livestock and environment: the study framework. In: Livestock and the Environment**.** Proceedings of the International Conference on Livestock and the Environment held in Ede/Wageningen, the Netherlands 16 – 20 June 1997, organized by World Bank Food and Agriculture Organization International Agricultural Centre http://www.fao.org/wairdocs/lead/x6130e/X6130E03.htm

Dhar, M., Chowdhury, S. D., Ali, M. A., Khan, M. J. and Pramanik, M.A. H. 2007. Responses of semi-scavenging F_1 crossbred (Rhode Island Red X Fayoumi female) grower and pre-layer chickens to diets of different nutrient density formulated with locally available feed ingredients. *The Journal of Poultry Science* 44:42-51.

Gunaratne, S. P., Chandrasiri, A. D. N., Hemalatha, W. A. P. M., and Roberts, J. A. 1993. Feed resource base for scavenging village chickens in Sri Lanka. *Tropical Animal Health and Production* 26: 249-257.

Gunaratne, S. P., Chandrasiri, A. D. N., Wickramaratne, S. H. G and Roberts, J. A. 1994. The utilization of scavenging feed resource base for village chicken production. In: *Proceedings of the Seventh Asian-Australasian Association for Animal Production Congress*, Bali, Indonesia, 2: 67-68.

Hasan, M. N., Chowdhury, S. D., Roy, K. R., Chowdhury, M. J. H. 2006. Hatchability traits and growth performance of indigenous chicken. *The Bangladesh Veterinarian* 23: 36-41.

Idi, A. and Ganda Ide, O. 2009. Revue du Secteur avicole, Niger. FAO, Rome (Italy). Div. de la Production et de la Sante Animales, 65 p. *http://www.fao.org/docrep/012/ak770f/ak770f00.pdf*

Mengesha, M., Tamir, B. and Dessie, T. 2008. Village chicken characteristics and their seasonal production situation in Jamma District, South Wollo. Ethiopia, *Livestock Research for Rural Development* 20(8)

Mopate Logtene, Y. 2010. Revue du secteur avicole, Republique du Tchad. FAO, Rome (Italy). Div. de la Production et de la Sante Animales , 68 p. http://www.fao.org/docrep/013/ak771f/ak771f00.pdf

Nellemann, C., MacDevette, M., Manders, T., Eickhout, B.,Svihus, B., Prins, A. G., Kaltenborn, B. P. (Eds). 2009. The environmental food crisis – The environment's role inaverting future food crises. A UNEP rapid response assessment.United Nations Environment Programme, GRID-Arendal. www.grida.no

Olukosi, O. A. and Sonaiya, E. B. 2003. Determination of the quantity of scavengeable feed for family poultry on free range. *Livestock Research for Rural Development* 15 (5).

Prawirokusumo, S. 1988. Problems to improve small scale native chickens management in South-east Asian countries. Proceedings of the XVIII World's Poultry Congress, Japan, 113-116.

Ravindran, V. Alternative feedstuffs for use in poultry feed. In: FAO: Poultry feed availability and nutrition in developing countries formulations. http://www.fao.org/docrep/013/al705e/al705e00.pdf

Riise, J.C., Permin A. and Kryger, K.N. 2005. Strategies for developing family poultry production at village level – Experiences from West Africa and Asia. *World's Poultry Science Journal*, 61: 15.

Roberts, J. A. 1999. Utilisation of poultry feed resources by small holders in the villages of developing countries. In: F. Dolberg and P. H. Petersen, eds**.** *Poultry as a Tool in Poverty Eradication and Promotion of Gender Equality,* pp. 311-336. Proceedings Workshop, Tune Landboskole, Denmark.

Roberts, J. A. and Senaratne, R. 1992. The successful introduction of hybrid egg laying chickens into a Sri Lankan village**.** *Proceedings 19th World Poultry Congress***,** Amsterdam 1: 818-821

Sarkar, K., Bell, D. G. 2006. Potentialities of the indigenous chicken and its role in poverty alleviation and nutrition security for rural households. *INFPD Newsletter* 16 (215), 15-26.

Singh, D. P., Fotsa, J. C. and Thieme, O. 2011. Summary and conclusions of the first e-conference of the International Network for Family Poultry Development (INFPD) on the theme "Opportunities for poultry breeding programmes for family production in developing countries: The bird for the poor."

Sonaiya E B, Dazogbo J. S. and Olukosi O. A. 2002 Further assessment of scavengeable feed resource base; In: *Characteristics and parameters of family poultry production in Africa*. Results of a FAO/IAEA Coordinated Research Program, IAEA, Vienna, Austria, pp. 193-200.

Sonaiya, E. B. and Swan, S. E. J. 2004. Small-scale Poultry Production. Food and Agriculture Organization of the United Nations, Rome, Italy.

Sonaiya, **E. B**. 1995. Feed resources for smallholder poultry in Nigeria. *World Animal Review* 82: 25-33.

Sonaiya, E. B. 2011. Rural Poultry Science: emerging concept in theoretical and empirical research. In: *Proceedings of the Seminar. 7th International Poultry Show and Seminar*. World's Poultry Science Association, Bangladesh branch. pp. 231-237.

Steinfeld, H. 1998. Livestock and global change. In: Livestock and the Environment**.** Proceedings of the International Conference on Livestock and the Environment held

in Ede/Wageningen, the Netherlands 16 – 20 June 1997, organized by World Bank Food and Agriculture Organization International Agricultural Centre http://www.fao.org/wairdocs/lead/x6130e/X6130E02.htm

USAID.2008. Telling our story: *Online news of USAID on 1st June 2008*. http://usaid.gov/stories/bangladesh/fp_bangladesh_poultry.html.

E-conference of the International Network for Family Poultry Development (INFPD) in collaboration with FAO and supported by the International Fund for Agricultural Development (IFAD)

Family Poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints.

PART II

List of messages

Themes

2.1 Climate change and the future availability of the scavengeable feed resource base for family poultry

2.2 Recent development in assessing feed resources for family poultry production including the scavengeable feed resource base (SFRB)

2.3 Nutritional opportunities and constraints of integrating family poultry with other production systems.

2.4 Opportunities and constraints of using commercial feed for family poultry.

2.5 Developing and promoting improved family poultry feeding systems.

Translations of the original messages are shown in Italics

Message No 1

Farhad Mirzaei (Ph.D) farmir2005@gmail.com Department of Animal Production Management , Animal Science Research Institute of Iran (ASRI), Iran,

It is good tips. Poultry feed is in harsh competition with human food. Feeds and Foods are produced following variable production systems depending on climatic variation. Therefore, feed suppliers must rearrange dietary combination in line with changing seasons resulting from climatic change.

Message No 1a (distributed as paper No 2)

Harry Swatson Harry.Swatson@kzndae.gov.za

Cedara College of Agriculture, Hilton 3245, KZN, South Africa

Opportunities and constraints of using commercial feed for family poultry

Knowledge and attitude of Family Poultry (FP) farmers towards commercial feeds

FP farmers have a limited knowledge of the use of commercial feeds and will feed any type of feed regardless of whether it is a starter, grower, finisher or layer feed. Commercial feeds are regarded as being a major component of the total cost of production, regarded as being of superior quality to homemade feeds but are very expensive.

Types of commercial feeds normally purchased and used for FP

Feeds purchased are broiler starter, grower or finisher or layer feeds. The broiler feeds range in crude protein from 18 to 25%, Energy 11.9 to 12.8 MJ kg DM^{-1}, available lysine 0.92 to 1.38%. Commercial feeds are often supplemented or diluted with large amounts of maize, sorghum or millet, canola, sunflower or soybeans if these are available for birds kept in the small scale intensive system by resource limited households.

Sources of raw materials or ingredients used in feed formulation

Raw materials or ingredients are purchased from feed companies or mills, and cereal crop farms. Home grown cereal grains or legumes, by-products from agro-processing or catering industries account for about 17% of raw materials. The availability of raw materials for FP depends on quantities available after competing industries that pay a

premium price (i.e. human consumption and highly integrated livestock industry), have been satisfied. Where the imports of protein sources are not adequate to meet the shortfall in local requirements, the price of protein raw ingredients will be very high relative to energy sources such as maize. In general, cereal products are over-produced and some exported while some oilseeds such as soybean or sunflower are under-produced and imported leading to exorbitant prices for FP production.

Is using commercial feeds profitable? What circumstance and production system permit such profitability?

Commercial feeds supplying an array of nutrients that closely parallel the FP's nutrients needs at all stages of their development and production will give rise to a better biological performance, without compromising its welfare under suitable managerial conditions. When productive or improved FP breeds are fed high protein commercial feeds in various stages of growth they possibly do not utilize the feed on offer efficiently as they have been formulated for a targeted breed of birds with well defined and predictable end product specification. It is possible that protein in diets may be in excess of FP requirements. The problems associated with the feeding of excess protein (and hence AA's) in diets are the depression in growth rates and the impaired utilization of dietary protein. Excesses of protein beyond the needs for protein synthesis are constantly degraded; this degradation increases as dietary protein level increases. The utilization of dietary protein is less than 100% efficient. Thus feeding commercial feeds to FP could be unprofitable.

What circumstance and production system may permit such profitability?

Unless agricultural production of home grown alternative protein and energy sources is increased and less reliance placed on commercial protein seed products or feed, FP will continue to be fed low dietary protein diets. This is the most profitable option if the FP industry is to survive under the small scale intensive system making use of productive native breeds or crossbreeds.

Message No 2

Kiplangat Ngeno aarapngeno@gmail.com Animal Breeding and Genomics Centre, Wageningen University, Pox Box 338, 6700 AH, Wageningen, The Netherlands

1. Climate change and the future availability of the scavengeable feed resource base (SFRB) for family poultry.

(a) How and to what extent may climate change affect FP production and the availability of the SFRB and which may be influencing factors like seasons and other circumstances ?

The world's climate is changing at unprecedented rates and is likely to have major impacts on poor livestock keepers and on the ecosystems goods and services on which they depend upon (Thornton et al., 2007). Evaluations already indicate that developing countries are more vulnerable to the effects of climate variability and change (CVC) due to their high reliance on climate-sensitive natural resources but with very limited capacity to adapt institutionally and financially due to high poverty levels (Thornton et al., 2006). The CVC in many countries is already impacting negatively on rain-fed agriculture and livestock systems. Many countries are already experiencing a number of hazards of CVC including more frequent droughts, prolonged dry spells, intense rainfall and flush floods, increased heat stress and disease outbreaks (IPCC, 2007). Poultry are raised in different agro-ecological zones

under scavenging environment (SE) with varying degrees of vulnerability to impacts of CVC. The SEs therefore have both direct and indirect climatic effects on family poultry. The CVC are accompanied with more changes including.

Changes in quantity and quality of feed: CVC is associated with changes in herbage growth, quality and DM yield.

Changes in forage species composition: There is a possibility that CVC will lead to a shift in the forage species and indirectly affect poultry performance. As temperature and CO_2 levels change due to CVC, optimal growth ranges for different species also change; species alter their competition dynamics, and the composition of mixed grasslands changes (Thornton et al., 2007).

Changes in quantity and quality of water: CVC is expected to increase the number of extreme meteorological events including; decrease and/or increase rainfall, change in the seasonal rainfall patterns, increase evaporation rates, intense rainfall and flush floods, increase in the number of dry days.

These changes are projected to increase and family poultry raised in SEs will likely suffer some impacts of increasing CVC. These impacts of climatic stress on poultry performance and feed resources have not been assessed.

Message No 3

Prof. E. B. Sonaiya fsonaiya@oauife.edu.ng Dept. of Animal Science, Obafemi Awolowo University, Ile-Ife 220005, NIGERIA. Coordinator, International Network for Family Poultry Development.

Subject: Topic 1 discussion

Climate change is expected to change everything – ambient temperature, relative humidity, insulation rate, etc. FP depends to a large extent on scavenging. Climate change is going to skew the condition of the range or backyard away from succulent vegetation onto hardier woody plants in some geographical zones. If the woody plants are seed and fruit bearers, their seeds and fruits may provide alternate feed resources. In other geographical zones, the water level will rise to support water-loving plants and, with land submersion, favor aquatic plants and animals. This means that climate change will change the scavengeable feed resources (SFR) and there will be need to assess these resources more frequently and wholly. Where the change in SFR is significant, there may even be the need to change the poultry species best suited to utilizing the "climate-changed" environment. It may be a change from guinea fowls to chickens, chickens to ducks and geese or waterfowls to ostriches.

Rising urbanization brings a new set of factors to bear on FP and SFR. More than 50% of the world's population now lives in cities some of which are becoming very crowded leaving little or no room for scavenging. Industrialization may not be a great issue because the days of heavy industries are gone and most new industries will be "green" and fully compatible with FP and may provide new SFR. Having found FP in the most unexpected places and conditions, I am sure that human families will find a way to continue their association with poultry. But such an association between man and bird may not include scavenging to the extent it is done currently. Cafeteria feeding and self-mixed rations may become more important in FP feeding.

Message No 4

Filomena dos Anjos mena.anjos@libero.it Faculdade de Veterinária, Department of Animal Production, Eduardo Mondlane University , Maputo, Mozambique.

Subject :Topic 1 discussion

I agree with Prof. Sonaiya, when he states that Climate change is expected to change everything, ambient temperature, relative humidity, etc. However, even without climate change the quantity and the quality of the SFRB from the environment and the grain supplement are varied with seasonal conditions and with activities such as cultivation, harvesting and processing.

The study carried out in Sussudenga district in Mozambique (4 villages) on nutrient composition of feed found in crop content has shown the following:

a) List of ingredients found in the crop content of chickens

Household waste	Maize meal, bones, egg shell, cassava peel , yam peel
Grain	Maize, sorghum, millet
Fruits	Papaya seed, citrus pulp, peel of papaya and citrus
Beans	Cowpea, bammbara groundnut
Green forages	Grass, green leaves of vegetable
Others	Insects, grit, unidentified material

b) The mean chemical composition in % DM of the crop content was 7.8 7.1 and 10.5 for CP, CF and ash respectively. The gross energy was 17.1 MJ/kg DM. There was no significant difference between villages.

The amount of feed available for scavenging in relation to the carrying capacity of the land areas and flock dynamics across the different seasons and agro-ecological has not been documented in Mozambique. However, it is known that apart from urbanization, disease control of NC with consequent reduction of mortality, an increase in the number of birds contributed to the reduction of areas where birds could scavenge for availability of feed.

I think with this "new scenario" it is important to look for what could be the better alternative feeds and production system for scavenging chickens in order to meet their nutritional needs. It is becoming urgent to develop strategies that can accommodate the increased number of birds per family and the availability of feed and link to the market. Development of semi-intensive family poultry production enterprises that could be a useful way of helping to meet the nutritional, income, employment and gender needs of the rural population (Kusina and Kusina, 1999). I think we must move /convert from the actual family poultry farming into a "commercial" family poultry. So as Prof Sonayia said Cafeteria feeding and self-mixed rations may become more important in FP feeding.

Message No 5

Sodjinin K. EKOUE itra@cafe.tg

Ingénieur Agronome Zootechnicien, Doctorant en Production Animale, Chef Programme Elevage à Cycle court/Aquaculture Pêche, Institut Togolais de Recherche Agronomique (ITRA), BP:1163

Climate change and the future availability of the scavengeable feed resource base (SFRB) for family poultry

In the opinion of scientists, the most extreme weather patterns are ahead. Forecasts speak of renewed drought in parts of Africa and floods in others. Rising sea levels and hurricanes threaten small island states. Nothing can stop the march of climate change, but there is still time to limit the effects (Spore - Special Edition, August-2008).

A recent study by the World Bank reported in the same journal, shows that African farmers are likely to move slowly to short-cycle livestock (goats, sheep) because they are more heat-tolerant than cattle and poultry. It will be more profitable to breed livestock than cultivate crops in the prospect of new climate regime because there will be more diseases for food crops (spread of pests and alien species, loss of biodiversity).

In fact livestock production is closely related to crop production with respect to animal nutrition either of ruminants or monogastric animals. Loss of vegetation by floods or drought would act directly on the farm not only for food but also by the restriction or lack of space. Since family poultry is well integrated into all households in Africa, it will be most affected. For this, the scavengeable feed will be rare by the fact that harvests won't be abundant hence little by-products will be available especially for monogastric animals whose diet contains ingredients that are in competition for human consumption. The solution is to rapidly find mitigation and adaptation measures that reflect the realities of each area i.e.: (i) adjust the cropping patterns, (ii) recourse to some TK (traditional knowledge); (iii) collect viable data on climate change, (iv) implement technical measures for sustainable management, (v) promote new production technologies, (vi) rehabilitation of traditional food crops or poultry species adapted to local niches.

Message No 6

Fasina, F. Oludayo dayo.fasina@up.ac.za Lecturer, Section of Swine Health, Production Animal Studies Department, University of Pretoria, Onderstepoort 0110, South Africa.

With regards to the Opportunities and Constraints of using commercial feed for family poultry, I have the following input:

I was working in Egypt in late 2010 under the APA programme of the INFPD / IFAD / FAO sponsorship and one of the question that arose was:

"**Why wouldn't these household farmers feed 100% commercial feed to their poultry when they are kept intensively almost exclusively?"**

The answers we found out include the following:

1. No household farmers will be viable economically if they have to feed 100% commercial feed to local improved breed. The template with which the feed price was made was based on exotic commercial birds (broilers or laying birds which genetically will do better than local improved breed like the Baladi chickens in Egypt). For example, while the commercial laying chicken may lay up to 280 eggs per annum, most local breeds may do well with about 150 eggs (130 eggs

short). While broilers may attain 2kg weight in a few weeks, local chicken may need some extra period to attain the same weight. As such, single feed pricing template will not work equally for both categories.

2. However, the Egyptian household poultry owners do something that is innovative. They combine the feeding of commercial feed (about 20% for adults, up to about 50% in chicks) with the feeding of grains (about 40 % in adult) and feeding of household leftovers, vegetables like seriss, berseem etc (about 40% in adult and up to 50% in chicks). This produced excellent results and the farmers that used this formula did relatively better in terms of production, income and productivity than those who were not using these.

Message No 7

Med.Vet.Jose F.Rafart Anton jfrafart@gmail.com gajo98@hotmail.com
Coordinador de Desarrollo Rural (interino) INTA-EEA Las Breñas Ruta 89-Km.227-Las Breñas-Chaco-Argentina

TEMA 2.4. Oportunidades y limitaciones del uso de piensos comerciales de aves de corral de la familia

La FP tiene plenos conocimientos de los resultados que les proporciona dar alimentos comerciales a sus aves, son productos ya muy probados y trabajados técnicamente que no generan muchas dudas y sorpresas, pero es cierto también que al masificarse su producción existen falencias en su elaboración y en el desconocimiento de la calidad de los insumos que se utilizan, y son creo esos los únicos casos en los que los alimentos comerciales causan problemas. Generalmente la FP posee sistemas de producción doble propósito en sus sistemas productivos y tienen probado que los alimentos comerciales mejoran notablemente la eficiencia , inclusive aun haciendo en muchos casos mezclas con cereales u otros productos en forma casera, en virtud de ello el FP tiene dentro de sus estrategias económicas un espacio para la adquisición de alimentos comerciales, en la manera que su economía se lo permita, amén de los precios al que adquieran el producto, que generalmente por los volúmenes que compran llegan a pagar hasta un 100% que el valor de mercado normal. Pero la FP tiene validado que los alimentos comerciales mejoran la eficiencia de sus aves, sus aves producen más carne y/o huevos, y por lo tanto mientras puedan seguirán adquiriéndolos.

Con respecto al conocimiento son los tipos y usos de alimentos comerciales por parte de la FP, son mínimos, deberían existir canales masivos de información que les genere un mayor conocimiento sobre sus usos, según tipo y producción. Se presenta por esta cuestión generalmente compras de alimentos comerciales, sin saber para qué tipo de producción se trata, y en muchos de estos casos el efecto deseado en la FP no buscado.

En lo referente a las materias que se utilizan los más utilizados es el maíz y en segundo lugar la soja y sus subproductos, a esto hay que agregarle los macro y micronutrientes necesarios para la producción que este plantada en alimento

La producción de la FP desde lo comercial es rentable, generalmente desarrollan nichos de marcado especiales o "especilities", que les permite vender sus producciones a un precio superior, en muchos casos logran hasta un 50% más del valor normal del mercado. Pero la rentabilidad más valorada en la FP pasa por otros aspectos como la integración familiar, el trabajo con niños y ancianos, el valor por los animales y los que pueden proveer de alimentos, el trabajo digno, la capacidad

de las familias de generar en sus fincas sus propios recursos para la alimentación de las aves y sus propios alimentos y por sobre todas las cosas el conocimiento que se transmitiendo a través de las generaciones

Es necesario definir estrategias para lograr una independencia, aunque sea parcial, para la producción de alimentos balanceados para la FP, hay que trabajar en el desarrollo de propuestas técnicas viables según los sistemas que tengamos en nuestros territorios y utilizar los canales más efectivos de información para que lleguen a la FP.

Topic 2.4. Opportunities and constraints of using commercial feed for family poultry

Generally, family poultry (FP) farmers know the benefits of using commercial feeds for their birds. These products have been widely tested and technically processed so they never result in negative surprises. However, due to mass-production of feed, there may be failures during processing or the raw materials used may be of unknown origin. I believe that these are the only cases when commercial feed could lead to problems. Generally, FP farmers have dual purpose systems and they know that commercial feeds significantly improve efficiency. This is true also when commercial feeds are mixed with cereals or other home-made products. If economically feasible, FP farmers include in their economic strategies a space for the purchase of commercial feeds. Also, due to the amount of feed purchased, they pay the feed up to 100 % of the normal market price. Anyway, FP farmers have proven data that commercial feeds improve the efficiency of their flocks; which produce more meat and / or eggs. Thus, as long as possible, farmers continue buying commercial feeds.

The awareness of FP farmers about the types and uses of commercial feeds are minimal; mass media and information channels should give them further knowledge on feed use, according to type and production system. Farmers often purchase commercial feeds without knowing for what kind of production they are recommended for and thus they do not obtain the desired results.

With regard to raw materials, corn is the most widely used, followed by soybean and its by-products. Moreover, micro and macro nutrients are necessary for the growth of the plants.

Commercializing FP products is profitable. Often these products are sold in niche markets or sold as "specialties". This allows producers to sell their production at a higher price, in many cases up to 50 % more than the normal market value. But the most valued benefits of FP come from other aspects such as family integration, work of children and elderly people, value of animals and of their food production, honorable work, ability of families to generate food on their farms for their birds and for their families, and last but not least the knowledge transmitted from generation to generation.

It is necessary to define strategies to achieve independence, even if partial, of the production of commercial feed for FP. We have to work on the development of viable technical proposals according to our territories and use the most effective channels of information so that FP farmers can be reached.

Message No 8

Andy Safalaoh safalaoh@gmail.com; Animal Science Department Bunda College, Lilongwe Malawi, Currently at the University of Nottingham, UK

Herewith my contribution on use of commercial feed:

Opportunities and constraints of using commercial feed for family poultry (FP)

From my experience, use of commercial feed by FP farmers is out of question especially if you look at the benefits. Firstly, FP is, in most countries, undertaken by poor resource households who cannot even, sometimes, afford a bag of food for themselves. Hence to suggest that they use the money for commercial feed for their chickens is a' joke' or an insult so to say.

Unless the returns after sale are profitable, we have a long way to go before the FP farmers use commercial feed. Studies conducted in Malawi showed that you need up to 20 weeks to attain a live weight of 2kg for local or Black Australorp chickens. By then a chicken would have consumed feed worth more than US$8 (using by current commercial prices in Malawi which are always going up). Yet, the selling price on the market is, on average about US$6 per live bird. Adding the cost of drugs, vaccines and labour make chicken production using commercial feed even more unprofitable. Ultimately, the return on investments is on the negative side and no rational farmer would embark on use of such a costly input, UNLESS and UNLESS, there is a market that can offer premium price for the 'FP chicken meat or egg'.

Due to the high cost, some FP farmers and (commercial farmers too!) have been observed to 'dilute' the commercial feed (grower's mash or layers mash) with maize bran to increase 'quantity', forgetting that in the process they are diluting 'quality'. So what we should be considering is on what type of birds should FP famers use commercial feed? If anything, commercial companies may be encouraged to produce feed supplements not necessarily balanced rations which can be used by FP farmers in addition to the SFRB.

With the current situation, use of commercial feed is therefore UNPROFITABLE for FP farmers.

For empirical evidence, checkout : Lwesya, H., R.K.D. Phoya, A.C.L. Safalaoh and T.N.P. Gondwe (2004); Gondwe and Woolny (2005); Kadigi, H., Safalaoh, A. C. L., Phoya, R. K. D. (2001); Kadigi, H. J. S., Phoya, R. K. D. and Safalaoh, A. C. L. (1998); Phiri et al 2004.

Message No 9 (Tema 2.3 Topic2.3)

Med.Vet.Jose Francisco Rafart Anton jfrafart@correo.inta.gov.ar
Coordinador de Desarrollo Rural-INTA EEA Las Breñas-Chaco-Argentina,
Referente técnico del componente granja aves para el Programa PROHUERTA en Argentina y Haití.

Oportunidades y limitaciones nutricionales de la integración de las aves de corral de la familia con otros sistemas de producción.

La integración de la FP con el resto de los animales de granja es algo generalmente presente en la Agricultura Familiar, ya que las estrategias de supervivencia de estos productores así lo determina, inclusive es más comúnmente observable la integración con los animales de granja menor(cerdos, caprinos, etc.). El conjunto de la producción animal en la Agricultura Familiar es indispensable como fuente generadora de proteína animal de alto valor biológico como así también y dado a sus peculiaridades como productores de alimentos, son además moneda de intercambio por otros insumos necesarios para las familias. Estas estrategias son consideradas en

muchos casos como parte de la cultura y son, fueron y serán un gran banco de conocimientos que se transmite a través de las generaciones.

La integración de la FP con la producción forestal y/o cultivos anuales y otras fuentes no tradicionales es en cierta forma la manera de poder llegar a una independencia parcial de insumos, se puede lograr con estas integraciones una complementación óptima de la FP. Es necesario como primera instancia para avanzar en propuestas técnicas para el uso de insumos locales no tradicionales el relevamiento y caracterización local de lo disponible, evaluar sus estacionalidad de producción, su cantidad estimativa, su capacidad de almacenaje, su necesidad o no de procesamiento y por sobre todo el grado de competencia con la alimentación humana y de otras especies. A partir de ello recién realizar una ponderación de lo más factible, para después recién comenzar con las experiencias en fabricación y pruebas de raciones balanceadas sustituyendo parcial o totalmente los insumos tradicionales.

Las principales limitaciones para el uso de otros productos en la alimentación de la FP pasan no tanto por la disponibilidad de los mismos sino por la insuficiente información, experiencias y socialización sobre sus usos.

El uso de insumos no tradicionales para la alimentación de las FP tiene un valor importante, teniendo en cuenta las posibilidades de acceso tanto monetarias como de calidad de la FP a alimentos comerciales. Es necesario trabajar en la experimentación inicialmente y luego en estrategias de comunicación claras (capacitaciones con organizaciones de productores, con organismos oficiales y programas de gobierno, ONGs, etc.) para llevar ese conocimiento sobre el uso de productos no tradicionales a la FP.

Topic 2.3. Nutritional opportunities and constraints of integrating family poultry with other production systems.

The integration of FP with other farm animals is common in Family Farming due to the survival strategies of the producers; particularly common is the integration with small farm animals (pigs, goats, etc). In Family Farming, the entire animal production is important since it represents an essential source of animal protein of high biological value and, due to the peculiarity of animals of producing food, a source of currency that can be exchanged to obtain other resources necessary for families. These strategies are often considered as part of the culture and are, were and will be a great bank of knowledge that is transmitted through the generations.

The integration of FP with forest production and / or annual crops and other non-traditional sources is a possible way to reach partial self-sufficiency of inputs; these integrations lead to an optimal complementation of FP. In order to make technical proposals on the use of nontraditional local inputs, it is necessary, first of all, to make a local survey and description of what is available, evaluate the seasonal production, make a quantity estimate, evaluate the storage capacity, determine whether there is need of processing and, last but not least, determine the degree of competition with other sources of food for humans and other species. On the basis of this, one has to determine what is more feasible, and start testing balanced rations by partially or completely replacing the traditional feeds.

The main limitation to the use of other feed products in FP is not their scarce availability but the insufficient information, experience and communication on their use.

The use of non-traditional feeds in FP is important if they are economically feasible and if good quality commercial feeds are not available. One has to make some tests

first and then implement clear communication strategies (training with producer organizations, with official bodies and government programs, NGOs, etc.) to spread the knowledge about the use of non-traditional products.

Message No 10

Dr. Aimable UWIZEYE (DVM, MSc) uwizeyza@supagro.inra.fr Montpellier SupAgro, Agris Mundus Programme, Sustainable Development in Agriculture, Montpellier-France

Integration of FP and other production

In Asia (China, Thailand, Vietnam), different integrations of crop-livestock production systems are found. But in other continents, the integration of poultry farming and other crops production is limited to the use of manure and litter as fertilizer for crop production. One integration system that is much studied is family poultry and fish farming integration practices (David Little and Kriengkrai Satapornvanit, in Thailand). Poultry are confined in house or free; commercial feed or scavenging resources are used. This system has been criticized for its negative impact on environment and public health. In fact, different pathogens such as salmonella, enteric bacteria and virus are transmitted to fish and spread to human after fish consumption causing toxi-infection. The nutrient accumulation in ponds and the eutrophication are also the consequences of use of fresh manure directly for fish nutrition. Waste from poultry slaughter houses is also used.

A good management of this practice should be more profitable if the quantities of poultry manure used in fish ponds are controlled. Water oxygenation, rapid recycling of water and crop irrigation may also be managed well for a sustainable integration.

Today, family poultry production faces more challenges. For traditional production, dependence on fluctuating scavenging resources and associated risks (diseases, predation, and bad practices) make this system very vulnerable to climate change and weather variations. The economic results are also very little. With the development of large-scale poultry production, FP is not at all competitive. The increase of chicken numbers, improvement of production techniques, the use of improved genetic and a sustainable use of farming waste with agro-ecologic intensification may help to reduce risks of pesticides and insecticides used in agriculture. An idea that comes out also, is the use of poultry as weeds and alien plants control, but it is known that poultry don't convert well celluloses and other components of plants without incorporation of bacteria's enzymes in feed. Also the behavior of chicken on grass resources is not well studied and may be very disastrous. The integration of poultry and forestry or tree crop seems to be very difficult to manage. However, in Asia (Japan), the integration of ducks to rice production seems to be very fruitful. Ducks eat weeds and insects that constitute a hazard to rice growth and participate to field fertilization.

Globally, family poultry production should be developed economically with different contracts and agreements between operators of poultry value chains. But, small scale farmers are really out of such form of agreements because their production may be not significant vis-à-vis the large scale poultry products.

The poultry nutrition is still the critical point. However, in several developing countries, commercial feed don't fit the minimum requirements in term of quality and quantity. This increases the conversion ratio and makes the activity uneconomic. The investment in the poultry sector should be a good solution to help families in

increasing productivity and profitability from this activity. The feed prices are instable according to the variability of grain prices. Feeding small scale poultry production with commercial feed is not economically profitable.

The consumption of poultry products has increased in last decade, because of the increase of investment in large scale poultry farming. The reduction of household poverty could be reached if strategies are developed to increase FP productivity by reducing production cost. If not, FP will always remain marginal and uncompetitive vis-à-vis the industrial production.

Message No 11

Harry Swatson Harry.Swatson@kzndae.gov.za Cedara College of Agriculture, Hilton 3245, KZN, South Africa

Nutritional opportunities and constraints of integrating family poultry with other production systems

(a) Family poultry is integrated into crop production rotational systems to avoid the buildup of pathogens and pests. Few examples include rice farmers making use of ducks on wet paddy fields to partially control insects and some weeds. FP is known to pick up ticks from cattle kept in a livestock kraal. FP generally feed on numerous ants, termites, insects that are associated with crop plants. These could have co-evolved with such plants. Geese integrated with crops do suppress weed growth in tobacco, maize and possibly cotton production. However, a holistic assessment of impact of pesticide could be indicated by meat and egg quality or even the productivity of family poultry in such a system (i.e. number of eggs, hatchability, shell physical characteristics, sperm quality and yield of the scavengeable feed resource base (SFRB)

(b) Nutritional opportunities include an increased SFRB. There will be a variety of insects, weed seeds, crops and even minerals available for chickens to optimize their growth. Some pests damage agricultural goods and livestock sheds (i.e termites). Where there is cover that enables birds to hide from predators they will be able to scavenge freely resulting in improved nutrition..

(c) Constraints of higher requirements of labour to manage an integrated system as households try to place emphasis on maintaining a sustainable and long term ecological health of the farm, with minimal synthetic fertilizer or pesticide application. The use of limited mechanical equipment or chemical plant regulators would require greater labour inputs to cultivate the same acreages. Buy-in by politicians, academics, scientists and farmers looking for an accelerated pace of agricultural development.

(d) Exploiting nutritional opportunities will require precise farmer knowledge of the interactions of FP with various species of crops or livestock. This will enable benefits to be obtained leading to sustainability and profitability of an integrated system. Farmer capacity building through on farm training and further research is required.

(e) Overcoming constraints

Promote traditional farming methods comparable with organic farming or mixed farming. Implement holistic policies and provide assistance to households and development workers (i.e. research, development, training and after training or extension support, guaranteed or premium prices for FP products). Create awareness

of various beneficial integrated systems such as permaculture-poultry and FP-tractor systems that integrate FP with vegetable production. FP contributes to improve soil fertility, tillage, and insect and weed control. Land for grazing should be well drained, covered with vegetation, with minimal turf damage. Pasture rotation to reduce the buildup of excessive amounts of manure and disease causing pathogens.

Message No 12 in response to message 6 (2)

Sofjan Iskandar sofjaniskandar@yahoo.com Poultry Researcher at Indonesian Research Institute for Animal Production, Bogor Indonesia

In response to message 6(2), in Indonesia, the introduction of local improved breed in family poultry has also been worked out. Mixing commercial layer or broiler type of feed with local ingredients such as corn and rice bran is common and it seemed sufficient to maintain production. However, guidance in formulating or mixing the diet is still needed. Even to keep the production system running, family poultry producers have to build a group with a committee, which will help in making the ingredients and diets available for the member of the group and make it much easier and cheaper.

Message No 13

Dr D Luseba, lusebad@tut.ac.za Department of Animal sciences, Tshwane University of Technology, P. Bag X680, Pretoria 0001, South Africa.

Ref: Climate Change (Topic 2.1)

There is a message from Prof. Sonaiya on climate change and its impact on future availability of scavengeable feed resources. It is true that the impact will be critical to family poultry. New ways and means of keeping poultry and therefore feeding poultry need to be explored. But what is somehow controversial is the change from one type of poultry to another. Chickens are not only kept for meat in many African societies; chickens for instance cannot be replaced by ducks or guinea fowl in social events and traditional ceremonies. This is for many rural people the only time they sacrifice or eat their birds. Ducks and guinea fowls are not even preferred as poultry meat and are not normally counted as poultry. Finding new resources and using different feeding techniques are better options than changing bird species to mitigate the effect of climate change on the availability of SFRB.

Message No 14 (Topic 2.1 and 2.4)

Mrs. Wahida Pervin wp.jotty@gmail.com Ph D student of Bangladesh Agricultural University

I am working on family poultry nutrition in the coastal areas of Bangladesh. I am reporting, what I have observed on how climate change is affecting indigenous duck production and the seasonal availability of the scavenging feed resources in Bangladesh (in relation to topic 2.1 and 2.4).

A survey result with 200 randomly chosen households in two coastal areas shows that about 90% of duck farmers are housewives. Their duck houses are made of tin and wood. Ninety seven percent of farmers were involved in rearing indigenous (*desi*) ducks under scavenging system. Most of the farmers (95%) supply small amounts of mixed wet feed in addition to what the birds derive from scavenging.

Majority of the farmers, on the basis of availability, use rice polish, broken rice and boiled rice as supplemental feeds for adult ducks (51-80 g/day/duck) and ducklings (31-50 g/day/duckling). Annual egg production of scavenging *desi* ducks was found to be 51-70 eggs/year/duck. An average of 60 households having five laying ducks shows that a maximum egg production (96%) was found in rainy season because various snail, insects, fishes, aquatic weeds, earthworms etc. are abundantly available in marshy lands, canal, ponds, road-side ditches as SFRB for ducks. Most of the farmers of the study area opined that high price of conventional feed in the market as well as scarcity of SFRB during the dry season (e.g. summer) were the main problems of feeding their ducks. If they are able to use natural feed resources in an increasing manner they would overcome the feed problem which is season dependent and not always possible for the farmers. Therefore, exploiting egg production is season dependent.

At the moment, I am conducting feeding trials at 60 households in four upazilas (Sub-districts) and visiting the trial sites most frequently and therefore getting ample opportunity to exchange ideas and experiences with the poultry farmers. While they are the victims of cyclone and tidal surge, most frequently particularly during summer and monsoon, their main problem in relation to agricultural occupation appears to be river erosion. Thousands of people lose their land, the homestead areas and move to other places every year. This also limits the scavengeable areas and therefore interrupts their poultry production. Once they settle in a new place nearby, they start raising poultry again in spite of their financial limitations and poverty. Women and children are the main actors of raising ducks and taking care of them.

Because of problems of natural calamities like cyclone, tidal surge and river erosion, urbanization and industrialization in those areas (coastal areas) are not extensive. Huge areas are used for paddy production. The duck owners confine their ducks at home during sowing and harvesting time. They allow their ducks to scavenge for the rest of the year. The scavenging ducks are able to derive more natural feeds during rainy season (monsoon) and in winter in the paddy field following harvesting of paddy.

I think, the future availability of scavenging feed resources will remain so particularly in those areas as the efforts are only being made to save lives of the people during disaster. Development programmes to gear up family poultry production considering effect of climate and season are not so extensive. Research on the effect of climate change on FP production has not yet considered although they are visible and remain so.

Message No 15

Prof S P Gunaratne, spgunaratne@gmail.com **Department of Farm Animal Production and Health, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya, Sri Lanka**

Some aspects to consider when measuring scavenging feed resource base (SFRB)

The present approch to estimate/ measure/ quantify the SFRB is based on crop+gizzard analysis and measuring household waste. This approach seems reasonably accurate to serve the purpose of those days where our knowledge on family poultry (FP) was minimum, but need further fine-tunning to make it more accurate to suit todays situation,

where vast amount of new knowledge has been generated during this period. We have a better understanding about the factors affecting the availability of SFRB, including climate change, season, limitations to scavenging area, changes in crop productions and processing systems etc., with only few to mention. We also have a reasonable knowledge about breeds of birds, production characteristics etc. Under these circumstances, I would like to propose a biological modeling approach to strengthen the present SFRB calculation.

My suggestion is to use bird performance also in addition to the method of SFRB measurement. Basically bird performance depends on two main groups of factors; bird factors and environment factors. The bird factors will include, genetic potential, breed, age, sex, health, physiological status etc. Feeds and other management conditions influencing performance come under environment factors. Whatever the quantitative and qualitative measurements of feed, nutritional status of the feed is expressed by bird performance. Bird will be using nutrients derived from feed for the purpose of maintenance, growth and production. The methodology of calculation of nutrients utilization, depending on bird performance is well established. This will allow to calculate quantitatively the major nutrients utilized and retained by the bird. If necessary, any modifications to existing equations to suit our requirements are also possible. As the production systems are gradually moving from extensive free range scavenging to other FP production systems, like small scale intensive system, application of this approch may be easy and convenient. This method also will helps to verify the values coming from present SFRB measurements, status of utilization of SFRB, quality etc.

Message No 16

Hans Askov Jensen askov@poultry-development.dk www.poultry-development.dk Poultry Development, Hyldehoj 15, 29990 Nivaa, Denmark

Topic 2.4. Opportunities and constraints of using commercial feed for family poultry.

Dr. Jose Francisco Rafat Anton argued for using commercial feed as only feed to family poultry. I don't agree, the breed constituting the stock for FP is indigenous breed and they have a low yield of meat or eggs, but they are not low yielding birds if the brooding and scavenging traits are valued. However, indigenous breed only used to produce eggs or meat has a low production capacity and it will never be viable to use commercial feed only.

Use of commercial feed to FP can be viable when used as supplementary feed. One of the main constrain in FP is the high mortality of newly hatched chicks. A system to reduce the high mortality rate has been developed and named the basket system. The chicks are kept in confinement under a basket the first 4 to 6 weeks of life and fed with commercial feed. This system can be viable, but often the amount of supplementary feed is too high due to waste of feed and that adult chickens have access to the commercial feed. The system is good but requires training in good management to obtain profitable results.

Message No 17 (Topic 2.3)

Aruna Pal and P.N. Chatterjee, aruna_pal@rediffmail.com chatterjeepn@gmail.com Indian Veterinary Research Institute, Izatnagar, U.P.

Family poultry interactions with large animals: Nutritional opportunities and constraints in rural belt of dry and arid region of Birbhum district, West Bengal, India

The rural people mainly rear indigenous varieties of chicks and ducks in semi-extensive system of production. They maintain the birds mainly for egg production. Birds are scavenging for day time and rest at night, even at farmer's bed room and occasionally a small shed or basket which is shared with ducks. The holding size ranges from 2-20 birds per family. In the rural sector, poultry are reared along with large animals viz. large and small ruminants or pigs. The animals or birds are offered rice bran or kitchen wastes on return at home in the evening hours. It has been observed that productivity of poultry birds are improved in terms of egg laying and egg size upon inclusion of commercially available vitamin and mineral mixture, along with their daily feed. However, proper guidance and training to rural women, who actually rear the birds, about ration formulation or balanced ration with the locally available feed ingredients have improved productivity in terms of egg laying and egg size to a large extent. It has been observed that in any commercial production system, feeding constitutes 70% of the total cost incurred. But in free- range system, it has decreased to little involvement.

So far as quality and safety of SFRB (scavengeable feed resource base) on bird's health is concerned, it increases the chances of contamination and spread of diseases. SFRB is one of the major source of spreading infectious diseases and incidences of various epidemics arising out in rural sectors viz. Newcastle disease and fowl pox in poultry and duck plague in ducks. Mouza-wise (area-wise) poultry vaccination programme has been introduced with the help of SHGs to ensure 100 percent vaccination coverage against these diseases. Bird flu, one of the most challenging outbreaks in recent years involving human health, causing uncontrollable mortality, also spreads in rural poultry sector through SFRB. However, especially in West Bengal, ducks possess a huge risk. It has been observed that during the bird flu outbreak, ducks acted as carrier for bird flu with no visible symptom or mortality, but they were able to spread the disease and maintain bird flu virus in their system. Ducks are very popular since they give comparatively better size eggs and demand is very high in local market. In 2008, the outbreak of Bird Flu in this district totally jeopardized the production system where out of 19 blocks 17 blocks had one or more epicenters. Regular culling, disinfection and disease surveillance have been adopted to combat such epidemics and pandemics in near future.

Message No 18

Professor Dr. S. D. Chowdhury drsdchow@gmail.com Bangladesh Agricultural University, Bangladesh

Dear Participants, Let me say a few words on Topic 2.4 Opportunities and constraints of using commercial feed for family poultry

(a). What is your opinion on the knowledge and attitude of FP farmers towards commercial feeds, including the economic factors, e.g. feed price and return on investments?

The knowledge of traditional FP farmers towards commercial feed is poor. They only know that the feed is good and therefore could be used for more production. Since the feed is costly they don't normally consider such feeds for feeding. The exception are the farmers who have financial capacity to purchase commercial feeds. This group of farmers never considers feed price and does not go for calculation of returns on their investment.

On the contrary, semi-commercial or commercial FP farmers (although the flock size is small) have some knowledge on commercial feeds. How much knowledge they have depends on the training they received and experience they gathered before and/or during the course of farming. They are very much concerned about feed prices and usually go for calculation of returns and profitability.

(b). Which types of commercial feeds are normally purchased/used for FP?

Again, this will depend on the type of farmers. Type of feed is not a matter of concern to the traditional FP farmers. Availability in the market is the main factor. But the FP farmers who are engaged in commercial farming with small flocks, try to get the right type of feed that they need for their birds. Unfortunately, this is not always possible for them as the suppliers sometimes fail to supply the right type of feed to the farmers. For example, the use of broiler starter diet in place of layer starter diet is quite common in Bangladesh that affect the growth of layer chicks reared in confinement.

Message No 19 (Topics 2.1, 2.4)

Sodjinin Ekoué, thomek06@yahoo.fr Zootechnicien, Doctorant en production Animale, Chef programme élevages à Cycle Court/ Aquaculture et Pêche à l'Institut Togolais de la Recherche Agronomique (ITRA). Lomé, Togo

Question 2.1:

Indeed, as predicted by scientists the climate change will have more dramatic consequences on agriculture especially on plant and animal production. This means not only natural disasters such as floods and droughts but also the emergence of more virulent diseases for crops and animals in general. Family poultry will not escape these developments, as when a flood occurs nothing can resist. I remember that during an investigation, a poultry seller had lost everything she had; more than 200 poultry were lost because she did not know how to save them when the water had spread throughout the house.

When drought occurs, poultry does not benefit from scavenging (worms, insects, and fly larvae cannot be found). During the floods in 2007-2008 in the South eastern region of Togo (Bas mono) residents were saved by their canoe. They use their

canoes for everything. Climate change and its consequences are a major constraint for the development of poultry farming.

Question: 2.4:

I have read the opinions given in the various posts but I also would like to give my views.

It is not appropriate to use the commercial feed for the family poultry business and this for several reasons including:

-The growth of the species exploited in family poultry has a top limit, regardless of the quality of the feed (less productive).

-This operation will run the risk of failure because the birds' sale price will not return the funds invested in the diet.

-The species used in family poultry are accustomed to scavenging and have to the feed from nature, kitchen waste

A study conducted at the Institute of Agronomic Research Togo (ITRA) was used to raise chickens in the local station to determine the parameters of reproduction and production. It appears from this study that the parameters such as laying rate, laying interval, the viability of the chicks improved, but not enough to cover the cost of feed. It was also noted that laying had increased to a level where one could not record any further increase. It is more advantageous to use all ranges of feed since animals are scavenging. The farmer in this case can take a lot of feed from the wild. The commercial feed would be a booster.

Another study on traditional poultry farming concluded that 50 % of the farmers do not have enough money to purchase grains for their birds (maize, sorghum). The few grains given to birds in rural conditions are necessary to create a bond farmer-poultry. How can family poultry farmers find the money for commercial feeds? A mixed diet in family poultry is the best choice.

Message No 20 in response to Message 16 Topic 2.4 - Commercial feed for FP

Vincent Guyonnet -vincent@internationalegg.com IEC Scientific Advisor DVM, Ph.D, Diplomate of the American College of Poultry Veterinarians

I have a comment to add to message 16 (2.4) relating to feed wastage. Is the feeder hung from the basket and raised regularly as chicks grow? I have some experience with a small flock fed commercial mash feed and wasting a lot of feed. We set the feeder on a small raised slatted and covered area and recover the feed wasted on a weekly basis. The feed is screened to remove debris and feces. On a weekly basis, the feed recovered that way can be used for another 2-3 days. Is this a common practice in FP setting when feeders are not raised as birds get older?

Message No 21

Harry Swatson Harry.Swatson@kzndae.gov.za Cedara College of Agriculture, Hilton 3245, KZN, South Africa

2.4 Opportunities and constraints of using commercial feed for family poultry

What are the constraints of using commercial feeds for family poultry? How can these constraints be overcome?

Constraints include the poor farmer's knowledge of feeds and feeding of commercial feeds, feed quality, prohibitive prices, prolonged storage, rodent contamination, and lack of access to readily available feeds, alternative feed ingredients or markets, and lack of appropriate transport for feeds. Improved farmer awareness, knowledge, adoption of appropriate technology and feeding practices could result in changes in FP productivity in the small-scale intensive system. This could be achieved through providing relevant FP rearing information, education and training on feeds and feeding of commercial diets. The risk of infection by salmonellae and pathogenic bacteria should be monitored. Adequate 'farm' bio-security measures should be implemented to attain predictable expression of full genetic potential of FP. Movement of feed, personnel and equipment should be controlled. In practice very little attention is paid to the surpluses of AA's in feeds on offer. An increase in dietary AA concentration occurs above the minimum requirement when poor quality protein sources such as maize gluten, protein leaf meal, *leucaena leucocephala*, copra or palm kernel oil cake and groundnut meal are fed to FP. It is only when good quality protein and synthetic AA's are unavailable or the cost of these is prohibitive that large amounts of poor quality proteins are used in FP feeds. This is done in order to meet the minimum requirements of the limiting essential AA's in the diet.

Observations are that when higher-than-normal protein contents are economically desirable, (i.e. when poor quality proteins are fed at levels beyond that recommended in order to meet the AA requirement) an upward adjustment of the dietary lysine level is a prerequisite to the formulation of efficient diets. When FP is offered high-energy diets, it is important to control the amount of energy intake because it also has potentially negative effects on carcass characteristics. It is therefore worthwhile to consider the cost effectiveness in terms of feed cost per kilogram of FP meat produced before any beneficial relationship between energy and protein can be applied profitably in attempts to improve growth by nutritional manipulations making use of commercial feeds.

Message No 22

D.V. Rangnekar, Datta Rangnekar dattarangnekar@gmail.com

This is Datta Rangnekar from Ahmedabad, India. I am a Vet graduate and did master's and doctorate in Animal Nutrition. I am involved in livelihood development programmes (mainly with NGOs) since last few decades and realized/learnt importance of traditional/ backyard/family poultry. My late wife and me did a few studies on the subject.

My compliments, though late, to the FAO and IFAD for organizing E–conference on this topic which does not get much attention but is important for 'underprivileged communities'. I find it difficult to separate the topics for comment.

Pardon my ignorance but I would like to ask whether we are discussing about 'Traditional / Backyard family poultry' (TBFP) or 'Semi-commercial/Small scale Family Poultry'. I ask clarification since it has implications on the discussions and I feel that the topics / sub-topics listed for discussion relate more to 'Semi-commercial Family Poultry' rather than the TBFP. My observations / comments are related to traditional / backyard family poultry.

The word "Scavenging" is derogatory – why not refer as "Foraging" or "Free Ranging".

The traditional poultry is a part of 'Livelihood Systems' of most of the Underprivileged rural families and hence it is bound to be associated with whatever other sub–systems that are adopted by the families- ranging from fisheries to crop and livestock production or wage labor.

While studying livelihood systems it was noticed that all along the west coast of India majority of families, from Muslim communities, involved in fishing keep country fowl. The birds are managed by women and fish waste is used for feeding. The women are aware of beneficial effect of fish waste on body weight and egg production of birds.

Majority of families from tribal and other underprivileged communities from Western India keep backyard poultry while involved in mixed crop – livestock production. Backyard poultry has multiple functions in the livelihood of these families viz. Economic, Risk Coverage, Nutritional Security and Social function. These free ranging birds get much of their feed from crop and livestock systems, kitchen waste etc. besides weeds, worms, insects (many families mentioned that these birds keep population of insects like termites under control).

There are hardly any studies (to my knowledge) on nutrition or feeding system of the free ranging fowl in India since the traditional backyard poultry production system itself is not well studied / understood. There are reports of such studies from other countries but it is doubtful how realistic and applicable these are considering the variability in conditions. We need to pay due cognizance to the effect of feed these free ranging birds pick up (weeds, insects, worms etc.) on the color / flavor / taste of the products (egg/meat) for which the products are sold at premium. And in our eagerness to improve egg production and bodyweight by providing balanced concentrate to the free ranging birds we may adversely affect these characters. It is also necessary to understand how the families, particularly the women, perceive the traditional backyard poultry system since the women also have to perform a variety of functions and have to partition their time and resources carefully.

Climate change has always been there and we all are product of that change, however, either the rate of change has increased since last few decades or that our information systems and understanding has improved considerably and we are now overly concerned (may be for the right reasons). All the indigenous livestock and poultry are a product of long term selection done in harmony with nature and hence they have inherent capacity of coping with changing situations. Nevertheless it is worth considering increasing vegetation using species that can withstand dry spells. However, before embarking on such intervention good understanding of foraging habit of country fowl is necessary – so as to select appropriate species. Promoting kitchen garden with underprivileged families taken up in India through development projects was found to be very useful in this context.

Considerable information on feeding habits of the birds (indigenous bird) can be gathered from the women as they are very keen observers and for them animals and

birds are like members of the family. Hence participatory approach to studies will be useful in gathering desired information.

Message No 23

Dr D P Singh dpscari06@gmail.com Principal Scientist, Avian Genetics and Breeding Division, Central Avian Research Institute, Izatnagar, Bareilly (UP) INDIA 243 122

Improved family poultry feeding system

Traditional family poultry keeping is in practice in developing countries since the time immemorial. It is not an occupation but a supplemental house hold activity mostly of the poor families. Birds are fed on the natural feed resources under this system. The natural feed resources are being reduced day by day due to various well known reasons and essential feed supplementation has questioned the sustainability of the system because poor poultry keepers are not capable to procure the poultry feed/ grains to feed the birds. Due to this reason, popularity of traditional family poultry keeping is being reduced day by day. Searching of the additional natural feed resources for scavenging chicken has become essential for sustainability of the traditional family poultry production.

An attempt was made to improve the availability of the natural feed resources under the project titled "Holistic Approach for Improving Livelihood Security through Livestock based Farming System in India". The project has different components of livestock and agriculture farming along with traditional backyard poultry production. To ensure the availability of the additional natural feed resources, the small flocks of scavenging chicken were integrated with the horticulture (fruits and vegetables). Scavenging chicken utilized the ground surface of the orchards/ kitchen garden for scavenging purposes where birds have been found to control insects and pest problem to a greater extent. Poultry fecal materials were used for Vermin-compost and earthworms were utilized as protein source in poultry feed especially for scavenging chicken.

Further, the use of Azolla obtained from the local ponds or cultivated at its own house was also found to minimize the need of supplementary feeding. Thus the integration of scavenging chicken production with different components resulted in sustainable poultry production which increased the popularity of traditional scavenging chicken production in the area in general and in project area in particular.

Message No 24 (Topic 2.5)

Sodjinin Ekoué, thomek06@yahoo.fr Zootechnicien, Doctorant en production Animale, Chef programme élevages à Cycle Court/ Aquaculture et Pêche à l'Institut Togolais de la Recherche Agronomique (ITRA). 2318 Lomé

It is undeniable today that family poultry must use a variety of products used in the food chain in order to be competitive. These include agro-industrial by-products but also agricultural food waste, kitchen leftovers, insects and others. Generally farmers often give a few grains to poultry in the morning. It is after this that the birds go out to peck other things which are in fact the real feed.

This trend is reflected especially in villages where the agro-breeder does not have good ways to feed birds. Around the cities another form of family poultry and

nutrition is growing which is suburban. The farmers mostly prefer to mix the ingredients to make a composite feed that they give to poultry. At this level supplementation occurs when scavenging on grassland or within the chicken run.

Protein sources in poultry feed are so expensive nowadays that breeders are trying to supplement the diet with termites they collect or produce themselves especially farmers in the northern part of Togo. Research is developing simple technologies of production of protein sources that are cheaper and at the reach of farmers to make them available, such as termites, larvae and insects. One can also mention the vitamin provided by the greens from the nature or vegetation. Water has to be ad libitum in farms.

Ultimately to make family poultry a business, it must be supported by a good diet i.e. a mixture of three or four ingredients that is distributed as half ration to supplement the scavenging. Of course feed is the most expensive item in poultry production. Either the farmer buys commercial feed that he/she complements with the by-products, food waste, insects, and earthworms. These types of feed are to be developed through research in collaboration with agro-pastoralists and can be made available to the same breeders at a lower cost.

One can thus think of family poultry formulas typically cheaper, a bit different from the broiler or layer feed. Obviously one has to make on-farm tests to confirm them before generalizing them. Throughout this process a participatory approach involving producers must be adopted.

Message No 25 (Topics 2.4c and 2.4d)

Professor Dr. S. D. Chowdhury drsdchow@gmail.com Bangladesh Agricultural University, Bangladesh

2.4. Opportunities and constraints of using commercial feed for family poultry

(c) What is the source of raw materials or ingredients used in feed formulation?

The source of raw materials/ingredients for feed formulation in the feed industry may vary with circumstances. In a country like Bangladesh, most of the raw materials are imported resulting in high price of the finished products. Local sources of feed ingredients are limited. Whatever local sources we have, these are being adulterated in most of the cases, particularly rice polish with rice husk. Imported sources have some risk of contamination with pathogenic organisms in the absence of a strong quality control system.

(d) Is using commercial feeds for FP profitable?

If so, what circumstances and production system permit such profitability?

It depends. Commercial feeds for traditional FP production are seldom used by the producers without taking into account its profitability. As the flock size is very small and production is low, particularly from indigenous stocks, we assume that it would never be profitable. It may be the fact since it is even much more difficult to ensure profitability with commercial broiler flocks of 100 or less. Undoubtedly, size of the flock is a determining factor. Recent studies in Bangladesh with flock sizes varying from 300 to 600 at farmers' households by feeding commercial feeds showed that commercial broiler production on littered floor is profitable but this profitability is

higher when interventions in terms of technical supports and extension services were provided to the farmers.

Message No 26 (in response to message 24)

Antonio Rota a.rota@ifad.org IFAD, Senior Technical Adviser, Livestock and Farming Systems, Technical Advisory Division – PT, Via Paolo di Dono 44, 00142 Rome, Italy

Dear Dr. Chowdhury,

Could you kindly ask the author of the message 24, Mr EKOUE Sodjinin, to describe in details (it would be great to have some photos) the technique to produce termites in Northern Togo?

Thank you and best regards

Antonio

Message No 27 (Topic 2.5)

Professor Dr. S. D. Chowdhury drsdchow@gmail.com

Bangladesh Agricultural University, Bangladesh

2.5. Developing and promoting improved family poultry feeding systems

(a). Which feeding systems are used by the family poultry keepers?

Feeding systems used by the FP keepers vary depending on country and location within a country. The usual system as followed by the FP farmers for those poultry foraging on SFRB is to provide supplementary feeding without balancing nutrients. The farmers usually provide either grain and/or grain byproducts either by spreading them in their household premises or by offering them as dry/wet mash (mixture of rice polish, some grains even cooked rice) for chicken irrespective of age of birds. For ducks, they prefer to provide wet mash in a plate or bowl, normally in the evening on return from scavenging. For commercial small flock of birds raised in confinement in Bangladesh, the FP farmers normally go for pellet feeding for broilers and mash feeding for layers. Both these types of feed are of industrial origin.

(b).Which sort of improvement in feeding system is required to augment production?

There is no doubt that improvement in feeding system is required to augment production. The most challenging is to make such improved practices cost-effective. For the scavenging birds, an improvement in the quality of supplementary feeds is needed. This could be well done by an improvement/increase in nutrient density of the supplemental feeds. One may argue that the nutrient requirements, particularly of the indigenous stocks, are not known and that any attempt to feed nutritionally balanced diets may not be cost effective. I don't disagree but this is a subject of research and should be left to the researchers. But I do believe that we need to determine nutrient requirements on one hand and the cost-effectiveness of formulated diets in relation to growth and production on the other. Since feeds for commercial stocks are of industrial original, improvement in feeding system could be made possible by correct feed management, for example by reducing wastage and following controlled feeding where necessary.

Message No 28 (Topic 2.5)

Auvijit Saha Apu auvijit_bau@yahoo.com Assistant Professor, Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh, Bangladesh

Family poultry provides a substantial contribution to household food security, diversify incomes of the rural households. It tends to be a women's domain thereby usefully contributing to women's empowerment in many communities. In Bangladesh, birds are usually kept under semi scavenging production system and fed on natural feed resources like household wastes, crop residues, insects etc. But these feed resources have dramatically declined in the last decade which is a major concern nowadays. So, to overcome this situation and save family poultry, initiatives should be taken without further delay. However, from the previous experience, it is noted that the introduction of supplemental feed supported by different donor funded projects enhanced the production performance of family poultry but with the withdrawal of funding, these initiatives went in vein. As farmers are not capable to carry on this program, an integrated approach should be taken involving the farmers community to develop the feeding system based on the experience of availability of feed resources in a particular area. Thereafter the question comes about its promotion. My opinion and suggestions are

1. Keep the household kitchen wastes, dust and others in a particular side (might be in a remote corner of the house) every day rather than throwing it here and there
2. Crop residues and industrial by products (varies based on the region), of low economic value may be considered to formulate a balanced diet.
3. Community based holistic approach may be applied to train the small group of farmers of a community first giving the knowledge about formulation of balanced diet using the local feed resources, thereafter these small groups will encourage other farmers to formulate the supplemental diet.

So, now it is the high time to disseminate knowledge and make a plan of action based on particular region considering the farmers opinion to develop and promote supplemental feed. Otherwise, experiments will be continued with no sustainable results.

Message No 29 (Topic 2.4)

Antonio Rota a.rota@ifad.org IFAD, Senior Technical Adviser, Livestock and Farming Systems, Technical Advisory Division – PT, Via Paolo di Dono 44, 00142 Rome, Italy

I would like to share the following observation after recent supervision missions of IFAD funded projects (in particular Swaziland and Laos) with a rural poultry development component. Women (normally those best performing) rearing local poultry breed and who are located in villages with access to markets on which commercial feed is available, tend to separate day-old-chicks from the hen from day 1, brood them artificially and feed them with a mix (50-50) of commercial feed and feed available on farm (broken rice or maize).

This is practiced for three-four weeks before shifting to a free-range plus supplement of on-farm available feed (I also do not like the term "scavenging"). Women reported

that in this way they have chicken ready for the market (1.3-1.5 kg alive) in 2.5/3 months. Does anybody else have noted similar practices?

On another note, I would be extremely interested in receiving information on poultry feed formulas or feed practices using locally available feed which are not theoretical or from manuals/research stations but used in reality by rural poultry producers.

Thank you and best regards.

Message No 30 (all topics)

Sujit Nayak sujit.nayak@nic.in Livestock Officer, Government of India

Dear Moderators and Participants,

I am Dr. Sujit Nayak, Assistant Commissioner (AH) in Department of Animal Husbandry, Dairying & Fisheries, Government of India. I am a veterinary graduate with MVSc in Veterinary Immunology. However, I am assisting seniors in policies regarding Animal Husbandry. I am more involved in poultry policies and we are implementing a 'Rural Backyard Poultry Development' program.

I am going through the experiences of other participants and messages of Dr. Datta Rangnekar (Message 22) and Dr. D. P. Singh (Message 23) which are interesting and kind of wrap up the future research to be done. I would like to supplement some more as follows and also would like to raise some issues which I feel need to be addressed as a policy-maker.

1. Climate change and the future availability of the scavengeable feed resource base for family poultry

The availability of feed resources and biomass in general are greatly variable with some major factors like season, harvesting of cereals, pulses, vegetables; flock size, land size, caste, religion, population of other livestock, farming community, rainfall, intensity of summer and winter, eating habit of the locality, human population, land preparation, plantation, plowing etc. The concentration of ponds per villages also reflects the animal protein sources. During showing period, the birds get the chance to get plenty available seed types of feeds. It is evident that except may be some factors like human population, religion, eating habit etc. rest all are directly or indirectly related to climate and any change affects the SFRB.

2. Recent development in assessing feed resources for family poultry production including the scavengeable feed resource base (SFRB)

In one report (as personal communication) by B. K. Mallik, P. K. Shukla & S. G. Narayankhedekar- samples collected from villages belonging to fishermen recorded higher fingerling content of crop as compared to other villages. Samples collected from upper caste villages engaged with agriculture recorded higher cereal and grain content of crop and gizzard. Samples from tribal areas recorded in-between the fisherman and upper caste. One sample recorded significantly higher paddy content of crop, which is assumed due to intake of paddy from field or during harvesting or drying & processing. The summer samples were recorded as higher insects and fingerling content where as winter samples were showed higher cereal concentration than summer and rainy season. Particularly at start of monsoon the crop contains larger amount of insects and snails; during mid part of monsoon physical counts more earthworms, centipedes, grasshoppers, cutworms, caterpillars, small toads, tadpoles, cockroaches etc. During winter, crop contains significantly higher percentages of garden vegetables, leaves, flowers and white ants. The last winter

and summer revealed significantly more termites and white ants crop cont. Overall the crop content varies from season to season and area to area depending on availability of ingredients in the local areas. Physical composition of crop and gizzard content is given as follows:

SL.No.	Parameters	%
1	Cereal & cereal by products	25.22±1.28
2	Vegetable & forage by products	4.13±0.98
3	Seed & seed by products	5.21±1.22
4	Insects	0.30±0.02
5	Worms	1.52±0.82
6	Unidentified	41.19±2.11
7	Inert materials	0.29±0.11
8	Sand & grit materials	22.14±1.23
	Total	100.00

The chemical composition is given as follows:

SL.No.	Parameters	%
1	Dry matter(DM)	48.21±6.22
2	Crude protein(CP)	9.75±2.01
3	Crude fiber(CF)	10.58±1.25
4	Ether extract(EE)	4.88±2.10
5	Ash	25.53±1.99
6	Calcium(Ca)	1.10±0.08
7	Phosphorous(p)	0.58±0.04
	Total	**100.00**

As a policy maker it is felt that at least some sort of broad mapping of resources may be done so that we may distribute birds of low-input technology birds depending on the biomass capacity and availability of SFRB.

As shown in Dessie and Ogle, 1996a and 1996b, the scavenging feed resource base is not constant. The portion that comes as a grain supplement and from the environment varies with activities such as land preparation and sowing, harvesting, grain availability in the household and season and the life cycles of insects and other invertebrates. From the results of work of Dessie and Ogle, (1996b), it is also possible to conclude that protein supply may be critical, particularly during the summer months, whereas energy may be critical during the rainy season Also others have described that feed resource availability is variable, depending on the season and rainfall. In the absence of an event which diminishes the flock biomass (number

x mean live weight), such as disease or occurrence of a major festival, the village flock will normally be at the maximum biomass that can be supported by the scavenging feed resource base. Any additions to the village flock which increases the poultry biomass will result in increased survival pressure and selection against the weakest members of the flock. According to the finding of Dessie and Ogle, 1996b, the feed resource is deficient in protein, energy and probably calcium for layer birds, which shows that supplementation of local birds with food sources containing energy and protein and a calcium source brings about a considerable increase in egg production.

References:

Dessie, T. and Ogle, B. (1996a). A Survey of Village Poultry Production in the Central Highlands of Ethiopia. Part I of M.Sc. Thesis. Swedish University of Agricultural Sciences, Department of Animal Nutrition and Management.

Dessie, T. and Ogle, B. (1996b). Nutritional Status of Village Poultry in the Central Highlands of Ethiopia as assessed by analyses of Crop contents and Carcass measurements. Part II of M.Sc. Thesis. Swedish University of Agricultural Sciences, Department of Animal Nutrition and Management.

3. Nutritional opportunities and constraints of integrating family poultry with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc).

Survival and growth in extensive scavenging system is limited by the availability of feed resources in the foraging area and the quantum of household waste, left-over grains (after harvest) etc. Thus scavenging systems work well where there is an abundance of biomass. In areas with poor rainfall in arid and semi-arid areas the feed availability is a limiting factor. Supplementation of feed to chicks results in gain in body weight and improved egg production. The strong forte of rural backyard poultry lies in little or no cost incurred on feed. However, in order to increase feed availability and thereby productivity increasing insect population, white ants, azolla, green leafy veggies in foraging areas are some solutions already mentioned. Intercropping millets into farming systems may be another.

The major constraints felt are in areas which are barren, arid, with little rain, colliery areas etc. The Rural Backyard Poultry Development program being implemented across India is for Below Poverty Line beneficiaries and they hardly have much access to other systems as they are mostly daily-wage labourers. However, there seems little problem in integration with other systems as with every other system there is generation of some surplus. During my field tours, I have seen birds moving around in banana plantations, paddy fields where they must be deriving necessary nutrition.

4. Opportunities and constraints of using commercial feed for family poultry.

I would like to know whether we need to give some additional help to the beneficiaries under our Rural Backyard Poultry Development program in terms of feed. We have no provision for giving feed/ feed cost to the beneficiaries but are providing four-week old rearing chicks. Besides, it was felt that the birds would not require any commercial feeding except for some supplementary feeding from kitchen surplus etc.

However, I have come across some programs of states where they are giving some aid for commercial feed to beneficiaries but in most cases they are distributing DOCs to them.

5. Developing and promoting improved family poultry feeding systems

I would like to note some anguish in Dr. Dutta Rangnekar's message (Message 22) on usage of the word 'scavenging' but we all know we are not equating with crows or vultures but foraging may restrict the sense of wide array of feed resource. We also know how selective the birds are in choosing what is nutritive from what appears to be garbage. That is why sometime back we resorted to modifying the word 'kitchen waste' to kitchen surpluses. Whereas we all know the sense 'scavenging' but from consumers point of view in future i.e. if these free range birds/ products do gain some marketability we may have to think of a more agreeable/ pleasing term.

I must admit that in the background documents of the Rural Backyard Poultry Development program, there is little consideration for SFRB probably because of lack of availability of data. But at the fault of repeating, I would like to know the necessary interventions required to strengthen the family poultry feeding systems in our program.

Message No 31 (Topic 2.4)

Kalidas Sarkar kalidassarkar@yahoo.com Deputy Director,Central Poultry Breeding Farm, Department of Livestock Services, Dhaka, Bangladesh.

Opportunities and constraints of using commercial feed for family poultry.

I am Kalidas Sarkar (K.Sarkar) Master of Science in Animal Husbandry (Animal Nutrition) currently working as Deputy Director in Govt. Central Poultry Breeding Farm, in the Department of Livestock Services, Bangladesh, Dhaka. On topic 2.4 of the E-conference, I am presenting the result of my recent experiment on feeding commercial diets to indigenous chicks.

Indigenous chickens are raised by almost 80% of rural households of Bangladesh. But the country has to increase its cropping intensity by double to feed its growing population. Due to priority paid for crop production, the husbandry pattern of indigenous chickens has greatly changed over time. Free ranging or scavenging facilities have dramatically shrunk in Bangladesh. Backyard poultry raisers have to confine their chickens most of the time in a day and allow birds to scavenge a few hours in the afternoon only. The paradigm of free range or scavenging management system has already been changed. Supplemental feeding based semi-scavenging management is practiced in the country except in hilly and river basined coastal areas. The juvenile period of chick's life is the most critical and vulnerable one. It ranges from day old to 3-4 weeks of age. Malnutrition, ground and aerial predators and incidence of diseases cause severe losses to indigenous chicks during this period. Not the eggs, but the number of chicks hatched out, survived and ultimately available for sale and consumption are the determinants of profitability of indigenous family flocks. Supplemental feeding and improved management interventions are found to be effective in this regard. Is it economic to feed commercial diets to indigenous chicks? To answer the question, a feeding trial was conducted with indigenous chicks by feeding four commercial diets containing different levels of protein that were available in the market. Diets were termed as T1 (17% CP), T2 (18% CP), T3 (22% CP) and T4 (20 %CP) respectively. Homemade diet TC (9% CP) usually fed to the chicks by rural households was used as control. Body weight gain per chick achieved during the experimental period of 6 weeks was 252, 301, 441, 345 and 162 g respectively for T1, T2, T3, T4 and TC diets and feed intake accounted for 932, 920, 907, 926 and 907g respectively. Mortality was 14.81, 7.40, 3.70, 7.40 and 22.22 % concomitantly for the treatments. Net profit per chick was 17.04,

26.28, 50.00, 33.00 and 4.40 BDT (1USD=78 BDT) respectively for the dietary treatments. Highest body weight gain 441g and net profit 50.00 BDT were obtained for diet T3. It was lowest 162g and 4.40 BDT for TC diet. Mortality of chicks was highest in TC (22.22 %) and lowest in T3 diet (3.70 %). The result of the experiment shows that under intensive management, it is economical to feed commercial diets to indigenous chicks for reducing their mortality and increasing income.

Message No 32 response to Message 29

Kalidas Sarkar kalidassarkar@yahoo.com Deputy Director, Central Poultry Breeding Farm, Department of Livestock Services, Dhaka, Bangladesh.

In response to a message of Dr. Antonio Rota (Message 29) on topic 2.4 regarding separation of chicks from mother, I would like to draw attention of participants to two of my articles published recently:

Sarkar, K. and Bell J.G. (2006) Potentialities of deshi chickens and its role in poverty alleviation and nutrition security for rural household. International Network for Family Poultry Development (INFPD) Newsletter Vol. 16 No.2 July- December 2006.pp 15-26

Sarkar, K. and Golam, M. (2009) A move from subsistence to semi- commercial family poultry farming with local chickens; effective strategies for family in Bangladesh. World's Poultry Science Journal 65(2)251-259.

In the above mentioned papers, detailed technical aspects of separation of chicks from mother are described. Separation of chicks from mother not only helps to increase body weight gain of chicks, but also increases egg production of mother, which doubles in a year and dramatically reduces the mortality of chicks.

Message No 33 (Topic 2.2)

Harry Swatson Harry.Swatson@kzndae.gov.za Cedara College of Agriculture, Hilton 3245, KZN, South Africa

Recent advances in assessing feed resources for family poultry production including the scavengeable feed resource base (SFRB): the use of choice feeding and mixture experiments

Family poultry (FP) have exact physiological and nutritional needs. They are regarded as 'generalists" and are capable of making the right choice from a wide variety of feeds in the SFRB which, when eaten in some proportion will meet their needs for growth, production and maintenance. They are able to first sample feedstuffs; find out if they are nutritious or palatable before feeding on them. An association between the sensory properties of each feed ingredient with its nutrient content or metabolic effects is necessary for the chicken to develop an appetite for the feed on offer. The presence of toxic substances in the SFRB could give rise to an aversive taste and thus chickens refusing to eat novel feeds because familiar feeds are nutritionally adequate. The question arises whether the FP whose crops or gizzards are examined are eating to meet their genetically determined appetites /capacity or requirement if they have been given **unrestricted access** to balanced amounts of the SFRB? The use of choice feeding and mixture experiments to complement the efforts of crop content analysis is desirable. This will enable the determination of the combination of feed components selected by FP that will maximize their biological performance whilst minimizing excesses of nutrient intakes.

If this is done for various feeds sources, it may be possible to find out *a priori* whether the supplementary feeding of similar proportions will be suitable to FP or whether no combination of feeds will enable them to make the right choice.

Message No 34 (Topic 2.4)

Dr. Md. A. Saleque, ma_Saleque05@yahoo.com **Adviser, Agriculture and livestock, BRAC International, 75 Mohakhali, Dhaka-1212, Bangladesh.**

Response to Theme 2.4 (Opportunity and constraints of using commercial feed for family poultry)

Thanks to all honorable participants for the valuable contribution in the second e-conference. We know that family poultry are reared in rural areas by the small scale farmers in 4 different production systems and different types of birds (indigenous and crossbred/hybrid) are usually reared in these production systems depending on their local condition. It is observed that indigenous birds and sometimes improved breed (crossbred/hybrid) are reared in backyard extensive and semi-scavenging system with some supplementary feed (locally available raw material or commercial feed) in the developing countries. But it has not yet been determined how much feed should be supplemented. Obviously, it depends on the availability of scavengeable feed, area of homestead, the flock size and type of breed reared by the farmers. On the other hand, for rearing small scale commercial bird in intensive system, obviously we need to supply commercial feed but before using the commercial feed in backyard extensive and semi-scavenging system we should consider the following factors:

a) Is it cost effective? If we think of meat production, it will simply not be viable because of higher FCR (> 4) as compared to broiler. On the other hand, cost of production using commercial feed and sale price of egg need to be considered under local condition when we think for egg production.

b) Commercial feed is usually costly as compared to locally mixed feed prepared from locally available raw materials.

c) Family poultry keeper rear different types and age groups of bird and these birds also need different type and amount of feed. The small scale producers need only small quantity of supplemental feed. Therefore, it is easier for them to prepare feed with locally available materials. But in this case they need training/technical knowhow for the preparation of feed.

Finally it is important to analyse the cost benefit by considering the 3 "A"s for suggesting the commercial feed:

These are:

- Available
- Accessible
- Affordable?

Message No 35 (Topic 2.4)

Dr. FOTSA Jean Claude (Ph.D) fotsajc2002@yahoo.fr jcfotsa2002@hotmail.fr

Senior Research Officer / Maître de Recherche Senior AgroZootechnician Engineer / Ingénieur AgroZootechnicien Hors Échelle (Poultry Production, Genetics & Diversity) Institute of Agricultural Research for Development (IRAD) Mankon Specialized Research Station (SRRAD) WPSA-Cameroon Branch's Secretary Box : 4099 Bamenda, Cameroon

Dear colleagues of INFPD

Thanks for this topic that will help so much our rural farmers to exactly know how to feed their local chickens. Thanks Dear Professor for the moderation of this valuable e-conference.

I am coming late because of an unavoidably situation. However, this is my contribution.

The intrinsic nature of rural chicken environment and management could be easily justifying their poor productivity. Despite the abundance of feedstuffs in the rural areas of Cameroon, little attention is given to feeding them to chickens rationally. The perception is that rural chickens can survive with little feed supplements. Water is not made available and is of questionable quality when available. Given the prevailing situation, some proposals have been made to alleviate the poor nutritional status of rural reared chickens as the investigation just carried out by Mr. Kalidas Sarkar in Bangladesh by feeding local chicken with commercial feed. From his study he found out that under intensive management local chickens can perform very well when fed commercial feed. The growth of these chickens which consumed 22 % proteins showed 441 g for body weight at six weeks of age. But the energy content of the feed is not given by Mr. Kalidas Sarkar.

We tried to use the commercial feed in Cameroon, it could not work because the feed is very expensive since some feed stuffs are still imported like soya bean cake, fish meal, concentrates, groundnut cake and sometimes corn (this last ingredient is widely consumed by human and animals that's the surplus has to be imported). It was based on the conclusion that, by feeding rural chickens with commercial feed cannot lead the rural poultry farmers to a descent benefit from his poultry rearing as activity generating revenue. That is why Fotsa et al (2007) suggested to rear local chickens with locally available feed stuffs made of maize, cassava root meal, cassava leaf meal, cotton seed cake, fish meal, soya beans, bone meals or oyster shell meal and kitchen salt respectively. The first five ingredients having the proportions of 2, 1, 1, 1, 1 and 0 measurements using a drinking glass of 250 ml added to a handful of bone meal and a pinch of salt to make a kg of feed. By using this ration among others, the farmer will not loose so much. I conclude this by saying that one can use commercial feed to feed local chickens which have been improved genetically. More information can be obtained from the reference below:

Fotsa J.C, Poné Kamdem D, Manjeli Y et al (2007) The State of Cameroon Rural Chickens: Production and Development Perspectives for Poverty Alleviation. *Ghanaian Journal of Animal Sciences,* vol 2 & 3, **1**, 171-176.

This is what I can say for now. I seize this opportunity to sincerely thank the organizers of this conference for having prolonged the date line.

Best regards

Message No 36

Professor Dr. S. D. Chowdhury drsdchow@gmail.com Bangladesh Agricultural University, Mymensingh 2202, Bangladesh

2.5. Developing and promoting improved family poultry feeding systems

I would like to take an opportunity to refer to my paper "Family poultry production in Bangladesh: Is it meaningful or an aimless journey?" presented at a Taiwan conference recently. A number of reports repeatedly confirmed that FP of indigenous origin is multiplying in the country by acclimatizing with lower plane of nutrition. The fact that scavenging diets are normally deficient in energy and protein but high in fiber demands an improvement of their diets either as free choice of individual ingredient or supplementary feeding of nutritionally balanced diet. Alders and Pym (2009; World's Poultry Science Journal 65: 181-190) compared between village and commercial chicken and suggested that low productivity of village chicken could be improved by better nutrition. Sarkar and Golam (2009;World's Poultry Science Journal 65: 251-259.) concluded that improved management interventions in the form of early weaning, creep feeding of chicks and supplemental feeding of hens during the incubation period, have the capacity to impact dramatically on profitability and income generation. A recent study in Bangladesh with a small flock of indigenous chicken in confinement clearly indicated 720 g weight gain of chicks during 3-12 weeks by feeding home-made high nutrient dense balanced diet (2800 kcal ME/kg and 23% CP) as compared to control (469 g) that received 2800 kcal ME/kg but 9.5% CP (for details, see paper 5 forwarded to participants of the e-conference). All these results, I think are encouraging. We have to proceed systematically keeping local situation into consideration. Whatever information we generate through research, is not disseminated to the FP farmers properly due to institutional weakness. So, extension methods and approaches can play a vital role in developing and promoting improved family poultry feeding systems

(c). What are the extension methods and approaches appropriate for developing and promoting improved feeding system in relation to production systems?

A model village could be established where farmers will have to be trained with access to hands in practice on improved FP feeding systems. Once a technology is generated by researchers, that should be put into practice there and if farmers are benefited, this will be followed and eventually sustainable.

Message No 37 (Topic 2.4)

Souleymane Fadiga (FAOCI) Souleymane.fadiga@fao.org FAO, Côte d'Ivoire

Dear participants

I would like to react to the system of traditional chicken production.

The semi-scavenging system allows on an area of 150 to 200 m² with a chicken house (12m²) and supply of endogenous feed based on local production (maize, rice, soybean, cowpea, millet, cassava and their derivatives) increased productivity.

Facilities have been built in the Ivory Coast on over a hundred farms. We have observed a significant decrease in mortality, an improvement in hatching rate and a final sale weight at 3 months of 1.1 kg (ration of 200 g/day). This shows that commercial feed is not profitable. Besides, bio-security on improved traditional farms is important.

Faced with this type of operation, we note an improvement of plant production by the operator who must also meet these usual needs but also ensure the feeding of the animals.

Message No 38 (Topic 2.4)

Dr. Md. A. Saleque ma_Saleque05@yahoo.com Adviser, Agriculture & Livestock, BRAC

Response to message 31 by Kalidas Sarker

The finding of the research study by Mr. Kalidas Sarker is very impressive and it is good news for family poultry producers. However, this study was done for only 6 weeks. It will be better if we have any study up to age of marketable size (i.e. at least 600 g) by providing commercial feed up to 6 weeks and then rest of period feed them with commercial feed or any other feed. The cost benefit analysis during this rearing period is important for actual economic performance which is needed and helpful for family poultry producers in rural areas.

Message No 39 (Topic 2.4)

Dr Siva Prasad vadlasiva@yahoo.com Veterinary Assistant Surgeon, Dept of Animal Husbandry, Hyderabad, India.

Opportunities and constraints of using commercial feed for family poultry

I am thankful to the organizers for their sincere efforts to give some thought on most neglected backyard poultry sector in our country because of many reasons. My observations and experience on the use of commercial feed to backyard poultry for non-descriptive local birds or developed breeds exclusively for rural people like Vanaraja by project directorate Hyderabad, Rajasri of the college of Veterinary Science, Hyderabad, India are as follows: Vanaraja has a multicolored germplasm which can thrive well in rural conditions, medium size and dual purpose breeds, the use of commercial feed for these breeds is a sensible thing as they are genetically bred for the quick weight gains and moderate egg production.

At present conditions especially in most parts of the country, there are no agencies either government or private that can supply chicks and feed simultaneously in larger volume productions. If we have larger number of birds in any specified area, then the idea of using the commercial feed will be successful. Farmers will appreciate the results quickly and time and cost benefit ratio are important. With little intervention by extension workers, farmers will adopt quickly.

Still in rural areas as the farmer are having 2-10 numbers of birds and most of them having non-descriptive or indigenous birds. Farmers will see little production difference with the use of commercial feed and quantity of feed required for these numbers is very little. So it is very difficult for farmers to adopt the commercial feed. Besides, shelf life of the feed in storage is a constraint.

Message No 40 (Topic 2.4)

Timothy Gondwe, PhD tgondwe@bunda.unima.mw Associate Professor in Animal Breeding, Head of Animal Science Department, Bunda College of Agriculture, P.O. Box 219, Lilongwe, MALAWI

Response to Theme 2.4 (Opportunities and constraints of using commercial feed for family poultry)

Thanks for the good deliberation on the conference. I come late due to poor internet we currently face. From my PhD study on rural poultry titled 'Characterization of local chickens in Malawi, Is there Potential for Genetic Improvement?' it was found that the potential requires both genetic and management strategies. Feeding was noted as inadequate and limiting growth rates. One on-station experiment included use of grower ration, locally formulated but like commercial feed. Growth was enhanced but poor feed conversion efficiency was observed. Overall, even with on-farm made rations, it was not cost-effective. On the other hand, on-farm evaluation encouraged supplemental feeding with maize bran. Those that supplemented had birds with higher growth rates, chick survival and egg production. This gave a clue to encourage farmers to supplement energy food by-products for enhancing productivity. In Malawi, another observation is that hens of family chickens stop laying during the rainy season. This is period of food shortage, some households resort to feeding maize bran. On households that have food during this period, used maize bran as supplemental feeds and hens did not stop laying and hatching chicks. The same observation is made on households that integrate dairy or piggery and produce concentrate feeds for the animals. Much of these observations require further monitoring and controlled studies, it appears energy based supplement feeding to scavenging resource adds value to family chicken productivity and flock sizes. This is much easier among resource poor households that cannot afford expensive protein ingredients even if we encourage them to locally make the feed. So, under current production, use of commercial feed does not exploit its advantage as genetic potential of chickens limits that, making the intervention non-profitable. It means that improving genetic potential of family poultry is the first job. The same has been the case of Black Australorp breed that is used to improve family poultry through crossbreeding in Malawi.

Message No 41 (Topic 2.4)

Filomena dos Anjos mena.anjos@libero.it Faculdade de Veterinária, Department of Animal Production, Eduardo Mondlane University , Maputo, Mozambique.

Responding to the question of Antonio Rota, I would say that:

In Mozambique, family poultry do not have a formula or manual to use to feed their birds. In general, the birds eat what they find in surrounding houses and sometimes especially in the period of harvest birds consume different cereal grains or beans. When the families provide feed, this is based on corn bran and corn grains, sometimes leftovers of coconut and peanuts (product of the extraction of coconut milk and peanuts). I hope that the next time you visit the Swaziland you will make time to come to Mozambique to see possibilities of developing rural poultry project.

Kind regards,

Mena

Message No 42 (Topic 2.5)

Vincent Guyonnet - vincent@internationalegg.com IEC Scientific Advisor, DVM, PhD, Diplomate of the American College of Poultry Veterinarians

There was an interesting paper in the International Journal of Poultry Science (2009) 8:1006-1010 by Dr. Oladoja in Nigeria entitled "Impact of private feed formulation and production as a tool for poverty alleviation among Poultry farmers in Ogun Sate, Nigeria - see link

http://www.pjbs.org/ijps/back.htm

Are the recommendations proposed by the author applied in other countries?

Message No 43 (general)

Professor Dr. S. D. Chowdhury drsdchow@gmail.com Bangladesh Agricultural University, Bangladesh

A seminar on the theme **"Indigenous poultry: Need for policy intervention and sustainable approaches to higher productivity"** was held on 28 January 2012 at the Department of Poultry Science of Bangladesh Agricultural University, Mymensingh, Bangladesh. The following are a few of the suggestions and recommendations of the day-long seminar in relation to family poultry nutrition:

1. Extensive efforts will have to be made to explore locally /produced available scavengeable feed resources and their correct assessment for indigenous poultry production. Indigenous poultry production based mostly on indigenous resources should be the main target.

2. A tremendous prospect of duck rearing exists in north-eastern districts and coastal areas of Bangladesh where scavengeable feed resources are abundant in small marshy land, pond, lake, river, canal, *haor, beel, dogi* (large marshy lands during monsoon) etc. Scientific knowledge on feeds and feeding should be disseminated to those duck farmers to augment production.

3. Institutional weakness in terms of failure to ensure strong and sufficient extension and technical services to small farmers should be removed.

4. Strong collaboration and linkage should be established among inter/intra departments, organizations, universities and research institutes in order to carry out all research and development works systematically to avoid repetitions of studies and utilization of funds in the most economical ways as possible.

5. Although the International Network for Family Poultry Development has already established a linkage with Bangladesh, it should be strengthened further in the interest of poverty reduction, nutrition and food security, income generation and empowerment of women in particular, who are the real owners/producers of indigenous poultry.

6. The National Poultry Development Policy should give more emphasis on the conservation and development of indigenous poultry in Bangladesh.

Message No 44 (Topic 2.5)

Hans Askov Jensen askov@poultry-development.dk www.poultry-development.dk Poultry Development, Hyldehoj 15, 29990 Nivaa, Denmark

In the management of family poultry, in particular with indigenous birds, I used to say that the main problem was the high mortality from 0 to 8 weeks of age and the methods to reduce the high mortality were:

1. Protect the chicks against predators by using the basket system;

2. Protect the chickens against diseases by vaccination;

3. Improve the immunity system by supplementary feeding.

The two first points have been proved by several research projects while the latter is based on common sense. Especially young chickens fed with unbalanced feed and often not in sufficient amount will not respond efficiently to vaccination. This is a hypothesis only and it can be interesting and useful to learn from others with more experiences in this field than me, because it is an essential element in using balanced commercial feed to young chickens.

Message No 45 (Topic 2.5)

Souleymane Fadiga Souleymane.fadiga@fao.org FAO, Côte d'Ivoire

To the moderator

Let me clarify the issue of feeding and the conduct of the operation that we have advocated in the Ivory Coast for improved traditional poultry farms. They are now numbered at 92 and distributed between the central, the northern and west regions. Based on 50 hens and 5 roosters, we provide to the animals the following: Four linear feeders (mixed feed containing 65% corn flour, 15% cassava flour and 20% fish meal), 2 other feeders (85% shell, 10 charcoal and 5% salt) three drinkers of water (bucket of water spilled on a plate) and a fountain (can of 25 l). I repeat that the animals are in an enclosure of 150 to 200m² with an adult shelter of 36m² and a chicks' shelter of 12m². The daily ration is estimated at 200g/pullet. Initial results are encouraging from the point of view of animal performance and the enthusiasm of the female farmers.

If we consider a sale price of 1500 FCFA for traditional chickens weighing between 1.1 and 1.5kg/live weight in our regions while in the restaurant chicken dish varies from 3500 FCFA to 5000FCFA then to the question of securing income and the fight against poverty in rural and peri-urban areas we must improve the process while keeping it under the control of farmers. We have many data and pictures that will be published shortly.

It seems that the genetic characterization of genetic diversity could also help us

Thank you

Message No 46 (Topic 2.4)

Dr El Hadji TRAORE, DMV, Dr es Sc. elhtra@coraf.org Chercheur à ISRA-LNERV, Coordonateur du Programme Productions Animales,

BP 2057, Dakar - Hann, Senegal

Opportunities and constraints of using commercial feed for family poultry.

What are your views on knowledge and attitude of FP farmers towards commercial feeds, including economic factors, such as feed prices and the return on investment?

The poultry feed production in Senegal, has become a true economic affair, an activity that applies only to operators of commercial strains of poultry. Indeed, the activity represents an important revenue that continues to improve: from 4.4 billion in 1992, it rose to 11.791 billion in 2000 to over 14 billion in 2004 and reached 32.6 billion in 2009 (Anonymous, 2005 to 2009) i.e. an increase of nearly 8 times in less than 20 years.

In this turnover, cereals, mainly maize constitutes more than half. The maize used is fully imported. Other inputs such as fish meal, oilseed meals and CMV (vitamin mineral additives) have fluctuating prices, indexed to world prices. All this makes that the selling price of concentrate feeds is not within the reach of FP farmers, who operate mostly with traditional and rustic breeds and whose productivity will certainly not cover the investments in the feed. In sum, feed sellers do not produce for family poultry which is mainly in rural areas.

What types of commercial feeds are normally purchased / used in FP

For the FP to use commercial feed in a rational and profitable way, we must review the formulas used and adapt them to the needs of poultry kept by the family producers (exotic strains or local), that means extensive to semi extensive. The work we conducted for the development of FP showed that among the three constraints that hinder the development of rural family poultry business the feed deficit is one. Considering the use of commercial feeds in FP should therefore be encouraged. But this requires using appropriate formulas, incorporating local raw materials at lower cost as from mills such as bran, the dried leaves of some legumes like Moringa etc. In sum, research must propose formulas to manufacture commercial feed for FP, which can cover at least all the maintenance requirements.

Supervised and sensitized, FP producers will very quickly realize the efficiency of such rations and will adopt them. With a control of the main diseases, accompanied by suitable environment, a small improvement in the diet can significantly increase the profitability of family poultry farming.

Message No 47

Med.Vet.Jose Francisco Rafart Anton jfrafart@correo.inta.gov.ar
Coordinador de Desarrollo Rural-INTA EEA Las Breñas-Chaco-Argentina,
Referente técnico del componente granja aves para el Programa PROHUERTA en Argentina y Haití.

Aportes y Comentarios para la conferencia

Agradezco a todos este espacio que hemos tenido para discutir e intercambiar ideas y puntos de vista de cada uno. Pero me quiero tomar el atrevimiento de contarles un poco más sobre mi experiencia de 15 años trabajando en el componente granja del

programa PROHUERTA. La granja en este programa tiene como objetivo complementar, a través de la producción familiar de aves, la dieta de las familias a través de la producción de huevos y/o carne. Para el caso de Argentina se trabaja con dos biotipos de aves ponedoras (Negra y Rubia INTA) y un biotipo para producción de carne de crecimiento lento (Pollo Campero), son muy rústicos y con una producción que ronda el 50 a 60 % de producción promedio/día en huevos y el pollo de carne de 2.6 Kg. en 100 días. Se llega a las familias con capacitación previa (equipos técnicos) y posteriores seguimientos de estos sistemas.

En estos momentos estamos realizando una evaluación de impacto en Argentina que todavía no está totalmente analizada pero quiero compartir alguna de las conclusiones. Los sistemas de producción generalmente son semi-intensivos, con multiplicidad de especies y con convivencia de biotipos, criollos, comerciales y sus cruzamientos. La alimentación se compone de restos de comidas, cereales, alimentos comerciales y sus mezclas. La conversión estimada en estos sistemas de aproximadamente 2,5 kg de alimento por cada docena de huevos producida. Estas familias si tuvieran que adquirir el huevo en el marcado formal le cuesta 1,37 dólares la docena, pero sus costos de alimentación son de 1,03 dólares utilizando alimento comercial y de 0,53 dólares con alimento casero para obtener una docena de huevos, permitiéndoles además poder vender si tienen excedentes a 1,83 dólares la docena en mercados no formales o venta directa.

Para el caso de el programa en Haití se ha hecho una adecuación de la experiencia de Argentina, esto es importante que se haga de esta forma porque es importante que las propuesta de desarrollo a partir de experiencias sean analizadas en profundidad antes de ser replicadas, hay que hacer buenos diagnósticos integrales previos, proponer inicialmente pruebas piloto, hacer seguimientos ,evaluaciones y ajustes, para luego comenzar a masificar los proyectos, no perdiendo la visión de los seguimientos y ajustes que sean necesarios sobre la marcha para darle sustentabilidad a los proyectos y que sean apropiados por la gente. Hago esta aclaración porque es el camino que estamos transitando con la adecuación en Haití, en el cual actualmente hemos pasado la etapa de piloto y estamos en proceso de masificación. Actualmente se están entregando aves de tipo comerciales(rusticas) en edad de recría (60 días), con un plan sanitario que garantice supervivencia de las aves y que a su vez no sean producto de diseminación de enfermedades, proveemos las familias también de capacitación previa para la cría de aves, como fabricar su alimento en forma casera, como hacer los gallineros con recursos disponible locales y además como manejar y cuidar el buen estado de los huevos que producen(inocuidad) y con una fuerte concientización sobre normas simples de bioseguridad. Con respecto a la alimentación de las aves en Haití es muy diferente, y comparto los comentarios de algunos participantes, el alimento comercial llega e este país a un alto costo 0,70 dólares el Kg. Por lo tanto la propuesta del manejo de la alimentación es diferente a la Argentina, a pesar que lo índices productivos diarios son semejantes(60 % postura diaria) la utilización sola de alimentos comerciales no es rentable, porque en el mercado el huevo cuesta 1,5 dólares/docena, y producirla en estos sistemas cuesta 1,75 dólares / docena de alimento comercial, pero si es viable trabajar con producción de alimento casero, a base de maíz, arroz o sorgo y porotos, que con el agregado de conchilla de mar y ceniza de huesos y sal se puede lograr una ración balanceada optima y a un costo 1,37 dólares. Ante esta situación la propuesta del programa en Haití tiene una fuerte concientización y capacitación en la planificación productiva de la huerta con el objetivo de obtener además de los alimentos para la familia y excedentes para la elaboración de alimento casero para las aves.

Como comentario de importancia quiera hacer una mención especial a una de las claves importantes del programa tanto de Argentina como Haití ,que son los "promotores ",los cuales se comportan como líderes en sus comunidades y/o instituciones y son el pilar fundamental para llegar con las propuestas técnicas a las familias.

Concluyo con ustedes con algunas reflexiones, cuando pensemos en propuestas de desarrollo, para estos casos como la avicultura familiar, como fuente de ingresos de alimentos como carne u huevos (proteínas de alto valor biológico), debemos ser cautos y con sentido común, los papeles resisten todo, pero cuando los bajamos a terreno llegan las sorpresas y hasta los fracasos. Hay que tener en claro que debemos dar un salvavidas y no chaquetas de plomo, hay que definir claramente la población y formas de abordaje, hay que definir objetivos logrables, transmitir mensajes claros y, debemos estar continuamente con la gente, debemos ser importantes y no indispensables.

Un afectuoso saludo a todos

Contributions and comments for the conference

I like to thank all participants for the opportunity to discuss and exchange ideas and views. I want to share with you my experiences of 15 years working in the agricultural component of the program PROHUERTA. The intention of this programme is to supplement, through family poultry production of eggs and / or meat, the diet of families. In the case of Argentina we are working with two genetic types of laying hens (White and Blonde INTA) and one type that is ideal for meat production and slow growing (Field Chicken). All are very rustic, with an output of around 50 to 60 % of average egg production and the production of 2.6 kg chicken meat in 100 days. The families receive initial training (technical equipment) and the results are being monitored.

We are currently conducting an impact assessment of this work in Argentina which is not yet finished but I want to share with you some of the conclusions. The production systems are usually semi-intensive, with coexistence of multiple species and genotypes, including Creole, commercial birds and their crosses. The diet consists of food waste, grain, commercial feeds and mixtures thereof. The estimated conversion rate in these systems is approximately 2.5 kg of feed per a dozen eggs produced. If these families had to buy the eggs at the formal market they would have to pay US$ 1.37 for a dozen. If they produce the eggs themselves, the feed costs for a dozen eggs are US$ 1.03 by using commercial feed and US$ 0.53 for homemade food, this allows them to achieve good surplus. Moreover, if they sell their extra eggs on non-formal markets or directly to consumers they will receive US$ 1.83 a dozen.

The program in Haiti has been an adaptation of the experience of Argentina. It is important to analyze the results in depth before one can replicate development approaches. This should include a comprehensive diagnostic of the positive achievements of the pilot activities, an evaluation of the adjustments needed, and then starting to expand the scale of projects, not losing track of any necessary adjustments on the way to give sustainability to the projects and that they are appropriate for the targeted people. I make these comments because it is the approach we are following in Haiti, which has now passed the pilot stage and we are in the process of up scaling. There we are currently providing commercial-type birds (rustic) with an age of 60 days, combined with a health plan that ensures survival of birds, training for the families prior to the distribution of the breeding birds. This

training includes how to produce feed at home, the construction of bird houses with local resources available, how to handle and take good care for the eggs produced (safety) and a strong awareness of simple standards of biosecurity. The feeding of birds in Haiti is very different from Argentina, and I share the comments of some participants about the commercial feed which arrives in this country at great cost of US$ 0.70 per kg. Therefore the proposal of feeding management is different from Argentina. Although the daily production rates are similar (60% daily posture) the use of commercial feed alone is not profitable, which would cost US$ 1.75 for a dozen eggs compared to the market price of the eggs of US$ 1.5. However, it is feasible to work with home feed production, by using corn, rice, sorghum and beans, and an addition of sea shell, bone ash and salt. A balanced ration can thus be achieved with a cost of US$ 1.37. For that reason the proposed program in Haiti has a strong awareness and training in planning of crop production both as food for the families and to generate surpluses to prepare homemade feed for the birds.

An important component and key for the programs both in Argentina and Haiti are the "voluntary promoters", which act as leaders in their communities and / or institutions and are the cornerstone to reach the families with the technical proposals.

Finally I want to say that if we think of development proposals for FP as a source of income for food such as meat or eggs (protein of high biological value); we must be cautious and use common sense. We may have a good plan but when we go down to the ground there come up surprises and failures. It should be clear that we have to give people lifejackets not jackets of lead, we must clearly define the population and ways to deal, you must define goals achievable, convey clear messages, we must be continually with people, and we must be important and not indispensable.

Warm regards to all

Paper No 1

Harry Swatson Harry.Swatson@kzndae.gov.za Cedara College of Agriculture, Hilton 3245, KZN, South Africa

Abstract

An assessment of the nutritive value was made of several insects and their larvae including the Mopani worm (*Imbrassia belina*), the Stink bug (*Pentatomidae*) and termites. The protein and available lysine concentrations of the Mopani worm (MW) and Stink bug (SB) were 586.7, 362.7 g/kg and 30.4 and 9.04 g/kg, respectively. The apparent and true metabolizable energy (AME_n and TME_n) values were 11.34, 22.12 and 11.74, 22.53 MJ/kg DM respectively. The nutrient and energy concentrations of these insects compare well with fishmeal and soybeans, with similar amino acid profiles that meet the requirements of a scavenging chicken. Simple processing (i.e. drying) may be required to improve the quality of the supplementary protein sources before feeding.

Keywords: Assessment, Insects, scavengeable feed resources.

Introduction

Feeding of a blend of high levels of conventional protein feeds such as soybean meal to freely ranging indigenous chickens may not always be practical, whilst fish-meals or commercial poultry feeds are very expensive. The scavenging feed resource base (SFRB) also varies with seasons, climatic conditions, and farming activities whilst the average levels of crude protein, energy, calcium and phosphorus are low (Goromela *et al*., 2006). The low levels can be corrected by providing a free-choice supplement of feeds such that when chosen in some proportion will meet the requirements of the FRICs. This includes unconventional protein sources like insects. A series of unique studies were undertaken to evaluate the chemical composition, energy and amino acid digestibility of selected insects in FRICs diets.

Materials and Methods

Analytical methods

Several samples of Caterpillars, Stink bugs, termites and leguminous seeds were collected, dried and ground to pass through a 1 mm sieve before chemical analysis. Samples were analyzed for moisture from which dry matter (DM) content was calculated. The crude protein content was determined with a LECO EP2000 Nitrogen Analyzer, based on the Dumas combustion method. Amino acid (AA) concentrations were obtained using the AA analyzer (Beckman System 6300, Palo Alto, California, USA). An adiabatic bomb calorimeter (DDS CP500, South Africa) was used to measure gross energy of the ground insect samples and excreta samples from the digestibility study.

Digestibility trial

Three groups of 12 adult cockerels of the same breed were each fed different insect samples and the third group was fed glucose solution. The precision feeding technique described by McNab and Fisher (1984) was used to determine the nitrogen corrected apparent and true metabolizable energy (AME_n and TME_n, respectively) and true amino acid digestibility (TDAA) values of samples.

Results and Discussion

In KwaZulu-Natal **(**KZN), supplementary FRIC (free ranging indigenous chicken) diets are based largely on vegetable matter and cereals such as maize or cereal by-products that are energy supplements. The main deficiency that could arise will be that of protein and hence amino acids such as methionine and lysine. Following the consumption of a diet with an amino acid profile deviating from an ideal balance, there are adverse effects varying from lowered growth rates, food intake, and nutrient utilization to acute neurological abnormalities and low survival rates (Harper *et al*., 1970; Swatson, 1997). Maize gluten, Fishmeal, Soybean meal and sunflower contain crude protein**,** lysine, methionine, leucine contents of 665.6, 623.1, 444.6, 431.4; and 1.6, 4.8, 7.1, 2.7 and 2.9, 3.7, 1.3, 2.1 and 17.0, 8.8, 8.8, 6.7 g/kg of protein sources respectively. When these protein sources were offered on a free-choice basis to chicks, they selected against maize gluten, this being the most badly balanced amino acid containing mixture (Swatson, 1997). The most useful measure of protein quality of scavenged protein sources will be that of the available lysine.

The protein and available lysine concentrations of the caterpillar (CTP) and Stink bug (SB) were 586.7, 362.7 g/kg and 30.4 and 9.04 g/kg respectively, whilst the apparent and true metabolizable energy (AME_n and TME_n) values were 11.34, 22.12 and 11.74, 22.53 MJ/kg DM, respectively. The crude protein content of the termites (548.3 CP/kg) was similar to that of the CTP (586.5g CP/kg) but higher than that of the commonly fed pumpkins (351.1 g CP/kg) and other legume seeds determined in our previous study.

The AME_n of the SB (22.1 MJ/kg) and the pumpkins (18.2 MJ/kg) was greater than that of the CTP (11.3 MJ/kg), termites (9.3 MJ/kg) and leguminous seeds. All potential sources of protein provided large amounts of phosphorous ranging from 2.6 to 3.6 g/kg, but the CTP and termites were a much better source of dietary calcium (1.9 to 3.2 g/kg). The concentrations of all AA's tended to be higher in the CTP than the SB, whereas the AME_n values for SB were twice that in CTP. The question to be posed is "can the amino acid requirements of the FRICs, based on maximal response in some criterion such as growth, feed utilization, improved carcass content or immune status be met precisely with the protein containing ingredients on offer?. Choice feeding and mixture experiments could be used in determining the optimum combination of those supplementary protein-containing ingredients that allow the FRICs to attain their best biological performance under improved traditional rearing systems.

Conclusion

The nutrient and energy concentrations of these insects compare well with fishmeal and soybeans, with similar amino acid profiles that could meet the requirements of FRICs. The provision of supplementary feeds containing balanced amounts of unconventional protein sources such as insects, together with improved husbandry conditions would lead to an improvement in FRIC production.

References

GOROMELA, E.H., KWAKKL, R.P., VERSTEGEN, M.W.A. and KALUTE, A.M. (2006) Strategies to optimize the use of scavengeable feed resource base by small holders in traditional poultry production systems in Africa: A review, African Journal of Agricultural Research Vol. 1 (3), pp. 091–100, November 2006.

HARPER, A.E., BENEVENGA, N.J. and WOHLEUTER, R.M. (1970) Effects of ingestion of disproportionate amounts of amino acids. *Physiological Reviews*, 50: 428-558.

McNAB, J.M. and Fisher, C. (1984) An assay for true and apparent metabolizable energy. Proc. XVIII World Poultry Science. Carg. Helsinki, p.374.

SWATSON, H.K. (1997) The use of choice feeding and mixture experiments to evaluate protein sources used in broiler feeds, MSc Agric. Thesis, University of Natal, KZN, South Africa

Paper No 2 (see Message 1a)

Paper No 3

Developing and promoting improved family poultry feeding systems

Anjos, F.[1], Gonçalves,S.[2],

[1]Veterinary Faculty, Universidade Eduardo Mondlane, Maputo, Mozambique.

[2]Department of Animal Science, Agricultural Research Institute of Mozambique, Maputo, Mozambique.

Corresponding author: mena.anjos@libero.it

Keywords: Family Poultry, feeding system

In Mozambique, availability of feed, water and mortality due to Newcastle Disease are the main production constraints for family poultry. With mortality due to ND being gradually controlled thanks to vaccination by government and NGO's (Langa, 2001, CARE et al., 2006, IRPC, 2006, Tomo, 2009) the main constrain to expansion of flocks is scavenge feed resource base (Alders et al., 1997, Woolcock et al., 2004, Sonaiya et al., 2002) since supplementary feeding is not commonly done (Harun and Massango (2001). Taking in account the above, there is a need to improve the feeding system to increase production. Some possible suggestions that could be explored are outlined below:

a) Create a system to collect household organic waste

It would be interesting to create a simple system to collect daily organic waste products and where possible store them under acceptable quality condition. Constraints to this approach may be that the waste will be not enough in terms of quantity and quality due to the lower levels of essential nutrients. In addition the composition may vary significantly possibly resulting in a dietary imbalance. Case studies could be done in order to assess the viability of the approach.

b) Promoting alternative feed production with potential for family poultry feeding

- **Production of agro forest species on marginal agriculture areas**

Diet of scavenging chickens can be improved through planting of perennial trees, shrubs and climbers which produce seeds, fruits and foliage that the birds can eat (Simons, 2009).

- **Production of insects**

The availability and the quantity of different insects consumed by the birds during scavenging time vary according to the season. During the rainy season there are abundant and different types of worms and maggots (e.g. snails, earthworms), insects (termites), can all be used as poultry feed, as a rich source of protein. But as they are limited in the environment during the dry season they can be produced for

each smallholder. If these could be produced at larger scale this could be a good source of protein especially in the dry season.

c) Integration of subsistence and cash crops in the household production system

In regions of high production and with homemade or industrial processing of oil crops, farmers must be encouraged to produce and use the by-products (cake), mainly from, coconut (*Cocosnucifera spp*), mafura oil (*trichilia emeticavahl***)** sunflower (*Helianthus annuus*) and sesame (*Sesamum indicum*). Mixing these ingredients with other by-products would be possible to formulate balanced diets for birds.

References:

Alders, R.G., Fringe, R. and Mata, B.1997. Village Chicken Production in Bilene District, Mozambique: Current Practices and Problems. Proceedings IFPD workshop, M' Bour, Senegal, Dec.9-13, 1997

CARE, OLIPA, (IDEMU). 2006) Balanço final do outsourcing de extensão. Iniciativa para o desenvolvimento de Murrupula. Financiado por DNER- MINAG. Mozambique

Harun, M. and Massango, F.A. 2001. Village Poultry Production in Mozambique: farming Systems and Ethno veterinary Knowledge in Angónia and Tsangano District, Tete Province. In: Alders, R.G. and Spradbrow, P.B. ed. (2001) SADC Planning Workshop on Newcastle Disease Control in Village Chickens. Proceedings of an International Workshop, Maputo, Mozambique, 6-9 March 2000. ACIAR Proceedings No. 103. (170pp). pp 76-79.

International Rural Poultry Centre(**IRPC), 2006.** Improvement of village chicken production in Chibuto District.Third Activity Report to CSL by the International Rural Poultry Centre (KYEEMA Foundation).Maputo, December 2005.

Langa,J.S.R. 2001 . Mozambican Field Experience-. Gaza Province. In: Alders, R.G. and Spradbrow, P.B. ed. (2001) SADC Planning Workshop on Newcastle Disease Control in Village Chickens. Proceedings of an International Workshop, Maputo, Mozambique, 6-9 March 2000. ACIAR Proceedings No. 103.(170pp). pp101-103.

Simons, I., 2009. Upgrading the scavenging feed resource base (SFRB) for scavenging chickens; Part I. Preferred perennial species.Livestock Research for Rural Development.Volume 21, Article #105. Retrieved January 12, 2012, from http://www.lrrd.org/lrrd21/7/simo21105.htm

Sonaya, E.B. Dazogbo, J.S., and Olukosi, O.A. 2002.Further assessment of scavenging feed resource base, in Characterizationparameters of poultry production in Africa. Results of a FAO/IAEA Co-ordination Research Programme, International Atomic Energy Agency, Vienna (2002)

Tomo, A. A., 2009. Economic impact of Newcastle disease control in village chickens: A case study in Mozambique. Thesis submitted to Michigan State University. In partial fulfillment of the requirements for the degree of Master of Science.

Woolcock, R.F., Harun, M., and Alders, R.G. 2004. The impact of Newcastle disease control in village chickens on the welfare of rural households in Mozambique. Paper presented at the Forth Co-ordination Meeting of FAO/IAEA Co-ordination Research Programme on the Assessment of the effectiveness of vaccination strategies against Newcastle Disease and Gumboro Disease using immunoassay-

based technologies for increasing backyard poultry production in Africa. Vienna, Austria, 24-28 May 2004

Paper No 4 (Topic 2.4)

Dr ABOH Boya André aboh.solex@gmail.com; a2abohboya@yahoo.fr

Laboratoire de Recherches Zootechnie Vétérinaire et Halieutique, Institut National des Recherches Agricoles du Bénin

Opportunities and Constraints of using commercial feed for family poultry

An experiment was conducted to evaluate the effects of rearing methods i) permanent confinement and scavenging on weight gain and economic return. The type of farming has affected the strain Isa Brown cockerels, local chickens and hybrid produced by crossing Isa brown x local chicken. Each type of chicken raised in confinement has received the commercial diet (Start: 17.85 % CP and 2789 kcal / kg; the grower phase: 15.88% CP and 2685 kcal /kg and finishing 17.1 % CP and 2655 kcal /kg). On the contrary, free-range birds have not received any dietary supplement.

The results indicate that:

1. *For birds in confinement, daily consumption is higher among Isa brown chickens, medium in hybrids and low among local chickens.*
2. *At starter and grower stages of each type of chickens, the average daily gain (ADG) was higher in each type of chickens in confinement than in the same types of scavenging. In contrast, at the finishing stage, the ADG was higher in all types of scavenging chickens compared to the same types of chickens in confinement.*
3. *Feed conversion at starter, grower and finishing in Isa Brown cockerels was low (3.67, 5.65, 9.44) medium for the hybrids (2.94, 6.04, 10, 54) and higher among local chickens (3.3, 7.12, 12.96).*
4. *The production cost per kilogram of live weight chicken in confinement was 4 to 6 times more expensive than those scavenging whatever the types of chickens.*

From this study, we conclude like other participants that commercial feed concentrates are not profitable as single feedstuffs to feed FP chickens.

From future perspective, with pressure on land, climate change and increasing number of chickens, a variety of feedstuffs (fodder, insects, earthworms, seeds etc.) could become rare with dramatic consequences on livestock.

That's why concentrated commercial feed may be used as a supplement after scavenging.

Paper No 5 (Topic 2.2(a)

M. Y. MIAH myoumsau2003@gmail.com Department of Poultry Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

Growth performance and meat yield of indigenous (*desi*) chicks receiving diets of different nutrient densities in confinement

Growth performance and meat yield characteristics of indigenous (*desi*) chicks were studied by feeding diets of varying nutrient concentrations during 3-12 weeks of age under confinement system of rearing. Two hundred twenty eight birds were initially brooded for 3 weeks and subsequently divided into 4 dietary treatment groups and reared on littered floor in an open sided house providing a floor space of 1.4 sq. feet per bird. Dietary treatments consisted of an arrangement of four diets that contained: broken rice-65%+ rice polish-30% + protein concentrate-1% (control; 2800 kcal/kg + 9.5% CP); a low nutrient density (LND) diet of 2400 kcal ME/kg + 19% CP, a moderate nutrient density (MND) diet of 2600 kcal ME/kg + 21% CP and a high nutrient density (HND) diet of 2800 kcal ME/kg + 23% CP. The contents of CP, ME and calcium (Ca) in high nutrient density (HND) diet were built-in with the requirements for broiler starter as suggested by the Bureau of Indian Standards (BIS), 1992. Diets were formulated using locally available feedstuffs. While initial body weight at 3-week was similar in all dietary groups, the final body weight of birds at 12 weeks was 598.43, 760.28, 783.63 and 849.89g in control, LND, MND and HND diet respectively. The highest body weight (850g) and live weight gain (719.89g) as observed in birds receiving HND diet differed significantly ($p<0.01$) from those of control and LND diets. The body weight gain of birds was 468.75, 631.61, 657.63 and 719.89g for control, LND, MND and HND diet respectively. FCR of birds fed *ad libitum* was 5.42, 4.66, 4.57 and 4.26 for control, LND, MND and HND diet respectively. The birds of HND diet group consumed the highest amount of feed and their feed conversion efficiency (4.26) differed significantly ($P<0.01$) from control and LND groups. Differences in dressing yield percentage were not significant among birds of different dietary treatments. Feeding HND diet had a tendency to yield higher breast meat but only drumstick meat increased significantly ($P<0.05$) in comparison with the control group at 12 weeks of age.

It may be concluded that it is possible to formulate least-cost poultry diets by incorporating locally available feed ingredients and the responses of indigenous birds to HND is most favourable and therefore its nutrient specifications may be followed for formulating diets for feeding indigenous (*desi*) chicks in confinement. Feeding such diet to satisfy nutrient requirements was also found to be most cost effective.

E-conference of the International Network for Family Poultry Development (INFPD) in collaboration with FAO and supported by the International Fund for Agricultural Development (IFAD)

Family Poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints

PART III

Summary and conclusions

Prepared by
S. D. CHOWDHURY[3], D. LUSEBA[4] and O. THIEME[5]

Contents

[3] Department of Poultry Science, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh,
[4] Department of Animal Sciences, Tshwane University of Technology, Pretoria 0001, South Africa
[5] Animal Production and Health Division, FAO, Rome, Italy

1. Executive summary

As part of the IFAD funded project "Smallholder Poultry Development Program" a second e-conference was held between 16 January and 17 February 2012 with the theme **"Family Poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints".** This was organized by the International Network for Family Poultry Development (INFPD) and the Food and Agriculture Organization of the United Nations (FAO). The following aspects of Family Poultry production were discussed during the conference:

1. Climate change and the future availability of the scavengeable feed resource base (SFRB) for Family Poultry.
2. Recent development in assessing feed resources for Family Poultry production including the scavengeable feed resource base (SFRB).
3. Nutritional opportunities and constraints of integrating Family Poultry with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc).
4. Opportunities and constraints of using commercial feed for Family Poultry.
5. Developing and promoting improved Family Poultry feeding systems.

A background document was prepared and distributed to the registered participants in order to facilitate the discussion. A total of 210 participants registered for the conference, some of them after the discussions had started. Efforts were made to discuss the different topics separately but all were open for discussion throughout the conference time. Forty seven messages and four short papers were received from 20 countries which were distributed to the participants along with French version during the conference time. However, edited versions of all messages and papers were also transmitted to the participants at the end of the conference. In addition to the specific topics that were addressed in the conference, some general comments of the participants in relation to Family Poultry production system and their nutritional aspects were also considered important and therefore included in the document. The conference was jointly moderated by Professor Dr. S. D. Chowdhury, Department of Poultry Science of Bangladesh Agricultural University, Mymensingh, Bangladesh and Dr. D. Luseba, Department of Animal Sciences, Tshwane University of Technology, Pretoria 0001, South Africa being assisted by Dr. Olaf Thieme, Animal Production and Health Division, FAO, Rome, Italy. This document is a synthesis report of the conference.

Although being an issue of global importance and affecting Family Poultry production few participants responded to the sub-topic about climate change and the future availability of the scavengeable feed resources (SFRB) While the participants generally agreed that the impact of climate change is quite visible there is a paucity of information in this regard and viable data in relation to the impact of climate change on availability of SFRB are still to be generated. This should be a continuous process in order to better judge how FP production systems cope under changing situations. The impact of climate change should better be addressed by identifying new feed resources and using different feeding techniques.

The participants found that assessing feed resources including the scavengeable feed resource base is an important topic for Family Poultry production. It was suggested that the old methods of such assessment need to be improved by using birds' performance in order to make it more accurate. Seasonal factors/influence should also be taken into account. Recommendations from a recent seminar held in

Bangladesh provide information for a better assessment of the locally available/produced feed resources with an emphasis of indigenous poultry production based mostly on indigenous resources.

Concerning nutritional opportunities and constraints of integrating Family Poultry with other production systems, in particular, forestry, tree crops, annual crops, large animals, fisheries, etc, few responses were obtained from the participants. Chicken/duck-cum-fish farming appeared to be problematic from the environmental point of view. Integration of ducks to rice production system in Asia seemed to be fruitful and that of geese to crop to suppress weed growth was suggested. Indian experience showed integration of FP with horticulture by utilizing droppings for vermin compost and earthworm production as sources of proteins for birds. However, farmers' knowledge on integrated system is required to exploit such an endeavor.

The discussions on opportunities and constraints of using commercial feed for Family Poultry received the largest interest and contribution with more than half of the contributions addressing it. The knowledge and attitudes of FP farmers towards commercial feeds, the types of commercial feeds normally purchased/used by FP farmers, the source of raw materials or ingredients used in feed formulation and the profitability of using commercial feeds were the specific points of discussion. The knowledge of the FP farmers about commercial feeds in general, was considered poor with the exception of those who are producing with commercial strains of poultry. Commercial feeds are being used either by commercial farmers in the interest of ensuring profits or by FP farmers who have native stocks and financial opportunities to buy. The commercial farmers always try to purchase the right type of feed for their birds, but it is not unusual that an incorrect type of feed is purchased to save their birds from starvation at the time of unavailability of alternatives. For the second group of FP producers the selection of the type of feed is not always professional. Usually, there are two sources of raw materials for commercial feed formulation: agro-industrial products/byproducts of local origin and those of imported origin. Importation makes commercial feeds costly and in developing countries they sometimes suffer from quality in the absence of a strong quality control system.

There were differences of opinion among the participants whether using commercial feeds for FP can be profitable. Out of the 24 messages on this theme, 17 participants supported the use of commercial feed. The others were opposed to its use mainly because of economic reasons but also because of limitations coming from the genetic potential of the local poultry. A number of constraints have been identified for using commercial feeds for FP farmers. The indigenous (native) stocks are highly valued because of their brooding and scavenging traits but their low genetic potentiality puts a question on the use of commercial feeds and its profitability. There were reports that feeding commercial feeds for FP can be profitable since the birds are always priced higher (more than double) compared to commercial strains. However, there were also reports about constraints in doing that like wastage of feeds, variation in feed quality, prolonged storage, rodent contamination, lack of access to readily available feeds, alternative feed ingredients or markets, lack of appropriate transport for feeds and high cost. Education and training along with FP rearing information would help in overcoming these constraints and consequently, profits could be ensured. It was concluded that in general due to economic viability, full feeding with commercial feed cannot be recommended. Instead using home-made mixtures from locally available feedstuffs prepared under the guidance of extension workers is recommended.

The last topic of discussion was how to develop and promote improved Family Poultry feeding systems. Different strategies, although not extensive, were

suggested by the participants to develop and promote feeding systems for FP. These feeding strategies need to be developed based on the conditions in specific locations (regions) so that homestead leftovers, grains, agricultural by-products can better be utilized. There is a need to educate farmers about commercial feeds, particularly regarding types and quality and to create awareness among them. They should be trained on collecting, mixing and feeding of home-made/home-grown feed ingredients. Minimizing wastage during feeding could economize feeding procedure and improve feed conversion ratio (FCR). Particular attention is needed to consider the situation of indigenous (local) breeds. Inclusion of vitamin-mineral premix or individual mixture (either vitamin or mineral) with local ingredients could be practiced to improve the production. Supplementary feeding of nutritionally balanced feeds to young scavenging birds of chicks/ducklings up to three or four weeks at home in confinement will help gain weight and reduce early mortality. Total confinement of birds for meat and/or egg production by providing balanced diet could be practiced under specific conditions. However, the participants emphasized the need to consider the cost effectiveness of such efforts for birds reared under both scavenging and confinement systems. There were proposals to use locally produced feed ingredients as alternatives to imported ones depending on country and locations. Extension methods and approaches can play a vital role in developing and promoting improved Family Poultry feeding systems. This can be implemented by establishing a model village with facilities for training of FP farmers and dissemination of technologies generated by scientists.

By synthesizing the different views that were expressed by the participants, the following conclusions and recommendations are provided by this report:

- Strengthening research that includes studying the possible impacts of climate change on FP production and ways of mitigating its consequences;
- updating the current method of assessment of SFRB;
- supplementary feeding of nutritionally balanced diets depending on location, seasons, and availability of SFRB;
- increased use of household wastes and crop residues in feeding practices;
- utilization of local feed resources as much as possible as this would result in better production and improved profitability;
- assessment of nutritional needs of different types of FP;
- development of feed formula locally, based on nutritional needs;
- practicing creep feeding of chicks and supplementary feeding of growing chicks and layer birds to achieve higher productivity;
- determination of cost-benefit ratio of feeding commercial/industrial/home-made feed to ensure sustainability;
- Training of FP farmers regarding feeds, nutrition and related poultry husbandry practices to achieve higher outputs;
- conduction of adequate FP research with respect to nutritional aspects, feeds and feed management;
- holding local, regional and international conferences in developing countries to determine future development strategies; and
- planning all development models cautiously and executing those in collaboration with local consultants/experts so that the FP farmers can benefit from the technologies that are generated by research.

2. Introduction

As part of the IFAD funded project "Smallholder Poultry Development Program" a second e-conference about Family Poultry production was organized by the International Network for Family Poultry Development (INFPD) and the Food and Agriculture Organization of the United Nations (FAO). The title of the e-conference was **"Family poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc): Nutritional opportunities and constraints".** The discussions of the conference took place from 16 January to 17 February 2012 and addressed the following issues:

1. Climate change and the future availability of the scavengeable feed resource base (SFRB) for Family Poultry.
2. Recent development in assessing feed resources for Family Poultry production including the scavengeable feed resource base (SFRB).
3. Nutritional opportunities and constraints of integrating Family Poultry with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc).
4. Opportunities and constraints of using commercial feed for Family Poultry.
5. Developing and promoting improved Family Poultry feeding systems.

A background document was jointly prepared by Dr. S. D. Chowdhury, Professor, Department of Poultry Science of Bangladesh Agricultural University, Mymensingh 2202, Bangladesh and Dr. L. Dibungi, Department of Animal Science of Tshwane University of Technology, Pretoria 0001, South Africa to introduce the above-mentioned topics. A few questions were set in this document for each of the above-mentioned issues to facilitate discussion by the participants. It also contained information about the implementation of the conference and how to participate. A technical committee comprising INFPD scientists (Dr. Olaf Thieme from FAO, Rome, Italy, Dr. E. B. Sonaiya from Nigeria, Dr. Md. A. Saleque from Bangladesh and Dr. E. Gueye from Senegal) assisted in its preparation. Both English and French versions of the document were distributed to the registered participants before the commencement of the conference. Contributions to the discussions were accepted in English and French and translated by Dr. Dibungi into the other language. A total of 210 participants registered for the conference, some of them after the discussions had started. Efforts were made to discuss the different topics separately but all were open for discussion throughout the conference time. Participants from 20 countries actively contributed to the e-conference with 47 messages. In addition four short papers were also submitted and shared with the participants. The contributions were shared with the participants during the e-conference and a list of all messages was also provided to them at the end. The largest number of contributions came from Bangladesh followed by South Africa and India. This document is a summary of the views expressed by the participants in their messages and short papers. In addition to the specific topics that were addressed some general comments of the participants in relation to Family Poultry production system and their nutritional aspects are also considered important and therefore included in the document.

3. Summary of the conference topics

The majority of Family Poultry production in developing countries is practiced with a low input low output system for income generation, poverty reduction, self-employment, women empowerment and house-hold nutrition security of the resource poor. This type of production usually involves flocks of small size that the farmers can afford. The economics of production are obviously an important factor, no matter which type of birds the farmers are rearing. Its interactions with other production systems, nutritional opportunities and constraints in particular are the vital points that need to be considered to accelerate the development process. Keeping this view in mind, this summary of the e-conference presents an account of information synthesized from responses of participants to the different topics that were discussed.

3.1 Climate change and the future availability of the scavengeable feed resource base (SFRB) for Family Poultry

Although climate change has become a global issue and obviously has an impact on the future availability of the scavengeable feed resource base for Family Poultry, only few participants responded to this theme. The paucity of information in relation to Family Poultry (FP) might be one reason for this lack of contribution as the subject is mostly dealt with in relation to other agricultural production systems, and not even in the case of industrial poultry production. Two questions were open for discussion: (a) how and to what extent may climate change affect FP production and the availability of the SFRB and (b) what will be the future availability of SFRB under changing circumstances such as urbanization, industrialization etc?

Competition for foods and feeds between human and poultry necessitates an adjustment of dietary raw materials for poultry production and its utilization depending on seasons of the year. This is changing as a result of climate change (**Mirzaei**, 1[6]). FP are raised in the different agro-ecological zones mostly in a scavenging environment that have varying degrees of vulnerability to climate variability and change (CVC). The future availability of SFRB will be affected directly or indirectly (**Ngeno,** 2, **Sonaiya**, 3) through changes in quality and quantity of natural sources of feed and water and also its composition (**Ngeno**, 2). Even the occurrence of cyclones, hurricanes, floods, tidal surge droughts and the uprooting of millions of people due to continuous river erosions (**Pervin**,14; **Ekoue**, 5, 19) have influence on the availability of the SFRB. The changing pattern of ambient temperature, relative humidity, insulation rate etc. may result in the growth of fruit/seed bearing hardier plants that could be utilized for the production of alternate feed resources (**Sonaiya**, 3). But as indicated in a number of previous studies on identification and quantification of crop/crop-gizzard contents it is also widely accepted that the SFRB may even vary without the impact of climate change (**dos Anjos**, 4). It is stated that the impact of climate change may even cause farmers to change the poultry species that they are rearing (**Sonaiya**, 3; **dos Anjos**, 4) although **Dibungi** (13) argued that one species of poultry will not be a true substitute for another. For that reason the impact of climate change should better be addressed by finding new feed resources and using different feeding techniques. **Pervin** (14) emphasized that millions of people have been uprooted because of river erosion in the coastal areas of Bangladesh as a consequence of climate change and that has also limited the availability of SFRB. The productivity of ducks has been

[6] The numbers given with the references refer to the list of messages prepared from the contributions to the e-conference.

found to be season dependent. However, it seems generally accepted that viable data in relation to the impact of climate change on availability of SFRB are still to be generated (**Ekoue**, 5) and this should be a continuous process in order to better judge how FP production system cope under changing situations. **Rangnekar** (22) argued about the use of the term scavenging, suggesting as better term "foraging " or "free ranging" and expressed the view that the birds have an inherent capacity of coping with changing situations caused by climate change.

3.2 Recent development in assessing feed resources for Family Poultry production including the scavengeable feed resource base.

Gunaratne (15) suggested a further fine tuning of measuring the SFRB to make it more accurate to suit today's situation by using bird performance in addition to the current method of SFRB measurement. This would not only aid an accurate assessment but also help in verifying the values coming from present SFRB measurements, statutes of utilization of SFRB, quality etc. **Pal and Chatterjee** (17) questioned the quality and safety of the SFRB as it might be a source of contamination with diseases and they demanded implementation of an effective vaccination programme. Referring to an unpublished report **Nayak (30)** indicated that the assessment of the SFRB showed variable results depending on the season of the year. It also showed that the supply of protein was critical in summer whereas energy during the rainy season. The influences of seasons and locations therefore need to be considered while assessing the SFRB.

According to **Swatson** (33), it is desirable to use choice feeding and mixture experiments to complement the efforts of crop content analysis. This will enable the determination of the combination of feed components selected by the FP birds to maximize their biological performance whilst minimizing excesses of nutrient intakes. If this is done for various feeds sources, it may be possible to find out *a priori* whether the supplementary feeding of similar proportions will be suitable to FP or whether no combination of feeds will enable them to make the right choice. A seminar on indigenous poultry of Bangladesh held in January 2012, recommended a correct assessment of the locally produced/available scavengeable feed resources and emphasized indigenous poultry production based mostly on indigenous resources (**Chowdhury,** 43).

3.3 Nutritional opportunities and constraints of integrating Family Poultry with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc).

There were only few responses of participants to this topic. Integrating FP with other production systems faces some challenges and therefore should be dealt with adequate caution. The most common integration appears to be chicken/duck-cum-fish farming but it is being criticized from an environmental point of view. Unless proper fish poultry ratios are maintained and the production of manure is controlled (**Uwizeye,** 10), this type of integration will remain problematic. The same participant stated that integration of poultry and forestry or tree crop seems to be very difficult to manage. However, in Asia (Japan), the integration of ducks to rice production seems to be very fruitful. Ducks eat weeds and insects that constitute a hazard to rice growth and participate to field fertilization. **Swatson** (11) also mentioned such type of integration and gave additionally information about geese integrated with crops to suppress weed growth in tobacco, maize and possibly cotton production. However, a holistic assessment of the impacts of pesticide use in such a

system on meat and egg quality or even the productivity of Family Poultry (i.e. number of eggs, hatchability, shell physical characteristics, sperm quality, yield of the scavengeable resource base (SFRB) is required. The labour requirements to manage an integrated system are higher as the use of less mechanical equipment or chemical plant regulators will require greater labour inputs for cultivating the same acreages. Exploiting additional nutritional opportunities through integration with other crops will require precise farmer knowledge of the interactions of FP with various species of crops or livestock. This could result in benefits through greater sustainability and profitability of an integrated system. Capacity building of farmers through on farm training and further research will be required to make such integration successful.

Singh (23) reported Indian experiences from a project of integration of FP with horticulture (orchards), kitchen leftovers and garden products (fruits and vegetables). In this system, the poultry droppings were used for vermin compost and earthworms' production to be used as protein sources for FP. Scavenging system works well where there is an abundance of biomass (**Nayak**, 30). Increasing insect population, white ants, azolla, green leafy veggies in foraging areas are some solutions in addition to intercropping millets into farming systems.

3.4. Opportunities and constraints of using commercial feed for Family Poultry

This topic received the largest interest and contribution with more than half of the contributions addressing it. The type of Family Poultry (native or commercial) and the farming systems both differ from country to country, and some FP farmers prefer to use commercial feed for their birds. It may be questioned whether this is an appropriate approach in general or whether this will depend on the respective situations and the topic was therefore considered important for the discussion. In order to guide and structure the responses the participants were given five specific questions. The contributions of the participants to each of the points are synthesized as follows:

(a) What is your opinion on the knowledge and attitude of FP farmers towards commercial feeds, including the economic factors, e.g. feed price and return on investments?

It was generally agreed that the knowledge of FP farmers about commercial feeds is poor and because of this fact they usually feed whatever they can get at the time of necessity no matter whether it is for a starter, grower or layer diet (**Swatson,** 1a). However, FP farmers who are involved with producing with commercial strains of broilers and layers, have some knowledge and therefore they are quite aware of what type of feed is to be fed to which type of birds (**Chowdhury,** 18). Since commercial feeds are always costly, they are considered either by the commercial farmers to ensure profitability or by farmers with native stocks who are financially strong enough to afford buying commercial feed without considering economic factors **(Chowdhury,** 18).

(b) Which types of commercial feeds are normally purchased/used for FP?

The farmers rearing commercial strains of birds try to purchase the right type of feed for specific age groups or production purposes if it is available. But it is not unusual that incorrect types of feed are being fed to chickens during the time of scarcity or to bring birds to higher weight. For example, purchase and feeding of broiler-starter feed for commercial starting chicks is quite common in Bangladesh not only during the time of unavailability but also to avoid the problem of underweight with

commercial chicks (**Chowdhury**, 18). But this is not the situation in the case of feeding of indigenous or other local breeds. The farmers purchase and use a variety of commercial feeds on the basis of availability and financial strength. Since the several types of feed are being purchased and used by the FP farmers for backyard chickens particularly for local stocks and breeds, the nutrients that the birds are deriving also vary (**Swatson**, 1a) with consequences of variation in productivity and profitability.

(c) What is the source of raw materials or ingredients used in feed formulation?

The opinions of the participants indicate that the sources of raw materials or ingredients used for feed formulation are not rigid. Rather, two major sources were identified: agro-industrial products/byproducts of local origin and those of imported origin. In countries where major raw materials, micronutrients and feed additives are mostly of imported origin, the cost of the finished products becomes high with the consequence of an increase in the cost of production of broiler meat and eggs. Commercial feeds in developing countries sometimes suffer from proper quality because of inclusion of adulterated raw materials and the prevailing risk of contamination with pathogenic organisms from imported materials, particularly in the absence of strong quality control system (**Chowdhury**, 25).

(d) *Is using commercial feeds for FP profitable? If so, what circumstances and production system permit such profitability?*

There were differences of opinion among the participants whether or not using commercial feeds for FP is profitable. Out of the 24 messages on the main theme, 17 participants supported the use of commercial feed while the others were opposed to its use mainly for economic reason or because of limitations coming from the genetic potential of the local poultry. In general, commercial feed cannot be recommended at 100% inclusion due to economic viability instead home-made mixture under the guidance of extension workers using locally available feedstuffs is recommended.

While the concept of industrial feeds seemed to be well understood by to the participants, a sort of misunderstanding still prevailed with regards to the term FP. It appeared from discussions on the various points that some participants limited the term FP to indigenous breed/crossbreds kept in backyard and small number as FP only while other participants considere keeping commercial strains in small numbers FP as well. The profitability of producing with commercial strains obviously depends on flock size, may be 300 or more (**Chowdhury**, 25) but profits with rearing indigenous stocks in confinement by feeding home-made balanced feed (**Miah**, Paper 5) as well as with supplementation of commercial feeds for the scavenging chickens (**Sarkar**, 31) have also been reported. **Swatson** (1a) argued that feeding commercial feeds to FP could be unprofitable because such high protein diets would be less efficiently utilized but small scale intensive rearing of native productive breeds/crossbreds whereas feeding could be made profitable if homegrown alternative productions of protein and energy sources are increased.

Fasina (6) expressed the view that no household FP will be economically viable if they feed local breeds a ration that consists of 100% commercial feed. He reported that good results are obtained in Egypt with feeding different proportions of commercial feeds, cereals and household leftovers, vegetables, etc. **Anton** (7) noted that farmers are aware of the proven quality and the impact of the commercial feed but their awareness about the types of feed is minimal. He also suggested mixing of commercial feed with cereals (corn or sorghum), if commercially feasible. Corn followed by soybean is the most used in feed formulations. Similarly, **Iskandar** (12)

suggested mixing commercial layer or broiler feed with maize and rice bran under the guidance of extension workers.

Safalaoh (8) from Malawi questioned the use of commercial feed for FP and strongly expressed the view that considering commercial feed for FP is a joke even an insult as feed cost is exorbitant for people who cannot even afford to pay for their own food. Safalaoh's views on mixing feed are that it does dilute the quality of the feed. This negative perception was partially echoed by **Askov Jensen** (16) who indicated that the use of commercial feed would never be viable in a low input low output operation with indigenous breeds. The same view was expressed by **Chowdhury** (18) who suggested that price and return on investment for commercial feeds in use with small flock sizes need to be considered; the type of feed used by this category depends more on the availability than requirements.

Ekoue (19) is also not in favour of using commercial feed for FP because of genetic limitations of the local breeds but also because the low price obtained for sale of the poultry that does not match the price for the inputs and locally made feed mixtures would be preferable. **André** (Paper 4) also expressed the opinion that using commercial feed concentrates as single feedstuffs to feed FP chickens is not profitable.

According to **Swatson** (21), the constraints to using commercial feed are poor knowledge of feeds and feeding systems, feed quality, prohibitive prices, prolonged storage, rodent contamination, transport etc. Improved farmers' awareness through training, FP rearing information, adequate on-farm biosecurity, an increase in dietary amino-acids concentration, control of energy levels that can negatively affect the carcass, might be considered.

Rangnekar (22) and **Ekoue** (24) argued that feeding balanced concentrates to free ranging birds has a negative effect on the profitability; low profitability could be improved if extension services and technical supports are provided. Furthermore, according to Ekoue raw materials and adulterated local sources are used e.g. rice polish with rice husks. On the contrary, **Apu** (28) finds that the use of commercial feed can be profitable; crop residues and industrial by-products could be used, however knowledge dissemination about its use is necessary. According to **Nayak** (30) no commercial feed is needed; except for feeding chicks up to 4 weeks of age. This was supported by **Sarkar** (31) who reported the results of a six-week experiment showing that supplementing with a 22% crude protein diet increased body weight gain, net profit three times and resulted in a low mortality.

Sarker (32) mentioned that separation of chicks from their mother helps to increase body weight and also increases egg production. **Saleque** (34) suggested that for meat production with local birds, the use of commercial feed may not be cost effective since the feed conversion ratio is high (>4) compared to commercial broilers. But a lower feed conversion than this (3.26) has been reported for indigenous birds of Bangladesh that were reared in confinement (**Miah,** paper 5). For egg production the selling price for egg needs to be considered and there is need to also consider the 3 "A"s in analyzing the cost benefit ratio that are: A= available, A= accessible and A= affordable.

Reporting about the situation in Cameroun **Fotsa** (35) mentioned that commercial feed is expensive because feedstuffs are imported. Similarly, **Souleymane** (37) suggests that because commercial feed is not profitable, the semi-scavenging poultry could be profitable if local feedstuffs e.g. maize, rice, soybean, cowpea, millet, cassava and derivatives are used. **Prasad** (39) stated that commercial feed could be successfully utilized for larger flocks and that the cost benefit ratio is important.

Gondwe (40) from Malawi recommended using energy supplements for feeding scavenging poultry and as said before argued that commercial feed does not exploit its advantage as genetic potential of chickens is a limiting factor that makes the operation unprofitable.

On the other hand, **Traore** (46) reported that commercial feed is a very important business in Senegal although maize is fully imported as are more than half of the ingredients that include fish meal, oilseed meals and concentrates. These feeds are not affordable and not available for FP. Through research, it could be possible to review formulas and adapt them to the needs of FP by incorporating local raw materials at a lower cost by using for example by-products from milling like bran, or dried leaves from legumes like Moringa.

Anton (47) reported from a project in Haiti that had been designed with experiences made in Argentina. Using commercial feed alone is not profitable in Haiti and he suggested also the use of home-made feed mixtures using corn, rice, sorghum and beans to which sea shell, bone ash and salt should be added. The program in Haiti as well as in Argentina has a strong awareness and training component for planning crop production both as food for the families and to generate surpluses to prepare home-made feed for the birds.

(*e).What are the constraints of using commercial feeds for Family Poultry? How can these constraints be overcome?*

Using commercial feeds for FP production has got some constraints. The low genetic potentiality of indigenous or local stocks may not permit profitable production as indicated by a number of participants (**Ekoue,** 19). But the birds are not low producers if brooding and scavenging traits are valued (**Askov Jensen**, 16). Local birds are already accustomed to scavenging on SFRB.

Another constraint is the wastage of feed which is more in local chickens and needs to be minimized by proper management (**Guyonnet**, 20)**.** Although the commercial feeds are always costly, some FP farmers buy them in spite of their poor knowledge. So, dissemination of knowledge by the use of most effective channels of information (**Anton**, 7), trainings or extension services (**Chowdhury,** 36; **Apu**, 28; **Pal and Chatterjee,** 17) are essential. **Swatson** (21) indicated some constraints like feed quality, prohibitive prices, prolonged storage, rodent contamination, and lack of access to readily available feeds, alternative feed ingredients or markets, lack of appropriate transport for feeds. Again, education and training along with FP rearing information would help in overcoming these constraints.

Further reading on the use of commercial feed was recommended by **Guyonnet (**42).

> Oladoja M.A. and Olusanya T.P. (2009). Impact of Private Feed Formulation and Production as a Tool for Poverty Alleviation among Poultry Farmers in Ogun State, Nigeria. International Journal of Poultry Science, 8:1006-1010.
>
> *From the Abstract*: A total of ninety-four poultry farmers were selected using a multi-stage random sampling technique; 63.8% of farmers milled their feed privately either on-farm or at commercial milling centres while assurance of feed quality and availability ranked first among perceived impacts recorded. Also, quality of feed ingredients and technical expertise ranked highest amongst constraints of private feed production. Significant relationship was found between farm size (number of birds) and source of feed production as well as constraints to private feed production. It was recommended that research institutes in collaboration with extension agencies should conduct

training and hold workshops for poultry farmers to build and increase their capacities, knowledge and skills to actively participate in private feed formulation and production in the study area in order to improve their livelihood.

3.5. Developing and promoting improved Family Poultry feeding systems

Although this theme was not fully described under this heading, many of the messages (25 in total) and one paper described the different strategies that can be employed to develop and improve feeding systems for FP.

The following was suggested:

- Rearrange dietary combinations according to regions or countries.
- Mix commercial feed with homestead leftovers, grains, agricultural by-products.
- Create awareness and guidance for farmers on what and how to mix feed.
- Separate chicks and creep feed them with commercial feed.
- Adjust feeders to manage feed wastage.
- Integrate feeding systems with other agricultural activities.

Anton (7) suggested to define feeding strategies according to locations (regions) and to improve farmers' awareness on the use of commercial feed. **Iskandar** (12) in response to message 6 **(Fasina**), cited the example of Indonesia where the introduction of an improved local breed in FP was accompanied by training of farmers in mixing commercial layer or broiler feed with local ingredients and its implementation. Committees were put in place for making ingredients and feed available to the group. A system to reduce high mortality rate in newly hatched chicks, the 'basket system' was mentioned by **Askov Jensen (**16). This system uses separation of the chicks from their mother and creep feeding with commercial feed for 4-6 weeks. However, observations are that although mortality was reduced the feed wastage was too high due to lack of training.

Improved egg laying and egg size were obtained with the inclusion of commercially available vitamin and mineral mixture into the daily feed with local ingredients but proper guidance and training were needed (**Pal and Chatterje**, 17). **Guyonnet** (20) in response to feed wastage recommended placing the feed on a raised slatted and covered area and the removing of the wasted feed on a weekly basis which can be used to feed for other 2-3 days.

According to **Ekoue (**24) the use of agricultural by-products by farmers who are preparing their own feed mixes and by adding termites as protein source and vegetables for vitamins has given good results. To make FP a business, a good nutrition is required and cheap feed should be developed based on research.

Chowdhury (27) stated that a good feeding system depends on consideration of the location and country; in general the supplement to scavenging is made of grain and by-products, dry or wet mash spread on the soil or bowl; any improvement has to be cost-effective and this can be achieved by increasing nutrient density of the supplemental feeds. As noted by other participants he believes that finding the nutrient requirements of indigenous birds and the cost-effectiveness of formulating diets in relation to growth and production, good use of commercial feed and avoiding wastage are essential. **Swatson** (21) also emphasized the cost effectiveness in

terms of feed cost per kilogram of FP meat produced. **Apu** (28) emphasized the utilization of household wastes and crop residues and training of farmers since the farmers are reluctant to practice supplementary feeding with nutritionally balanced diets.

Rota (29) reported observations from projects in Swaziland and Laos where chicks are kept separated and brooded artificially from day one up to three/four weeks and fed by a mixture of commercial feed and locally available broken rice or maize (50:50). This is followed by free range rearing with supplementary feeding and available feed ingredients to increase body weight. Similarly **Sarkar** (32), referring to published research results, mentioned how this practice helps to increase body weight of chicks and egg production of the mother hen which can be doubled while at the same time dramatically reducing the mortality of chicks. Quoting from his experimental results **Miah et al.** (Paper 5) showed how feeding home-made balanced feed (not the industrial one) significantly improved body weight of indigenous birds in Bangladesh that were reared in confinement. **Apu** (28) mentioned the importance of utilizing household waste and crop residues for feeding purpose to economize feed cost.

Fotsa (35) reporting from Cameroun proposed alternatives to the expensive commercial feed since ingredients such as soybean cake, groundnut cake and fish meals are imported. He suggested a ration containing maize, cassava root meal, cassava leaf meal, cotton seed cake, fish meal, soya beans, bone meals or oyster shell meal and kitchen salt In another message, **Chowdhury** (36) referring to his paper "Family poultry production in Bangladesh: Is it meaningful or an aimless journey?" presented at the Asia Pacific Poultry Conference in Taipei, Taiwan in 2011 indicated that scavenging diets are normally low in energy and protein content but high in fibers hence an improvement in their diets either as free choice of individual ingredient or supplementary feeding of nutritionally balanced diet would be needed. Reference was also made to a paper by Alders and Pym (2009) who suggested that low productivity of village chicken could be improved by better nutrition and Sarkar and Golam (2009) who concluded that improved management interventions in the form of early weaning, creep feeding of chicks and supplemental feeding of hens during the incubation period, have the capacity to impact very positively on profitability and income generation. A recent study in Bangladesh with a small flock of indigenous chickens kept in confinement clearly indicated an improvement by feeding home-made high nutrient dense balanced diet. Extension methods and approaches can play a vital role in developing and promoting improved Family Poultry feeding systems. This can be implemented by establishing a model village with facilities for training of FP farmers and dissemination of technologies generated by scientists (**Chowdhury**, 36).

Fadiga (37) reported that housing combined with endogenous feed based on local production increased production with decreased mortality, improvement in hatchability rate and final sale weight at three months. A report based on a PhD dissertation from **Gondwe** (40) indicates that supplementation of energy food by-products such as maize bran during the feed shortage time (rainy season) instead of commercial feed adds value to family chicken productivity and flock sizes. **Fadiga** (45) from Côte d'Ivoire also reported that good results from improved local FP kept in enclosure with appropriate feeders and supplemented with local resources including corn flour (65%), cassava flour (15%), fish meal (20%) or shell (85%), charcoal (10%) and salt (5%) and water. The enthusiasm of female farmers for implementing such practices was notable.

4. Conclusions and recommendations

1. Climate change obviously has an impact on the future availability of the SFRB. In order to cope with it, efforts should be directed to find out new feed resources and feeding techniques. So, research that includes studying the possible impacts of climate change on FP production and ways of mitigating its consequences should get momentum in developing countries.
2. The method of assessment of the SFRB by measuring crop-gizzard contents needs to be updated. The current state of knowledge may help with more accurate assessment if birds' performance is considered.
3. In general feeding FP, more specifically, the indigenous or local breed solely with commercial feed may not be profitable. Supplementary feeding might be the best option depending on location, seasons of the year and the availability of the SFRB. Increased use of household wastes and crop residues may minimize cost of supplementary feeding that should be nutritionally balanced. But it also seems necessary to consider the local situation since there are also reports that show positive profitability of birds reared with either industrial feed or home-made feed under both confinement and scavenging systems.
4. The type of bird to be fed, level of supplemental feed in terms of home-made or industrial origin and profitability of such endeavor will therefore depend on the country, location within a country and the SFRB. There was consensus that local feed resources should be utilized as much as possible as this would result in better production and improved profitability. The research results that were presented are supporting these statements.
5. Feed formulations for FP that are based on locally produced/available raw materials are advantages compared to costly commercial or industrial feeds. Feed formulae therefore need to be developed locally that rely on an assessment of nutritional needs of different types of FP to augment production under varies systems of rearing.
6. Interventions like separation of chicks from their mother at three or four weeks, creep feeding of chicks and supplementary feeding of growing chicks and layer birds appear to be effective to achieve higher productivity.
7. The cost benefit ratio of feeding commercial/industrial/home-made feed appears to be the major factor for FP production no matter whether such feeding is practiced in confinement or offered as supplementary feeding under a scavenging system. Sustainability is a major factor since the FP farmers would not only like to see more production but also more profits and good use of their inputs.
8. Training of FP farmers regarding feeds, nutrition and related poultry husbandry practices is essential to bring an improvement in the feed formulations, feed management and the system of production overall to achieve higher outputs. The extension staffs of Governments, NGOs and from the private sectors should play an important role in this respect. Monitoring of production activities of the trained FP farmers and finding solutions to the existing problems by the extension workers should back the production process.
9. Adequate FP research with respect to nutritional aspects, feeds and feed management is important. Since it is expected that FP production in developing countries will continue to grow in the future decades, the International Network for Family Poultry Development can play a significant role to enhance the productivity of FP in developing countries in the interest of ensuring food and nutrition security.

10. Local, regional and international conferences should facilitate open discussions amongst scientists of developing countries regarding ongoing activities and to determine future strategies in order to make FP a valuable and viable asset for food and nutrition security in developing countries.
11. Sustainability is a major issue for all development programmes in developing countries. While exploring nutritional opportunities to overcome existing constraints, all development models should be cautiously planned and executed in collaboration with local consultants/experts so that the FP farmers can benefit from the technologies that are generated by research.

5. Acknowledgements

The moderators are grateful for the contributions of Dr. Olaf Thieme, Professor Dr. E. B. Sonaiya, Dr. M. A. Saleque and Dr. E. Fallou in the preparation of background document and the final report.

6. List of participants that contributed to the discussions

André, Aboh Boya (Dr), FRANCE**,** Laboratoire de Recherches de Recherches Zootechnie Vétérinaire et Halieutique, Institut National des Recherches Agricoles du Bénin, aboh.solex@gmail.com; a2abohboya@yahoo.fr (Paper 4)

dos Anjos, Filomena MOZAMBIQUE, Faculdade de Veterinária, Department of Animal Production, Eduardo Mondlane University , Maputo, mena.anjos@libero.it (Message Nos 4, 41, Paper 3)

Apu, Auvijit Saha, BANGLADESH**,** Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh, auvijit_bau@yahoo.com (Message No 28)

Anton, F. Rafart, ARGENTINA, Coordinador de Desarrollo Rural (interino) INTA-EEA Las Breñas Ruta 89- Km.227-Las Breñas-Chaco-Argentina, jfrafart@gmail.com gajo98@hotmail.com (Message Nos 7, 9, 47)

Askov Jensen, Hans askov@poultry-development.dk www.poultry-development.dk (Messages Nos 16, 44)

Chowdhury S. D. (Dr.), BANGLADESH, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh 2202. drsdchow@gmail.com. (Message Nos 18, 25, 27, 36, 43)

Ekoué, Sodjinin, TOGO, Zootechnicien, Doctorant en production Animale, Chef programme élevages à Cycle Court/ Aquaculture et Pêche à l'Institut Togolais de la Recherche Agronomique (ITRA).BP :1163 / 2318 Lomé, thomek06@yahoo.fr (Message Nos 5, 19, 24)

Fadiga, Souleymane COTE D'IVOIRE**,** Souleymane.fadiga@fao.org, (Message Nos 37, 45)

Fasina, F. Oludayo, SOUTH AFRICA**,** Lecturer, Section of Swine Health, Production Animal Studies Department, University of Pretoria, Onderstepoort 0110**,** dayo.fasina@up.ac.za (Message No 6)

Fotsa, Jean Claude (Dr.), CAMEROON**,** Institute of Agricultural Research for Development (IRAD) Mankon Specialized Research Station (SRRAD) WPSA-Cameroon Branch's Secretary Box: 4099 Bamenda, fotsajc2002@yahoo.fr jcfotsa2002@hotmail.fr (Message No 35)

Gondwe, Timothy (Dr.), MALAWI, Animal Science Department, Bunda College of Agriculture, P.O. Box 219, Lilongwe, tgondwe@bunda.unim (Message No 40)

Gunaratne, S P, SRI LANKA, Department of Farm Animal Production and Health, Faculty of Veterinary Medicine & Animal Science, University of Peradeniya, Peradeniya, spgunaratne@gmail.com (Message No 15)

Guyonnet, Vincent, IEC Scientific Advisor, vincent@internationalegg.com (Message Nos 20, 42)

Iskandar, Sofjan, INDONESIA, Indonesian Research Institute for Animal Production, Bogor, sofjaniskandar@yahoo.com (Message No 12)

Luseba, Dibungi SOUTH AFRICA**,** Department of Animal Sciences, Tshwane University of Technology, P. Bag X680, Pretoria 0001,. lusebad@tut.ac.za (Message No 13)

Mirzaei, Farhad (Dr.) IRAN, ASRI, farmir2005@gmail.com (Message No 1)

Miah, M. Y., BANGLADESH, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh 2202, myoumsau2003@gmail.com (Paper 5)

Nayak, Sujit, INDIA, Department of Animal Husbandry, Dairying & Fisheries, Government of India auvijit_bau@yahoo.com, (Message No 30).

Ngeno, Kiplangat, THE NETEHERLANDS, Animal Breeding and Genomics Centre, Wageningen University, Pox Box 338, 6700 AH, Wageningen, aarapngeno@gmail.com (Message No 2)

Pal, Aruna and Chatterjee, P.N. INDIA**,** Indian Veterinary Research Institute, Izatnagar, U.P. aruna_pal@rediffmail.com chatterjeepn@gmail.com (Message No 17)

Pervin, Wahida, BANGLADESH, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh 2202, wp.jotty@gmail.com (Message No 14)

Prasad, Siva (Dr), INDIA, Department of Animal Husbandry, Hyderabad, vadlasiva@yahoo.com (Message No 39)

Rangnekar, D.V. (Dr.) INDIA**,** dattarangnekar@gmail.com (Message No 22)

Rota, Antonio, ITALY, IFAD, Livestock and Farming Systems, Technical Advisory Division – PT, Via Paolo di Dono 44, 00142 Rome, a.rota@ifad.org

(Message Nos, 26, 29)

Safalaoh, Andy, MALAWI, Animal Science Department Bunda College, Lilongwe Malawi, Currently at the University of Nottingham, safalaoh@gmail.com (Message No 8)

Saleque, M. A. BANGLADESH, Agriculture and Livestock Division, BRAC International, 75 Mohakhali, Dhaka-1212, Bangladesh, ma_Saleque05@yahoo.com (Message Nos 34, 38)

Sarkar, Kalidas, BANGLADESH, Central Poultry Breeding Farm, Department of Livestock Services, Dhaka, Bangladesh, kalidassarkar@yahoo.com (Messages 31, 32)

Singh, D.P. (Dr.), INDIA, Central Avian Research Institute (CARI), Izatnagar, dpscari06@gmail.com, (Message No 23)

Sonaiya, E. B., NIGERIA, Dept. of Animal Science, Obafemi Awolowo University, Ile-Ife 220005, Coordinator, International Network for Family Poultry Development. fsonaiya@oauife.edu.ng (Message No 3)

Swatson, Harry, SOUTH AFRICA South Africa, Cedara College of Agriculture, Hilton 3245, KZN, Harry.Swatson@kzndae.gov.za (Message Nos 1a, 11, 21, 33; Paper 1)

Traore, El Hadji (Dr), SENEGAL, Chercheur à ISRA-LNERV, Coordonateur du Programme Productions Animales, elhtra@coraf.org (Message No 46)

Uwizeye, Aimable (Dr), FRANCE, Montpellier SupAgro, Agris Mundus Programme, Sustainable Development in Agriculture, Montpellier, uwizeyza@supagro.inra.fr (Message No 10)

Distribution of the contributions from the participants by country

Country	Number of messages/papers	Message No
Argentina	3	7, 9, 47
Bangladesh	12	14, 18, 25, 27, 28, 31, 32, 34, 36, 38, 43; Paper 5
Cameroon	1	35
Côte d'Ivoire	1	45
Denmark	2	16, 44,
France	2	10; Paper 4
India	5	17, 22, 23, 30, 39
Indonesia	1	12
Iran	1	1
Italy	3	26, 29, 37
Malawi	1	40
Mozambique	3	4, 41; Paper 3
Netherlands	1	2
Nigeria	1	3
Senegal	1	46
South Africa	7	1a, 6, 11, 13, 21, 33; Paper 1
Sri Lanka	1	15
Togo	3	5, 19, 24
UK	1	8
Not defined	2	20, 42
Total	**52**	