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FAMILY POULTRY DEVELOPMENT

Issues, opportunities and constraints



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Executive Summary

Family poultry encompasses the wide variety of small-scale poultry production systems found in rural, urban and peri-urban areas of developing countries. One can distinguish four broad categories of family poultry production systems: small extensive scavenging, extensive scavenging, semi-intensive and small-scale intensive. Empirical and circumstantial evidence from many developing countries shows that poultry development interventions can bring significant benefits to households, in terms of contributions to food security, women's empowerment and poverty reduction. During three electronic conferences and preparation of the "Decision Tools for Family Poultry Development" several good practices and lessons learned for a "roadmap towards a more sustainable family poultry development" were recognized as essential tools for designing more effective projects.

It is crucial to assess the feasibility and economic viability of family poultry interventions in each specific operating environment, and to develop an appropriate and tailored response in order to achieve sustainability. Lessons learned show that a "one-size-fits-all" response is not successful. Two different approaches towards family poultry development emerged from the electronic conference discussions: a conservative approach and a progressive approach. The former is used to preserve existing practices; the latter is used to introduce new practices. The progressive approach is often adopted by development agencies, as they assume that it leads to more efficient and productive systems. Economic outcome and sustainability of family poultry production should be given consideration when recommending more intensive production systems. The conservative approach seems more appropriate for remote village conditions, where the introduction of new technologies is challenging and poultry production is subject to many constraints.

Development interventions should respond to the specific needs of the target group and, therefore, may involve single or multiple stages. Nevertheless, interventions focused on a single component of the production system (e.g. feeding, housing, health or breeding) often yield little improvement in family poultry production, as other constraints may arise and hamper productivity. In promoting the introduction of new technologies, it is crucial to carry out "hands-on/learning-by-doing" training and ensure follow-up by technical agents. The formation of producer groups to deliver support services to poor farmers, such as training for capacity-building, supply of inputs and assistance for marketing, is a key issue for development. To achieve success and sustainability, however, the formation of producer groups needs to be combined with a value chain approach.

Recommendations for specific genetic resources also need to be location specific. A single type of bird may not be suitable for all conditions. Suitability is dependent on a variety of factors, such as household resources (including time and commitment) and the underlying objective of poultry rearing (to meet household needs or to access markets and earn a sustained livelihood). The most appropriate genetic resources for scavenge-based systems are local breeds with improved productivity, adaptability and disease resistance. This also favours the conservation of indigenous breeds; its self-propagation capability ensures sustainability and very low dependence on external agencies/persons. Breeds that have low input costs with

improved productivity are recommended for semi-intensive systems. These may be crosses of local with exotic breeds or crosses of two exotic breeds/lines designed to contribute improved productivity in line with increased investment. This system requires supplementary feeding and proper housing of improved birds, and use of crossbred chickens requires a supply system that produces the crosses. Government support may be required for the development of improved genetic resources that are appropriate to the specific conditions of scavenging poultry and for those used in semi-intensive production systems.

Assessing the availability of locally available/produced feed resources is important for all four family poultry production systems. The utilization of new and existing local feed resources through different feeding techniques can assist in mitigating the potential impacts of climate change. For scavenging systems assessment of the scavengeable feed resource and its efficient use is crucial. Family poultry farmers using small extensive scavenging and extensive scavenging systems should be able to use on-farm mixtures as supplements to scavenging. Supplementation with locally available feedstuffs or commercial feed as a supplement to scavenging can be recommended for the semi-intensive system if the market prices of the birds or eggs ensure profitability. Poultry in small-scale intensive systems require ad libitum feeding with balanced commercial feed. The continuing education of family poultry farmers regarding types and quality of commercial feeds should raise awareness among them of their need for training on collecting (sourcing), mixing (formulating and compounding) and feeding (supplying, storage and offering) of commercial feed, as well as locally available (home-grown/home-mixed) feed.

Newcastle Disease is identified as the major health constraint to family poultry production in developing countries. However, once controlled other constraints have to be addressed, such as other diseases (mainly fowl pox, fowl cholera and duck plague) and shortage of feed resources. The availability of quality vaccines and well-trained vaccinators is required to implement efficient vaccination programmes. Ensuring the involvement of women as vaccinators and advisors contributes to both effective poultry disease control programmes and the improved status of women in their households and their communities. Effective vaccination programmes should be combined with appropriate biosecurity measures and practices to strengthen the immune systems of birds (e.g. good nutrition and control of mycotoxins on grains).

Appropriate family poultry policies are essential for family poultry development to ensure that the socio-economically disadvantaged are able to make use of these potent tools to improve livelihoods and the position of women. To achieve these goals policy-makers need to be made aware of the real contributions that family poultry can make, so as to ensure their active support. Family poultry development programmes need support from different sectors and careful designing to achieve a favourable environment for future sustainability.

Introduction

The Food and Agriculture Organization of the United Nations (FAO) and the International Fund for Agricultural Development (IFAD) are funding a number of projects developed to help achieve the Millennium Development Goals (MDGs) related to improving food security, income generation and women's empowerment, while respecting traditional knowledge and socio-cultural values. Family poultry production plays an essential role in some of these projects.

Investigation into the development opportunities presented by family poultry production was motivated by the rapid intensification of poultry production in many countries and the renewed focus on small-scale poultry producers during the avian influenza crisis. Over the past two decades, FAO and IFAD have researched, designed and implemented projects that fit a variety of production environments and address the specific needs of family poultry producers. Several networks, including the International Network for Family Poultry Development (INFPD), have shared information and experiences relating to family poultry development approaches. IFAD provided funding for two training programmes for technical staff and for three electronic conferences that FAO implemented in cooperation with partners including the INFPD and the KYEEMA Foundation. These events provided ample opportunity to discuss the present circumstances of family poultry production, its development opportunities and constraints. This working paper presents a synthesis of the discussions and findings.

Improving the effectiveness of family poultry development projects will require: increased awareness among decision-makers in national governments and donor agencies of the role played by family poultry production, both in terms of food security and income generation; support for the development of national policies; better access to services (e.g. training, health, vaccination, credit); funding for participatory adaptive research to identify appropriate technologies/models that are pro-poor, sustainable, economically viable and environmentally sound (this includes sharing knowledge generated by farmers); and the creation of opportunities for knowledge sharing.

Chapter 1

What is family poultry production?

Many people in developing countries keep small numbers of poultry for home consumption, to sell and for various socio-cultural uses. In 1989, the participants of a workshop in Africa defined the term “rural poultry” as “any genetic stock of poultry (unimproved and/or improved) raised extensively or semi-intensively in relatively small numbers (less than 100 at any given time). There is minimal investment on inputs with most of the inputs generated in the farmstead; labour is not salaried but drawn from the family with production geared essentially towards home consumption or savings” (Sonaiya, 1990). The term was later replaced by “family poultry” to encompass the wide variety of small-scale poultry production systems found in rural, urban and peri-urban areas of developing countries. Rather than defining the production systems *per se*, the term is used to describe poultry production that is practised by individual families as a means of obtaining food security, income and gainful employment (Besbes *et al.*, 2012).

One can distinguish four broad categories of family poultry production systems:

- small extensive scavenging
- extensive scavenging
- semi-intensive
- small-scale intensive.

The conditions and requirements of these systems and the resulting performance differ extensively, as a result of the type of genetic resources used; feeding practices; prevalence of disease; prevention and control of diseases; the management of flocks; and the interactions among these factors. Table 1 examines the importance of these and related factors for the four family poultry production systems.

The distance of the producer from markets affects the availability of inputs and services for production and the opportunities and ways of selling products. This is expressed in the relative importance accorded to poultry production for either food security or income generation. Figure 1 illustrates this relationship.

Smallholder family poultry is an integral component of the livelihoods of poor rural households, and is likely to play this role for the foreseeable future (FAO, 2008a). It makes a substantial contribution to food security and poverty alleviation in many countries around the world (Dolberg, 2008). The main outputs from family poultry production are food for home consumption, either in the form of poultry meat or eggs, and income from the sale of these products. Although the output may not be high, a great advantage of family poultry egg production is the frequent, if not daily, provision of nutrients of high biological value, which are ideally consumed by the vulnerable members of the household.

In Asia, village poultry manure is used as feed for fish when poultry are raised on top of ponds as part of an integrated system. Family poultry can also be integrated into crop production rotational systems to avoid the build-up of pathogens and pests. Such integrated systems increase the nutritional diversity of the scavenging feed resource base. There will be a variety of insects, weed seeds, crops and even minerals available for chickens to optimize their growth. Pasture/crop rotation also reduces the build-up of excessive amounts of manure and disease causing pathogens. Poultry also plays important social and cultural roles in the life of rural people, not least for building social rela-

Figure 1. Influence of site effects on family poultry production

Location	Main purpose	Poultry production system
Remote village	↑ Food security ↓ Income generation	↑ Small extensive scavenging
Village with access to rural markets	Food security = Income generation	↑ Extensive scavenging ↓ Semi-intensive
Peri-urban village with access to urban markets	↓ Food security ↑ Income generation	↑ Semi-intensive ↓ Small-scale intensive

Source: Developed by A. Rota and O. Thieme.

tions with other villagers (FAO, 2010a). Ritual use of poultry is found on all continents (FAO, 2010a) and local breeds have a specific role in this respect.

Family poultry, especially scavenging village poultry, frequently command a higher price in urban markets because they are considered to be free of antibiotic and other residues. Formal mechanisms for certifying these birds as “organic” do not exist in most countries, but opportunities for improving branding and marketing are being recognized in an increasing number of countries.

The accelerating pace of urbanization and changing lifestyles, especially among the young, pose a potential threat to the role and contribution of family poultry to livelihoods. In this context, worthwhile options that promote a stronger business approach to family poultry production include cooperative activities and micro-financing. Climate change is also a potential threat, particularly with regard to the future availability of the scavengable feed resource base (SFRB). Mitigation efforts in developing countries should focus on studying the possible impacts of climate change on family poultry production, locating new feed resources and developing new feeding techniques.

Another danger to family poultry stems from its co-existence with commercial poultry production systems at the same locations and in the same market supply chains. During the highly pathogenic avian influenza (HPAI) epidemic, for example, many family poultry birds were viewed as a source of the virus and were destroyed. However, the high consumer preference for family poultry birds in certain countries limits the market for commercial poultry among some consumers. On the positive side, the advances made in commercial poultry systems benefit family poultry systems, while the “green or organic” name of family poultry can lend commercially produced poultry greater acceptability. The tension between the two systems may not disappear, but may also be beneficial to both systems.

Despite regional differences in family poultry production systems, women generally undertake the day-to-day management of birds often with the assistance of children. Men usually construct the night shelters, procure inputs and assist occasionally with the marketing of products. This division of labour may change, however, as poultry production intensifies. Family poultry can be a tool for women’s empowerment, particularly where women are vaccinators and poultry advisers. This brings more income for their family and prestige for them within the community.

Table 1. Characteristics of the four family poultry production systems

Criteria	Small extensive scavenging	Extensive scavenging	Semi-intensive	Small-scale intensive
Production/farming system	Mixed, poultry and crops, often landless,	Mixed, livestock and crops	Usually poultry only	Poultry only
Other livestock raised	Rarely	Usually	Sometimes	No
Flock size (adult birds)	1-5	5-50	50-200	>200 broilers >100 layers
Poultry breeds	Local	Local or crossbred	Commercial or crossbred or local	Commercial
Source of new chicks	Natural incubation	Natural incubation	Commercial day-old chicks or natural incubation	Commercial day-old chicks or pullets
Feed source	Scavenging; almost no supplementation	Scavenging; occasional supplementation	Scavenging; regular supplementation	Commercial balanced ration
Poultry housing	Seldom; usually made from local materials or kept in the house	Sometimes; usually made from local materials	Yes; conventional materials; houses of variable quality	Yes; conventional materials; good-quality houses
Access to veterinary services and veterinary pharmaceuticals	Rarely	Sometimes	Yes	Yes
Mortality	Very high >70%	Very high >70%	Medium to high 20% to >50%	Low to medium <20%
Access to reliable electricity supply	No	No	Yes	Yes
Existence of conventional cold chain	No	Rarely	Yes	Yes
Access to urban markets	Rarely	Rarely or indirect	Yes	Yes
Products	Live birds, meat	Live birds, meat, eggs	Live birds, meat, eggs	Live birds, meat, eggs
Time devoted each day to poultry management	< 30 minutes	< 1 hour	> 1 hour	> 1 hour

Chapter 2

Developing family poultry through networking and information sharing

Efforts to improve smallholder poultry production began in developing countries during the Colonial period with cockerel exchange programmes. Research pioneers in Egypt, India, Indonesia, Nigeria and Zimbabwe continued this breeding approach. By the late 1970s, a series of conferences and seminars held in Asia had resulted in widespread recognition of the need for a multi-system approach. Researchers laboured in isolation to overcome problems of genetics and disease control. Then came the advent of networking.

The INFID evolved in 1997 out of the African Network for Rural Poultry Development. It was created to facilitate networking with the following objectives:

- to consolidate knowledge and coordinate the development of family poultry production;
- to serve as a forum for the exchange of ideas, methods, resources and results;
- to document results and disseminate information;
- to coordinate training and the development of human resources; and
- to identify opportunities for research and development, cooperation and funding.

INFID now counts more than 1 000 members from 105 countries and publishes a twice-yearly newsletter in three languages (English, French and Spanish) entitled *Family Poultry Communications* (http://infpd.net/e_news_letter/user_list).

During the years 1997 to 2008, the Danish Network for Poultry Production and Health contributed substantially to family poultry development with support for research and training activities in Africa and Asia. Since 2003, the International Rural Poultry Centre (IRPC) of the KYEEMA Foundation has promoted cost-efficient and sustainable improvements to village poultry production with a focus on control of Newcastle Disease (ND).

Since the 1989 when the first network was founded, the following developments have occurred in family poultry development:

- **Poultry health.** The highly pathogenic avian influenza (HPAI) crisis focused attention on the health of the poultry sector. Fears were expressed that extensive poultry production systems contributed disproportionately to the spread of HPAI, although this claim could not be supported by data related to control measures for HPAI in commercial or backyard production systems. While some countries developed a policy to ban family poultry in specific locations, the HPAI crisis also revitalized discussions about the role and contributions of family poultry production to food security and the livelihoods of small producers (FAO, 2008a). The Coordinated Research Programme of the Joint FAO/IAEA Division undertook research activities that led to the publication of *Improving Farmyard Poultry Production in Africa: Interventions and their Economic Assessment* (IAEA, 2006).

- **Vaccines.** Newcastle Disease vaccines were developed in different Asian and African countries with funding from the Australian Centre for International Agricultural Research (ACIAR), which produced HRV4 and Strain I-2.
- **Breeding.** Different researchers from countries in Africa, Asia and Latin America have characterized local breeds and presented breeding results.
- **Feeding.** The concept of the scavengeable feed resource base (SFRB) was developed, first tested in Sri Lankan villages and later modified for prediction in Nigeria. Unconventional feeds have been tested and feed resources of family poultry in Africa were reviewed (Sonaiya, 1995).
- **Socio-economic role of family poultry.** Excellent examples of work in this field include analyses of the situation in Africa (Kitalyi, 1998) and Bangladesh (SA PPLPP, 2011). The sustained work in Bangladesh has demonstrated the importance of family poultry in the alleviation of poverty and the promotion of food security. In 2002, an INFDPD/FAO electronic conference and an INFDPD workshop, held in Dhaka, focused on ways in which African and Latin American countries could learn from Bangladesh (<http://www.fao.org/docrep/019/aq634e/aq634e.pdf>).
- **Communication.** Useful publications include a technical manual on small-scale poultry production (Sonaiya and Swan, 2004), a compilation of unconventional feedstuffs (Sonaiya, 1995) and a technical evaluation of SFRB assessment parameters (Sonaiya, 2006). Research papers on all fields of family poultry production are regularly published in scientific journals, including the ‘Small-Scale Family Poultry Production’ section of the March and September issues of *World’s Poultry Science Journal*. The INFDPD subscription-based newsletter provides information to students and staff of more than 30 institutions, colleges and departments.

Several good practices and lessons learned for a “roadmap towards a more sustainable family poultry development” have been recognized as essential tools for designing more effective projects. These are collected in *Decision Tools for Family Poultry Development (DTFPD)* (FAO, 2014).

While some developing countries have long maintained interest in family poultry production (e.g. Bangladesh, Burkina Faso, Tanzania, Thailand), others have regained an interest in this form of production in recent years (i.e. Brazil, India, Senegal, Swaziland) or in more extensive forms of poultry keeping. The INFDPD has underlined the importance of developing human capacity to support smallholder poultry production, as a means to improving the economic situation of poor households. The project “Smallholder Poultry Development” was therefore designed, with the financial support of IFAD, to train young scientists as Associate Poultry Advisers (APAs), and to share information and knowledge about the situation and development opportunities of family poultry among the concerned technical staff and development practitioners. The project organized three e-conferences on issues facing poultry breeding programmes, opportunities and constraints of poultry nutrition, and strategic interventions for family poultry through research and development, respectively. The findings and conclusions of these three e-conferences are summarized in this publication as a basis for future planning and implementation of family poultry development activities.

Chapter 3

Technologies for family poultry development

3.1 APPROACHES, STRATEGIES AND OPTIONS FOR SUSTAINABLE FAMILY POULTRY DEVELOPMENT

Empirical and circumstantial evidence from many developing countries shows that poultry development interventions can bring significant benefits to households, in terms of contributions to food security, women's empowerment and poverty reduction (Dolberg, 2008; Pica-Ciamarra & Dhawan, 2010). The marked increase in demand in recent decades for poultry products and livestock products, in general, has led most poultry-related development interventions to attempt to intensify traditional poultry systems (FAO, 2009). The most common approach has been the introduction of "improved" technologies in poultry breeding, feeding and health with the aim of increasing productivity. Such interventions have resulted in a variety of different outcomes for family poultry:

- **Introduction of "improved" technologies in small extensive scavenging and extensive scavenging systems.** Generally, the aim of these interventions is to bring benefits to many households, as such interventions often address a large target group and the introduced practices can be easily passed on among producers.
- **Upgrade of extensive scavenging systems to semi-intensive or small-scale intensive systems.** Generally, the aim of these interventions is to bring benefits to a few targeted smallholder producers, as they require a larger investment per household and relatively important changes in the allocation of resources in the farming system.
- **Improvement of technologies in semi-intensive and small-scale intensive systems.** Generally, the aim of these interventions is to bring benefits to selected targeted producers, as only a limited number have intensive systems and access to inputs, services (e.g. credit, veterinary services, etc.) and markets.

Field experience in family poultry development indicates that interventions have to be well planned because of the many limiting factors (especially restricted communication, weak producer organizations, limited economies of scale and poor access to services, such as training, inputs, credit and markets). They also require investments in human and economic resources on the part of producers and development agencies. Numerous projects have failed to achieve their objectives due to inadequate approaches and strategies.

Conservative vs. progressive approach

Two different approaches towards family poultry development emerged from the e-conference discussions: (i) a conservative and (ii) a progressive approach. The former approach is used to preserve existing practices; the latter is used to introduce new practices. Table 2 lists the main elements that characterize the two approaches.

Table 2. Approaches to family poultry developments

Conservative approach (preserving existing practices)	Progressive approach (introducing new practices)
<ul style="list-style-type: none"> Improvement goes against one of the main characteristics that make family poultry systems cost-efficient: “low input-low output”. Producers have developed, through experience, the best possible practices for poultry keeping under local conditions. Any intervention to increase production requires an appropriate level of poultry technology that will involve additional costs for the producer and make production unprofitable. Interventions for improved productivity might affect marketing and quality (e.g. change in organoleptic characteristics of meat). Certain constraints to improvement cannot be overcome: diseases, backward and forward linkages, insufficient organization, high cost of commercial feed, and reluctance of younger generations to get involved with family poultry farming. Family poultry production is a secondary and subsistence activity. 	<ul style="list-style-type: none"> Interventions are necessary to make family poultry systems more sustainable. Systems should be changed/upgraded whenever technical improvements are available. Interventions that improve production have the capacity to impact significantly on profitability and income generation Interventions are necessary to ensure the survival of family poultry, considering the decreasing availability of the SFRB (e.g. due to the effects of climate change or urbanization). Improvement of family poultry production systems by means of research and development is crucial in order to achieve gains in productivity and mortality reduction. Small interventions in family poultry in terms of “improved” husbandry practices and “improved” diets can bring a significant increase in productivity. Improvements are necessary to meet the growing demand for poultry products and to meet standards for food quality and safety.

The progressive approach is often adopted by development agencies, as they assume that it leads to more efficient and productive systems. As a matter of fact, development agencies tend to see innovation as the key to success. These agencies often promote standard technical packages that include the rearing of “improved” poultry breeds, the utilization of commercial feed, the creation of links with urban markets, and the delivery of vaccines, veterinary drugs and supplies. Lessons learned show, however, that a “one-size-fits-all” response is not successful. It is crucial to assess the feasibility and economic viability of family poultry interventions in each specific operating environment, and to develop an appropriate and tailored response in order to achieve sustainability. Family poultry development interventions should be cost-effective and respond to the needs, priorities and capacities of the targeted family poultry producers. The local culture, indigenous knowledge, time and resources of family poultry producers and the social perception of family poultry development should be taken into account when determining which development approach fits best. Many development interventions have failed because they did not respond to the needs of the family poultry producers and because the technologies introduced were not suitable to local conditions.

The conservative approach seems more appropriate for remote village conditions, where the introduction of new technologies is challenging and poultry production is subject to many constraints (see above). On the other hand, the progressive approach seems more appropriate for family poultry producers living in villages with better access to communication technologies and for those living in peri-urban areas. These producers usually have easier access to services (particularly health, extension, and credit) and to input and output markets.

Family poultry production systems and development

The choice of development strategy should be based largely on the local context and access to markets and services (e.g. vaccination, health, credit). Certain aspects related to the family poultry production system should also be taken into consideration when developing an effective development strategy (Table 3).

Intensive family poultry systems are more open to technological and economic improvements than scavenging systems. Indeed, the higher outputs of the former systems increase the opportunities for making improvements sustainable and economically viable for those wishing to become dedicated poultry farmers.

Single vs. multiple interventions

Development interventions should respond to the specific needs of the target group and, therefore, may involve single or multiple stages. Nonetheless, interventions focused on a single component of the production system (e.g. feeding, housing, health or breeding) often yield little improvement in family poultry production, as other constraints may arise and hamper productivity. For example, mortality reduction through vaccination or improved housing does not improve efficiency and profitability of family poultry systems if producers cannot provide sufficient feed, should they wish to sustain a larger flock.

With multiple interventions, certain technical components of the poultry system can be given priority, depending on the needs and local context. By and large, experience shows that interventions for improved health, housing and feeding are a precondition for breed improvement. It is difficult to achieve higher productivity from improved breeds in unimproved traditional production environments, as these birds are less resistant to diseases and require better feeding (FAO, 2010b). However, experiences, such as that of Kuroilers in India, show that the introduction of improved breeds can act as an incentive for the adoption of “improved” poultry practices. The constant availability of day-old chicks is a key factor in determining the success and sustainability of such interventions.

In promoting the introduction of new technologies, it is crucial to carry out “hands-on/learning-by-doing” training and a follow-up by technical agents, and not limit the training to a one-to-two-day theoretical session. Training sessions facilitate the understanding and acceptance of technologies and are important for the sustainability of development activities. Exchange visits among family poultry producers are also an important element for building capacity.

Table 3. Considerations for development interventions and strategies

Production system	Considerations for development interventions	Development strategy
Small extensive scavenging and extensive scavenging	<ul style="list-style-type: none"> • Particularly important for the resource-poor. • Constrained by the availability of the SFRB. • More sustainable systems as they depend less on external inputs. • Poultry feed does not compete with food. • Mostly use of local poultry breeds. 	<ul style="list-style-type: none"> • Low cost approach. • Particular attention should be placed on the cost-effectiveness of the improvements (due to the low outputs of the system). • Family poultry can provide a vital livelihood support within mixed farming systems and act as a stepping stone to alternate livelihood activities for those who aim to significantly alter their production systems.
Semi-intensive and small-scale intensive	<ul style="list-style-type: none"> • High productivity is necessary for the activity to be profitable. • Dependent on the availability of input and output markets and services. • Provides part or full-time income-generating employment to youth and women. • Mainly use of genetically improved crossbred poultry. • Market-oriented. 	<ul style="list-style-type: none"> • Particular attention should be placed in a thorough economic and financial analysis before investment, with particular reference to the capacity to compete with imported frozen poultry products and with the integrated large-scale poultry operations within the country. • Focus on input and output markets, on services, and on developing networks/groups of producers.

Key points

- *There are two distinct approaches to family poultry development: a conservative approach (for preserving existing practices) and a progressive approach (for introducing new practices).*
- *Poultry development interventions should be tailored to the socio-economic, cultural and logistical conditions.*
- *An appropriate development strategy should be developed according to the characteristics of the poultry production systems.*
- *The likelihood of success of interventions is higher if constraints characterizing a specific family poultry production system are addressed in a holistic and integrated manner.*
- *With multiple interventions, field experience indicates that the sequencing should give priority to improving health, feeding and housing¹ conditions before breed improvement.*
- *“Hands-on/learning-by-doing” training, exchange visits for family poultry producers, and follow-up sessions have all proven to be effective ways for building capacity.*

¹ This includes techniques for reducing predator losses of chicks from day old to one month old.

3.2 BREEDING

During the first e-conference on the theme “**Opportunities of poultry breeding programmes for family production in developing countries: The bird for the poor**”, the participants agreed that a careful situation analysis of the perceptions and priorities of poultry keepers is a must before any recommendations about type of production system and number and type of birds can be made. Preferences for specific types of birds may depend on various factors; hence, recommendations need to be location specific. A single type of bird may not be suitable for all conditions. Suitability is dependent on a variety of factors, such as household resources (including time and commitment), and whether the objective of poultry rearing is to meet household needs or to access markets and earn a sustained livelihood.

Scavenging systems in villages that incorporate local poultry breeds and maximize the use of the scavenging feed resource base tend to be very robust, as demonstrated by their existence in many rural areas of the world in the absence of external interventions. Eggs and meat are produced under this system at low cost by scavenging birds without supplementation with commercial feed. There was a general consensus that the most appropriate poultry for this system are local breeds with improved productivity, adaptability and disease resistance. The use of local breeds also favours the conservation of indigenous breeds; its self-propagation capability ensures sustainability and very low dependence on external agencies/persons. It is also cost effective and satisfies consumer preferences for eggs and meat of local birds and cultural linkages. This satisfies the needs of poor groups unable to cope with the requirement of improved birds, or who keep these birds in very limited number for household food security and supplementary income generation only. The importance of conserving local breeds was stressed because of their hardiness, disease resistance and ability to cope with harsh environmental conditions. The strengthening of existing informal-traditional systems of breeding and supply of chicks was emphasized for remote rural areas, where regular crossbred chick supply is not possible.

Breeds that have low input costs with improved productivity are recommended for semi-intensive systems. These may be crosses of local with exotic breeds or crosses of two exotic breeds/lines designed to contribute improved productivity in line with increased investment. The small-scale intensive system should be based on commercial broiler or layer breeds. The success of this system depends on regular and timely supply of chicks and good feed, existence of strict disease control and proper marketing. Given the potential for poultry feed requirements in semi-intensive and intensive systems to compete with human food requirements, the participants emphasized the importance of determining locally available feed that reduces reliance on crops destined for human consumption. In some regions the land available for cropping is reducing as result of urbanization and human population growth. This has greatly reduced the scavenging feed resource base making supplementation via cafeteria feeding and self-mixed rations essential.

Development/selection of suitable breeds for family producers requires an agency or appropriate organizational structure with all the facilities for a breeding programme, appropriate multiplication and distribution networks for supporting poor farmers taking into account the respective country’s situation. Considering the limitations, potential and interests of the different institutions concerned, including governments,

the private sector, research institutes and NGOs, an effective and efficient programme should be designed that can benefit poor producers as well as the country. Within the private sector there are limited organizational structures for breeding programmes of native breeds and their crosses. The public/government sector, however, is responsible for livelihood issues relating to the poor. Hence, it was decided to place government institutions in charge of breeding strategies. The strategies should comprise intra-population selection for the improvement of native breeds. It was also deemed desirable to involve farmers' cooperatives in improvement programmes that are location specific for the native breed/ecotype.

When producing crossbreds to be used for semi-intensive systems, pure exotic breeds (Rhode Island Red, Black Australorp and Fayoumi, etc.) should be kept in central breeding centres. Crossbreds have the advantage of benefiting from heterotic effects (increase in the fitness and reproduction traits up to 25-40 percent), with the proviso that F1 should be the terminal cross. Organizational structures for breeding programmes of native breeds/crossbreds for scavenging and semi-scavenging systems have been set-up under the government sector in Bangladesh, Ethiopia, India, Kenya, Malawi, Nigeria, Thailand and Viet Nam, which is a good indicator of a better future for family poultry. In the case of small countries, joint ventures may be attempted for future breeding programmes, sharing infrastructure facilities and a common gene pool. This can assist in the development of breeds for use in a number of countries with similar conditions, and which share the same breeding objectives.

The development of suitable germplasm by poultry research institutions or agricultural universities alone is not sufficient to benefit family poultry producers with improved breeds. This also requires multiplication and distribution networks, which frequently operate below requirements. These responsibilities may be shared, however, with universities/research institutions working on genetic improvement of indigenous chickens and farmer cooperatives on multiplication and distribution. Mini hatcheries can be established in communities. IFAD has already demonstrated in Bangladesh that poor women can successfully handle mini-hatchery technology (www.ifad.org/lrkm/pub/hatchery.pdf).

Conservation of a particular breed requires a complex management system based on scientific principles. This can be costly and requires thorough planning, a source of regular financing and follow-up on action plans. The first step is to carry out a survey of the breeding tract. This should clarify the types and present status of local breeds and the requirements, habits and management practices of farmers. FAO recommendations stipulate that performance data are collected from several locations along with data about farmer and consumer preferences. This type of information is only rarely available in developing countries. The selection of native breeds/ecotypes should be based on representative samples of clearly defined genetic stocks from the areas.

Key points
<ul style="list-style-type: none"> • Native/local breeds are considered the bird of choice for the traditional scavenging system. These breeds ensure self-sustainability and fulfil various sentiments attached with native fowl and its conservation. Improved native breeds or crosses of native with exotic breeds may be a good option for farmers in a position to fulfil the additional requirement for supplementary feeding and proper housing of improved birds, however, use of crossbred chickens requires a supply system that produces the crosses. • Birds that have low input costs and improved productivity are recommended for semi-scavenging systems. These could be crosses between native and exotic breeds or crosses of two exotic breeds/lines. Scavenging should comprise a substantial part of the total feed with locally available feed ingredients accounting for the remainder. • Systems with scavenging birds are facing problems of reducing homestead area and natural feed resources in many locations. Under such conditions producers can be motivated to adopt more appropriate approaches to improving livelihoods, such as semi-intensive and small-scale intensive poultry production. The small-scale intensive system is also suitable for part or full-time self-employment for rural youth or women. Commercial strains of either broilers or layers should be used for this system. To ensure success, the system requires a regular and timely supply of chicks and good feed, the existence of strict disease control and proper marketing. • There are rarely sufficient organizational structures for breeding programmes to develop and distribute suitable germplasm for scavenging and semi-scavenging systems. Joint programmes between the public sector and farmers' cooperatives are more likely to fill this gap than the private sector. Identification, characterization and improvement of native breeds/ecotypes and the development of suitable crosses should be the responsibility of research institutes. Local farmers/farmers' cooperatives should be involved in identification of the required traits for inclusion in the breeding programme. These may include broodiness, meat pigmentation, flavour or other specific traits associated with the particular breed known to the local farmer. • Specialization in parts of the chicken value chain may be an appropriate option for semi-intensive and intensive family producers, but will require corresponding organizational structures.

3.3 FEED RESOURCES AND FEEDING

During the second e-conference on the theme “Family poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc.): Nutritional opportunities and constraints”, the participants agreed that assessing the availability of locally available/produced feed resources is important for all four family poultry production systems. For the two scavenging subsystems assessment of the SFRB is crucial. Furthermore, the accuracy of existing assessment methods could be greatly improved by including the production performance of birds and the effect of seasons on feed resource availability. Since the impact of climate change on droughts and floods has been clearly established, there

is a need to generate data relating climate change to availability of all feed resources, including the SFRB. Further efforts are also needed to respond to the impact of climate change by identifying new feed resources and different techniques for using existing feed resources.

The integration of family poultry with other production systems, such as forestry, tree crops, annual crops, large animals, fisheries and so on, presents nutritional opportunities. However, chicken/duck integration into aquaculture systems poses problems when animal physiology and environmental degradation are taken into consideration. On the other hand, the integration of ducks into rice production systems has the potential to optimize soil fertility and water use, while geese into crop systems may promote weed control and soil fertility. More nutritional opportunities are found in the integration of family poultry with fruit and vegetable production, which utilizes droppings for composting, and the production of earthworms, which provides proteins for poultry.

The use of poultry feed made by commercial feed mills for family poultry production is receiving considerable attention among certain farmers. Family poultry farmers employing small extensive scavenging and extensive scavenging systems, in general, have poor knowledge and experience of commercial feeds, but those using semi-intensive and small-scale intensive systems are better informed about commercial feed and try to purchase the right type of feed for their birds. However, farmers may purchase incorrect types of feed to save birds from starvation during periods of scarcity in rural villages (with road access), and in peri-urban areas where alternatives to commercial feeds are not available.

The raw materials for commercial feed formulation are crop and animal products/by-products and agro-industrial products/by-products of either local or imported origin. In developing countries, imported raw materials make commercial feeds costly and in the absence of enforced standards these are sometimes of poor quality.

The majority of participants to the e-conference viewed the use of commercial feed in family poultry systems as profitable, in spite of the higher feed cost, because of the much higher market prices of family poultry (more than double those of commercial strains of broilers and spent layers). The underlying assumption, here, is that the semi-intensive system is used. Where a small-scale intensive system is used to raise indigenous birds, it is assumed that buyers will still pay higher prices even though there will be no flavour advantage over commercial strains for the intensively raised indigenous birds. Where commercial strains are used, there will be no market price differential between family poultry birds and commercial farm birds.

A significant minority of participants to the e-conference provided the following rationale against the use of commercial feed in extensive family poultry systems:

- The genetic potential for growth and performance of indigenous unselected birds is too low.
- The ability to scavenge will be lost with *ad libitum* use of commercial feed.
- Prolonged storage and rodents lead to wastage of feed and variation in feed quality.
- Roads and transport services to markets for purchase of commercial feed and sale of table birds are poor.

Family poultry farmers using semi-intensive and small-scale intensive systems, both located in villages (assuming reasonable road access) and in peri-urban areas,

should be able to use commercial feed as a supplement to scavenging or *ad libitum*, respectively, if the market prices of their birds ensure profitability.

Family poultry farmers using small extensive scavenging and extensive scavenging systems should be able to use on-farm mixtures of locally available feedstuffs as supplements to scavenging. These are to be prepared under the guidance of extension workers backed-up by well-equipped animal nutritionists.

A family poultry feeding system is based on a sustainable strategy of education, training and extension on feed resources and their uses. Such systems must be flexible enough to respond to the conditions in specific locations (regions), so as to incorporate the grains, agricultural by-products, homestead leftovers and vitamin-mineral premix, or individual sources of vitamins or minerals in the feeding system.

The continuing education of family poultry farmers regarding types and quality of commercial feeds should raise awareness among them of their need for training on collecting (sourcing), mixing (formulating and compounding) and feeding (supplying, storage and offering) of commercial feed, as well as locally available (home-grown/home-mixed) feed.

A viable family poultry feeding system must be dynamic and flexible. It should respond to the need for facilities to train family poultry farmers and disseminate technologies generated by research. The location of supporting institutions, whether government, non-government or private sector organizations, must be decided carefully by each country, state or region.

Key points

- *Family poultry feeding systems must be carefully planned and executed in collaboration with local consultants/experts and stakeholders, in relevant production systems, to enable family poultry farmers to benefit from technologies generated by the global R&D community.*
- *Research on the possible impacts of climate change and the nutritional opportunities provided by other production systems (forestry, tree crops, annual crops, large animals, fisheries) to family poultry production systems needs to be developed, strengthened and supported.*
- *Further research is needed to update current methods of assessing SFRB, and to improve knowledge of feed ingredients and nutritional requirements of birds in the different family poultry production systems.*
- *Family poultry farmers should be trained on creep feeding of chicks, and supplementary feeding of growing and laying birds, so as to achieve higher productivity, outputs and profits.*

3.4 POULTRY HEALTH

During the three e-conferences, poultry health issues were described as the major constraint on family poultry production, ahead of inadequate feeding, housing and value chain organization. Although disease control was identified as a key factor in family poultry projects, this should be implemented alongside other appropriate husbandry measures to ensure a good return on investments (Ahlers *et al.*, 2009). As the majority of family poultry producers raise chickens, more information is

presented here for this species than for others, such as mallard and Muscovy ducks, guinea fowls, quail and pigeons.

Vaccines and vaccination programmes

Newcastle disease (ND) is identified as the major health constraint in chickens, with fowl pox becoming an issue once ND is controlled, especially in scavenging village chickens in Africa. Fowl cholera is also an important concern in Southeast Asia. The major concern for mallard ducks in Asia is duck plague. Vaccines are available to prevent each of these diseases. Different poultry vaccination models are in use in Africa, Asia and Latin America, reflecting the different ecological, economic and cultural circumstances in each region. The use of thermotolerant ND vaccines is essential in remote rural areas where cold chain facilities are lacking and a number of different strains and formulations are present (Alexander *et al.*, 2004).

The effective control of diseases such as ND is facilitated by:

- availability and affordability of appropriate vaccine (i.e. thermotolerant, small dose format);
- awareness among farmers of the importance of vaccinating their flocks;
- existence of sustainable delivery mechanisms including well-trained community vaccinators and cost-recovery mechanisms; and
- adherence to a vaccination calendar appropriate to local conditions.

Sustainable vaccination programmes against fowl pox, fowl cholera and duck plague would benefit from further research and development. Further research on improving the immune system of birds and, thus, their capacity to respond to vaccination is also merited. Malnutrition and mycotoxins are two factors that can lead to immunosuppression.

Women vaccinators

In recognition of the central role played by women in family poultry, vaccination programmes in both Africa and Asia have focused on the inclusion of women as vaccinators. Significant empowerment of women has occurred when they became vaccinators and poultry advisers, assuring them an income and enhanced prestige within the village, and an enhanced role in family decision-making. In addition, money in the hands of women also tends to bring educational and nutritional benefits to children.

Practices to improve biosecurity

Biosecurity is the implementation of measures that limit the introduction and spread of disease agents (FAO, 2008b). Biosecurity risks and requirements vary according to the production system involved; therefore, biosecurity practices must be tailored accordingly. The control of mechanical transmission of disease through fomites is relevant for family poultry producers. Both the scavenging feed resource base and commercial poultry rations could spread disease.

Food safety

The highly pathogenic avian influenza subtype H5N1 highlighted the importance of food safety in family poultry production. In reality, the poultry industry has been dealing with a number of zoonotic diseases such as salmonellosis for a number of years. The increasing homogeneity of chicken breeds, increasingly dense stocking

rates and rapid movement between facilities has increased the rate at which zoonotic pathogens are emerging. Improvement to poultry health services and appropriate training of veterinary and poultry science graduates is essential to tackle food safety issues in an organized and efficient manner.

Veterinary services

Health services for family poultry are deficient in many countries and require attention from national ministries and collaborating agencies (including the private sector, international organizations and donors). Strengthening poultry disease surveillance, prevention and control will make a significant contribution to poverty alleviation, food security and the early detection and control of zoonotic diseases, such as highly pathogenic avian influenza. In addition, it will contribute to women's autonomy and the increased participation of women in public spaces and decision-making.

Key points

- *Newcastle disease (ND) is identified as the major constraint to family poultry production in developing countries. However, once ND is controlled other constraints have to be addressed, such as other diseases (mainly fowl pox, fowl cholera and duck plague) or limitations of the scavenging feed resource base due to larger flock sizes.*
- *Ensuring the involvement of women as vaccinators and advisors contributes to both effective poultry disease control programmes and the improved status of women in their households and their communities.*
- *Institutional strengthening is required to ensure strong and sufficient extension and technical services to small farmers.*
- *Effective vaccination programmes should be combined with appropriate biosecurity measures and practices to strengthen the birds' immune systems (e.g. good nutrition and control of mycotoxins on grains).*
- *Sustainable vaccination programmes against fowl pox, fowl cholera and duck plague should be developed and implemented in the family poultry sector.*

Chapter 4

Addressing future needs for family poultry development

Family poultry production has been widely perceived as a fast way to ensure food security, generate employment and income, and promote women's empowerment at a relatively low investment. Significant improvements can be achieved through strategic interventions if these are backed by appropriate policies and programmes of governments, non-governmental organizations, international agencies or donors. The 3Ps (policies, people and programmes) are key elements to address the needs of family poultry production in developing countries. Promising approaches have therefore evolved for developing programmes through policy support and the creation of enabling environments.

4.1 POLICIES

Family poultry producers have limited direct influence on the development policies of governments in their countries. It is therefore important that their interests are represented by others, which may include national institutions and international agencies (e.g. FAO and IFAD), as well as networks of individuals interested in family poultry development, like the INFDP. Development agencies have both direct and indirect influence on the formulation of policy and its application, either through the implementation of projects or through the promotion of family poultry production on development agendas. Agencies that have contributed to such initiatives include ACIAR, DANIDA, FAO, IFAD, ILRI and the World Bank. Over the last two decades, these agencies, the INFDP and other networks such as the South Asia Pro Poor Livestock Policy Programme (SA PPLPP) were able to bring the potential of family poultry to the attention of governments in many developing countries. The Domestic Animal Diversity Information System (DAD-IS), hosted by FAO, has highlighted the importance of sustainable use of indigenous poultry genetic resources through its communication and information tool for implementing management strategies.

Successful government programmes have evolved in Ethiopia, India, Swaziland and Uganda as a result of national policies. In Swaziland, the Ministry of Agriculture emphasized the production of indigenous chickens (Swazi breed) by promoting special markets, supporting the creation of indigenous poultry groups/associations, and training farmers in improved management practices. Appropriate government policies implemented in Ethiopia, India and Uganda made Kegg Farms' enterprises with the Kuroiler possible. The government and NGOs in Bangladesh have adopted a policy to promote the *Sonali* bird as a means of generating employment among the underprivileged.

A roadmap for family poultry policies is essential to ensure that the socio-economically disadvantaged are able to make use of these potent tools to improve livelihoods and the position of women. To achieve these goals policy-makers need to be made aware of the real contributions that family poultry can make so as to ensure their active support. Local, regional and international conferences should

facilitate open discussions among scientists in developing countries to determine future strategies and activities to make family poultry a valuable and viable asset for food and nutrition security. Four areas are of particular importance for achieving sustainable development of family poultry:

- government-supported development of genetic resources appropriate to the specific conditions of production (one type of bird may not be suitable for all conditions);
- utilization of new and existing local feed resources through different feeding techniques, taking into account the potential impact of climate change;
- availability of quality vaccines and well-trained vaccinators; and
- access to credit.

There are numerous suggestions for the achievement of these objectives and a measure of research and implementation has been achieved. However, attention to family poultry in current poultry development policies has yet to gain momentum and the implementation of policies, where under process, is slower than desirable.

4.2 PEOPLE

Studies from various parts of the world have shown that family poultry production activities reach the poorest households and can act as an effective tool for poverty reduction. Stakeholders playing a pivotal role in promoting family poultry as a livelihood option include NGOs, international organizations and the private service sector. The formation of producer groups to deliver support services to poor farmers is a key issue for development and this concept receives the support of the majority of NGOs and other service providers. The support services provided include training for capacity building, supply of inputs and assistance for marketing. To achieve success and sustainability, however, the formation of producer groups needs to be combined with a Value Chain Approach, as exhibited by PRODEBEKA (Projet de développement du petit élevage dans la Kara) in Togo. Meanwhile, three NGOs in India (ANTHRA, BAIF and PRADAN) provide a total package of services ensuring backward (supply of chicks, feed, vaccination, medication and training) and forward (marketing of birds and eggs) linkages for poultry farmers. Another related NGO concept is the M4P (Making Markets work for the Poor) approach. This includes the introduction of systems analysis to assess how markets and basic services serve the poor and opportunities for change. In addition to these examples, producer groups play a vital role in creating platforms, establishing links with Microcredit and exchanging ideas (i.e. how microcredit can work to ensure different support services and project success).

Studies conducted by the NGO BRAC during different periods in Bangladesh and in some African countries (Tanzania, Uganda) have identified a series of requirements for women's empowerment. These include access to training, credit, inputs and markets provided in a sustainable way. A number of projects in Bangladesh² have demonstrated the positive impact of family poultry development on women's empowerment. The SA PPLPP has reported similar positive impacts from projects in other Asian countries. Development of family poultry production not only enhances the cash income of women, it also leads to their greater empowerment when they

² These are: Agricultural Sector Programme Support: Adaptive Research Project (ASPS II); Income generation for Vulnerable Group Development (IGVGD); Poultry for Nutrition (PFN); Participatory Livestock Development Project (PLDP); and the Smallholder Livestock Development Project (SLDP).

participate as extension workers and vaccinators. Working as a poultry vaccinator provides self-employment opportunities, but also generates community respect, empowerment, self-confidence and dignity among the women involved.

4.3 PROGRAMMES

Any organizational structure to support family poultry production must take into account the respective country's situation. The main points for consideration are covered by the STEPS approach:

- **S=Structure:** government, private organization or NGOs for technical support and distribution of replacement stock, types of support and extension services, adaptability, forward and backward linkages, etc.;
- **T=Technology:** easily adoptable, available at grass root level, etc.;
- **E=Environment:** adapted to local economic, social and ecological conditions;
- **P=People:** ensure participation to ensure local perceptions and priorities are addressed; and
- **S=Sustainable:** ecologically, economically and socially (i.e. cost effective at service provider level and also farmer level).

With the support of external funding from donors and international agencies, governments, NGOs and universities in developing countries in Africa and Asia have taken initiatives to enhance livelihoods and reduce poverty through family poultry production. These include R&D programmes and support services sometimes as single intervention (e.g. Newcastle Disease vaccination), but more often combined, covering several aspects in a holistic approach (e.g. group formation, training, input supply, credit support, linking to markets, creating a value chain). Future programmes will largely depend on the priority that national planners accord the promotion of family poultry in their respective countries.

Several donors³ have provided funds to NGOs/CBOs for family poultry production as an important livelihood option, and also as a component in nutrition and health programmes. Different organizational models for family poultry development have been practised. The African model is based on vaccination as the lead intervention. The Asian model adopts a more market-based approach with the private sector (commercial and NGO) playing a prominent role in model implementation.

Organizational structures for the breeding programmes of native breeds/cross-breds for scavenging and semi-scavenging systems have been set up under the government sector in many countries, including Bangladesh, Ethiopia, India, Kenya, Malawi, Nigeria, Thailand and Viet Nam. These are positive indicators, however, their resources are limited. Good results have been noted in Afghanistan with poor women using birds that are similar to the *Sonali* used in Bangladesh. In Indonesia, the Indonesian Research Institute for Animal Production (IRIAP) has selected Kampung chickens for increased egg production, while maintaining broodiness. In Kenya, the Kenya Agricultural Research Institute (KARI) coordinates research and development activities in livestock production including poultry. In Thailand, the Department of Livestock Development (DLD) is working to support long-term sustainability in small farmers through a network specialized in rearing native chickens.

³ These include: AusAID, the Bill and Melinda Gates Foundation (BMGF), CIDA, DANIDA, DfID, the European Union, FAO, IFAD and USAID.

Mini hatcheries established in communities in Malawi with non-electric incubators, such as the brick incubator, have proven successful under rural conditions. In Bangladesh, an IFAD programme has demonstrated that poor women can use successfully a mini-hatchery technology based on the “Chinese Rice Husk Method”. This technology is particularly appropriate for remote areas with poor infrastructure, and can be used for hatching chicken, duck and quail eggs. The SA PPLPP has documented several good practices in Bangladesh and India related to family poultry development that have potential for replication in other countries (www.sapplpp.org).

Under family poultry farming systems it is common practice for individual farmers to remain involved in all stages of production. Mobilizing family poultry producers to form group enterprises may put in place a complementary system among production enterprises (e.g. chick producers, distributors, traders, processors, consumers, transporters) to enhance the efficient flow of products and services.

Key points

- *Family poultry can be an entry point for poor farmers to engage in enterprises, get out of poverty and promote women's empowerment.*
- *Whereas commercial poultry farms established by industrialists can operate without support from donors and even from governments, family poultry development programmes need support from different corners and careful designing to achieve a favourable environment for future sustainability.*
- *A situation analysis of the perceptions, constraints, needs and priorities of poultry keepers and local conditions is essential prior to recommending a suitable production system and numbers and types of bird.*
- *Adequate research activities related to breeding, feeding, animal health and management issues are important, but are largely lacking with respect to species other than chickens.*
- *The cheapest eggs are laid by scavenging hens kept under the traditional scavenging system without systematic supplementation or complete rations. However, many countries are imposing constraints on this system.*
- *Where supplementary feeding is the best option, feed formulations for family poultry should be based on locally produced/available raw materials. These have advantages compared to costly commercial or industrial feeds. Moreover, efforts should be directed to locating new feed resources and feeding techniques to cope with climate change.*
- *Training of family poultry farmers regarding breeding, nutrition, health and related poultry husbandry practices is essential to achieve higher outputs.*
- *For semi-intensive and intensive family poultry production, a value chain approach should be applied with emphasis on market development, input supplies and training.*
- *Economic outcome and sustainability of family poultry production should be given consideration when recommending more intensive production systems.*
- *The integration of family poultry with forest production and/or annual crops and other non-traditional sources is a possible way to reach partial self-sufficiency of inputs leading to optimal complementary of farming enterprises.*

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Links to documents from the e-conferences

1. *Opportunities of poultry breeding programmes for family production in developing countries: The bird for the poor* (24 January – 18 February 2011)
available at <http://www.fao.org/docrep/018/aq633e/aq633e.pdf>
2. *Family poultry interactions with other production systems (forestry, tree crops, annual crops, large animals, fisheries, etc.): Nutritional opportunities and constraints* (16 January – 17 February 2012)
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