

## Food and Health

### Poverty alleviation, food security and the well-being of the human population through family poultry in low-income food-deficit countries

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#### Abstract

Family poultry (FP), which are still very important in low-income food-deficit countries (LIFDCs), have been kept by local communities for many generations. These birds usually make up more than 80% of the national poultry flock in many LIFDCs. Although requiring low levels of inputs, FP are a valuable asset to local populations, especially in underprivileged groups and less favoured areas. FP represent an appropriate system to provide additional income to the generally resource-poor small farmers, especially women, to supply the fast-growing human population with high quality protein, hence their significant contribution to poverty alleviation, food security and the overall well-being of household's members. Nevertheless, there is a strong need for governments, non-governmental organizations, international agencies and donors to design, implement, monitor and evaluate FP development programmes by taking socio-cultural issues into account.

**Key words:** Family poultry, family well-being, food security, poverty alleviation.

#### Introduction

The growth of the world human population, which is expected to increase from 5,282 million in 1990 to 7,286 million in the year 2015<sup>1</sup>, will take place largely in low-income food-deficit countries (LIFDCs) of Africa, Asia, the Near East, Latin America, Europe and the South Pacific. LIFDCs are defined, for analytical purposes, by the Food and Agriculture Organization of the United Nations (FAO) (<http://www.fao.org>) using three criteria. Firstly, countries should be poor, with a per capita income amounting to less than US\$ 1,445 in 2000. Secondly, countries should be net importers of food over the preceding three years. Thirdly, the self-exclusion criterion is applied when countries that meet the above two criteria specifically request to be excluded from the LIFDC category. In order to avoid countries changing their LIFDC status too frequently – typically reflecting short-term, exogenous shocks – an additional factor has been recently taken into consideration. This consideration, called “persistence of position”, would postpone the “exit” of a LIFDC from the list, despite the country not meeting the LIFDC income criterion or the food-deficit criterion, until the change in its status is verified for three consecutive years. During these three years, the country in question would be considered to be in a “transitional” phase. In 2000, 84 nations were defined as LIFDCs (44 in Africa, 24 in Asia, 8 in Latin America and the Caribbean, 5 in Oceania and 3 in Europe). Most of the 826 million people still suffering from malnutrition and approximately 1.2 billion people living on less than US\$ 1 a day (UNDP<sup>2</sup>) live in LIFDCs, especially in the arid zones of Africa and Asia. Poultry production represents one of the alternatives to feed the fast-growing human population. Over the last decade, poultry population has grown spectacularly throughout the world: 23 percent in developed and 76 percent in developing countries. This increase, due primarily to industrial or commercial production, has been most notable in the South and East Asia where growth averaged 90 percent. For example, in India, production has increased sixfold in ten years. However, according to Branckaert and Guèye<sup>3</sup> and Guèye<sup>4,5,6</sup>, most of the conditions required by the

(semi-) industrial poultry sub-sector are not met in LIFDCs, namely:

- the ability to purchase most inputs, i.e. improved birds, feeds, vaccines, drugs and equipment;
- the availability of a highly skilled manpower;
- the presence of a strict disease control; and
- the existence of national domestic markets able to absorb poultry products at attractive prices by consumers with adequate purchasing power.

In fact before developing medium to large-scale units, either for broiler or egg production, it is important to achieve either self sufficiency in cereal products or to generate the necessary hard currencies provided by the export of oil or other expensive raw materials, or to have a developed services sector. Family poultry (FP) is still very important in LIFDCs. While making one of the best uses of available natural resources, FP constitute an important component of the agricultural and household economy in LIFDCs, a contribution that goes beyond direct food production for the fast-growing human population as well as employment and income generation for resource-poor small farmers, especially women. They also serve as a means of capital accumulation and as a barter product in societies where there is no circulation of currency. Furthermore, they are closely linked to the religious and socio-cultural lives of several million resource-poor farmers for whom poultry ownership ensures varying degrees of sustainable farming and economic stability by minimizing risks and strengthening the cohesion within traditional communities. Additionally FP have medicinal and environmental functions. FP keeping is usually the responsibility of women. Despite its significant contribution to poverty alleviation, food security and the well-being of the human population, especially in disabled and disadvantaged groups in less-favoured areas of LIFDCs, FP does not receive due attention from many agricultural policy makers (including livestock specialists). Small-scale poultry is not yet regarded by many researchers, development and extension workers as an area of importance in terms of political aspects and scientific prestige. This paper aims

at providing staff of universities, research institutes, governments, NGOs, international agencies and donors with relevant information about this very important but generally overlooked poultry sector.

### **FP Production Systems and Importance of Poultry**

**Management systems:** Typically four poultry management systems can be distinguished<sup>3,6,7,8,9</sup>, namely

- (1) the free-range system or traditional village system: scavenging, no regular water or feed, little or poor night shelter;
- (2) the backyard or subsistence system: regular water, supplementary feeding, improved shelter, care of chicks in the first weeks, vaccination against Newcastle disease and other diseases (e.g. fowl pox, fowl cholera, Gumboro disease, coccidiosis), when necessary, and treatment for parasites;
- (3) the semi-intensive system: as in 2. above, with genetically improved breeds and balanced diets; and
- (4) the small-scale intensive system: as in 3. above, with further improvements in overall husbandry conditions.

All of these systems are encountered in FP, although in the very few cases in which the intensive management system is practised, it is the small-scale option that is adopted. The choice of system is largely determined by the availability of resources and inputs, i.e. housing, cages, feed, drugs and time/attention<sup>6,9</sup> (Figure 1). Thus, most FP-keeping farmers adopt the free-range, backyard and semi-intensive husbandry systems, in that order. Also, these management systems frequently overlap; thus, free-range is sometimes coupled with feed supplementation, backyard with night confinement but without feeding; or standard poultry cages in confined space. Under the extensive poultry management systems, there is almost no health care. Nevertheless, according to Guèye<sup>10</sup>, 35–79% of resource-poor village poultry farmers in Africa rely on ethnoveterinary medicine which is mainly based on the use of natural products, especially locally available plant products. Thus, FP in LIFDCs are often maintained with very low levels of inputs (i.e. land, labour and capital), though there are possible variations between and within regions or countries. The level of inputs also depends on the keeper's or household's socio-economic circumstances. On the whole, FP can be managed by even the poorer social strata of the local communities.

In LIFDCs, poultry production is based mainly on traditional extensive poultry management systems, especially free-range and backyard systems<sup>3,6,8,11,12,13,14</sup>. It has been estimated that more than 80% of the poultry population is found in traditional family-based poultry production systems, contributing up to 90% of poultry products in some countries. Approximately 20% of the protein consumed in developing countries originate from poultry (i.e. meat and eggs)<sup>3</sup>. All over the developing world these low input–low output poultry husbandry systems have been a traditional and integrated component of rural, many peri-urban and some urban households or small farms, and are likely to continue in the foreseeable future.

**Flock characteristics:** According to Guèye<sup>15</sup>, household poultry flock size ranges from 1 to 95 in Africa, from 5 to 35 in South America, and from 30 to 2000 in Asia. Foundation stock is usually obtained from the market or through exchange (barter) or as

gifts. Flock size is associated with the purposes for keeping poultry (e.g. consumption, income, gifts, socio-cultural and/or religious ceremonies, ornamental poultry, hobby, gifts, security and breeding stock) (Table 1). Under the free-range and backyard systems, the female to male ratios (or sex ratios) in flocks amount to 1:1–8:1 for chickens or domestic fowls, 2:1–5:1 for guinea fowls, 0.7:1–1.7:1 for Muscovy ducks (the duck species mostly kept in dry areas, especially in Africa and Asia), 1.1:1–2.7:1 for turkeys, and 1:1 for pigeons (pigeons are mostly kept in pairs). The numbers of males tend to be lower in flocks with high proportions of growers, and to be higher in larger flocks. Males are generally removed from the flocks at an early age in relation to the objectives of the poultry enterprise.

Under the free-range and backyard systems, all birds (irrespective of poultry species, sex and age) generally move freely in and around the compound of households. In many cases, the household's poultry flock is composed of several 'sub-flocks' belonging to different family members and/or to other relatives or friends living outside the household. Furthermore, birds from different households can even share the same shelter and housing. At night, birds are sometimes sheltered in rudimentary coops, often elevated from the ground, which provide protection against bad weather and night predators such as reptiles, cats, dogs, and others. In FP husbandry systems, various species of poultry (i.e. chickens, ducks, guinea fowls, geese, pigeons) are kept, albeit chickens largely dominate family flock composition. Ducks are popular in Asia and South America. Birds are of indigenous or local types, exotic breeds and crosses between two types of poultry breeds. Under extensive management systems, FP usually scavenge in and around the compound of household, feeding on locally available resources e.g. earthworms, household refuses, insects, residues from the harvest. Their feed is sometimes supplemented with agricultural byproducts, especially for laying birds and poultry intended for sale. FP is usually raised together with other domestic animals (e.g. other monogastric species such as pigs and rabbits, small and large ruminants) and in some cases with fish. Animal agriculture is often integrated into crop cultivation and associated with off-farm activities. On the whole, integrative farming systems have always promoted sustainable agricultural production on small farms<sup>6,30,31,32,33,34</sup>.

**Productivity:** Productivity of birds depends on the management system adopted. Figure 2 illustrates the effect of the level of intensification on the productivity of chickens. According to Guèye<sup>15</sup>, under the free-range and backyard systems, a guinea fowl produces 37–95 eggs per year, a Muscovy duck 30–80 eggs per year, a goose 20–40 eggs per year, a turkey 25–100 eggs per year and a pigeon 14–29 eggs per year. The average egg weight amounts to 30–65g for domestic fowl hens, 30–40g for guinea fowls, 50–85g for Muscovy ducks, 65–95 g for geese, 80–100 g for turkeys and 10–20 g for pigeons. Sexual maturity of local female poultry occurs late, at 24–36 weeks in domestic fowl hens, 28–42 weeks in guinea fowl hens, 28–32 weeks in Muscovy ducks, 35–47 weeks in geese, 20–48 weeks in turkeys and 17–19 weeks in pigeons. Hatchability is usually high in domestic fowls (60–95%), Muscovy ducks (55–90%), turkeys (60–95%), pigeons (70–95%), but much lower in guinea fowls (20–50%). Because of poor hatching rates observed in guinea fowl hens, chickens and ducks are used in many local communities for hatching guinea fowl eggs and brooding

guinea fowl keets. A domestic fowl hen can hatch 15–20 guinea fowl eggs, and a Muscovy duck can sit on 35–40 guinea fowl eggs. Indigenous or local poultry grow slowly and are rather small. According to Guèye<sup>15</sup>, adult female chickens weigh 0.7–2.2 kg and male chickens weigh 1.2–3.2 kg; adult guinea fowls weigh 1.7–2.0 kg (female) and 2.0–2.5 kg (male); adult Muscovy ducks 2.8–3.5 kg (female) and 3.5–5.0 kg (male); adult female geese weigh 2.5–4.0 kg and males weigh 3.8–6.2 kg; adult female turkeys weigh 5.5–7.5 kg and males weigh 8.5–13.0 kg; and adult pigeons weigh 0.24–0.30 kg (female) and 0.29–0.45 kg (male). However, meat and eggs from indigenous stocks are more esteemed by LIFDCs' consumers, in comparison with those from intensively raised poultry flocks. Consumers generally argue that products from indigenous poultry are tastier and healthier (because synthetic drugs, such as antibiotics, are rarely used); therefore they often fetch premium prices. Because of its low productivity, FP in LIFDCs has been undervalued and is frequently considered by farmers as an insignificant occupation compared with other agricultural or trade activities. As a result, it does not receive due attention from many agricultural policy makers (including livestock specialists). Nevertheless, FP is a valuable asset to local populations because it is not only a source of income, food but is also critical to strong socio-cultural linkages in LIFDCs, especially in disadvantaged groups and less-favoured areas.

**Social, cultural and religious importance of poultry:** In LIFDCs, the keeping of poultry by local communities has been practised for many generations. More than 85% of rural families in sub-Saharan Africa<sup>35</sup>, more than 90% of tribal families from 35 surveyed villages in the five districts of western India<sup>36</sup>, 92% of the 100 surveyed respondents in Madhya Pradesh in central India<sup>37</sup>, 89% of the rural households in Bangladesh<sup>38</sup> and 90–95% of the households in rural Cambodia<sup>39</sup> keep one or more poultry species. All ethnic groups tend to be involved in FP production<sup>32</sup>, and birds are kept for many reasons. Poultry keeping has a symbolic importance within the context of many social and cultural activities (e.g. special banquets for distinguished guests, gifts, cocks as alarm clocks for the villagers) and/or religious ceremonies (e.g. cocks as offerings to the deities). In the Mossi society of Burkina Faso, chickens are given or received to show, or accept friendship, or to give thanks for a favour or assistance (e.g. from officials)<sup>40</sup>. In the traditional society of the Mamprusi tribe in northern Ghana<sup>27</sup>, guinea fowls are given as gifts to visitors. To give is a wealth-increasing action, but also an act to please the receiver. For most of these social, cultural and religious purposes, a specific sex and feather colour of poultry are prescribed. In many LIFDCs, chicken cocks are the most popular sacrificial animals. For example, in northern Ghana, a red cock is sacrificed to the ancestors to wish rain or a good harvest<sup>27</sup>; a white cock is used when community members are grateful; a black cock is sacrificed to ask for protection from evils such as diseases, war or quarrels; a white cockerel is given by one family to another when a marriage agreement is made. Because of these customs, birds with much sought-after sex and feather colour(s) are relatively costly. Poultry also has a mystical function. For example, village chicken farmers in Senegal believe that bad spirits which originally target the family can be diverted to chickens. As a result of this, birds (which are in fact affected by Newcastle disease) show neurological symptoms, which manifest as 'madly' strange behaviour.

This partially explains why there is a strong wish to keep at least one chicken flock in each Senegalese village household<sup>10,35</sup>.

Poultry, or their products are also used in traditional medicine in some African communities. White-feathered chickens are in great demand for use for medical cures in Somalia, in the Mandara tribe of North Cameroon and in Zambia<sup>41</sup>. Sonaiya et al.<sup>42</sup> reported that, in southwestern Nigeria, chicken entrails are traditionally used to increase libido in old men. In Mamprusi society of northern Ghana<sup>27</sup>, soothsayers and traditional doctors prescribe a sacrifice to cure a sick person or to ask for a safe journey. Moreover, eggs are widely used in magical practices. On the whole, FP production systems can be considered as an integral part of the culture in many traditional communities in LIFDCs.

In LIFDCs, keeping poultry is in many cases considered as the first step in animal-rearing activities, especially after events such as climatic disasters (e.g. droughts, cyclones, hurricanes and floods), civil wars, political and economical instabilities in LIFDCs lead often to drastic decrease in numbers of livestock (i.e. goats and cattle). This was, for example, the case in Mozambique, after as a long-lasting war and drought. According to Bagnol<sup>43</sup>, selling 4–5 chickens enables rural women in Mozambique to get access to a goat. Poultry can also serve as a unit of exchange in societies where there is no circulation of currency. In southern Senegal, 5–6 adult chickens can be bartered for one goat, and about 25 adult hens can be exchanged against one head of cattle. In rural Uganda, a single hen is equivalent of one bar of soap, one kg of salt and one litre of cooking paraffin, and 5–8 chickens can procure a goat<sup>44</sup>. However, according to Guèye<sup>45</sup>, the 'barter exchange rate' in rural Africa can vary with factors such as the household's socio-economic circumstances, geographic locations, climatic conditions and occurrence of disease(s). Furthermore, according to Sonaiya et al.<sup>8</sup>, keeping poultry for smallholder farmers represents a household savings, investment and insurance as the value of the birds increases over time. Under traditional management systems, most eggs from various poultry species are allowed to incubate under the mothers-poultry, because FP-keeping farmers in LIFDCs are aware of high mortality, especially in growing birds in rural areas. Keeping even a small flock is their major concern partly because of the social, cultural and religious importance of poultry. Mortality rates in chickens are estimated at 53% up to four weeks of age in sub-Saharan Africa<sup>10</sup>, 35–40% over the whole rearing period in Bangladesh and 40% in chicks in western India<sup>36</sup>.

The major role played by women, assisted in some cases by children, in FP production in LIFDCs is widely recognized<sup>15,18,36,37,41,45,46,47,48,49,50,51,52,53,54,55,56,57,58</sup>. For example, more than 70% of chicken owners in rural areas of sub-Saharan Africa are women, while traditionally pigeons belong only to children (boys)<sup>35</sup>. Although they are generally the main poultry owners and they take care of birds, women do not usually decide the use of poultry and eggs (i.e. consumption, selling, exchange). The classic division of roles and responsibilities in most traditional societies in LIFDCs implies that women have access to FP, but do not have full control over the production tools and the benefits gained from them. The gender-disaggregated data that would provide exact figures on women's roles in, and contributions to, this subsistence poultry sub-sector are still very insufficient. Besides the need for field studies and participatory rural appraisal, sustainable FP

development does require the availability of gender-disaggregated data and gender analyses. This is the prerequisite for significantly promoting gender equality and resource equity<sup>15</sup>.

### **FP as an Income-Generating Activity and a Source of Well-Being**

FP production systems are financially economic because even if the productivity of birds is low, some poultry meat and some eggs constitute almost a net profit for poultry keepers due to very low costs<sup>32,34,37,38,45,59,60,61,62,63,64,65</sup>. Thus, marketing poultry and eggs can generate significant disposable income for them, especially those living in rural areas, and who do not have access to land or other important resources such as cattle and/or small ruminants. The contribution of poultry and their products to the household cash income are generally difficult to assess. Nevertheless, calculations of Chitukuro and Foster<sup>66</sup> revealed that an average family flock of 5 adult chickens (2 males and 3 females) enables women in Central Tanzania to have an additional income equivalent to US\$ 38 in one year, representing 29% of the average annual income. Similarly, economic studies of FP keeping in southern Tanzania have shown that this sub-sector is a viable and promising alternative source of income for rural households. Indeed, Salum et al.<sup>67</sup> calculated that a household with 10–15 chickens, at a reproduction rate of 3–4 hatches per hen per year and clutch size of 10–15 eggs, will generate an income of between US\$ 563–1000 per year, which is more than the 1997 per capita income of Tanzanians (US\$ 130). Some field data relating to the contribution of FP to the household income in various LIFDCs are given in Table 2. Benefits gained by poultry producers from this subsistence poultry sector do not go exclusively to them, especially if there are women<sup>32,33,34,45,51,59,61,70</sup>. They are in many cases distributed, directly or indirectly, to all family members, contributing significantly to the overall well-being of household's members (Table 3). In addition, a survey conducted in rural Botswana revealed that, after selling chickens and eggs, 44% of the 1000 chicken rearers interviewed used the money to buy food for their families. The money was also used to pay school fees, to buy school requisites (pens, pencils, uniforms and books), to acquire additional birds, to pay contributions at burials and at the church, to purchase large stock and small ruminants (goats and sheep), to buy kitchen utensils and to remunerate traditional doctors<sup>72</sup>. The sum generated by the sale of poultry and their products can besides be used to cover costs relating to services and other social obligations. In rural Bangladesh, Paul et al.<sup>56</sup> reported that a farmer having 5–10 geese were able to cover costs relating to the education of two children. Similarly, in rural Uganda, two hens when sold were able to pay school fees for a child for a term<sup>44</sup>. A study from Indonesia showed that the keeping of only 10 scavenging chickens provided a household with 25% of their monthly expenditure, but only after controlling Newcastle disease<sup>73</sup>. FP keeping is thus capable to contributing significantly to poverty alleviation and the well-being of the human population in disadvantaged groups in less-favoured areas of LIFDCs.

### **Poultry as Source of Food**

In less-favoured areas such as non-coastal, remote, hill and densely populated regions with no mineral resources and where the arable land is often scarce, FP are mostly the only source of protein for underprivileged groups. For example, in rural Bangladesh<sup>38</sup>, FP sub-sector supplies about 80% of the total production of eggs and

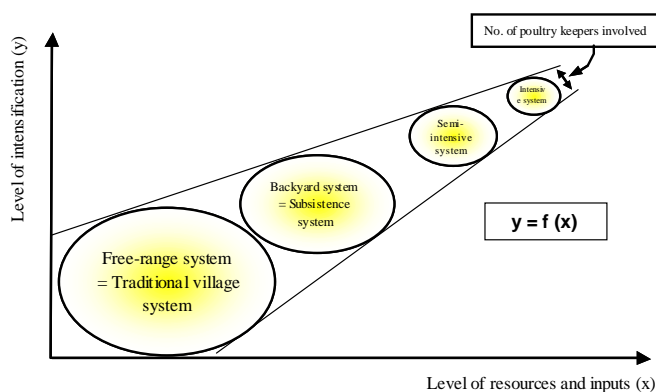
chicken meat. Therefore, strategies are being implemented to make FP keeping more profitable for landless farmers, distressed women and jobless youths. FP also provides job opportunities within traditional communities<sup>32,64,74</sup>. Despite the small flock sizes that are generally reared in families, the contribution of this traditional poultry sector to the national egg and meat production is substantial. Village poultry was estimated to account for 12.4% of the 192,640 mt eggs produced in 1987 in Nigeria<sup>75</sup>. In Indonesia, village poultry contributed 25% (157,000 mt) of the total meat produced in 1984, and 11% of national egg consumption<sup>11</sup>. In Côte d'Ivoire, the village poultry population provided about 69% of the 21,500 mt of poultry meat, and 26% of the 12,200 mt eggs produced in 1984<sup>76</sup>. In Morocco, about 25.6% of the 117,000 mt of poultry meat and 36.4% of the 1,100 million eggs produced in 1989 came from the traditional poultry sector<sup>77</sup>. According to Mbugua<sup>78</sup>, local poultry contributed 71% of 64.8 million dozens of eggs produced in 1987 in Kenya, while the contribution of local chickens for meat was estimated as 72% of the total production of 11,960mt. In reality, these proportions are probably higher at present, because farmers in commercial poultry sector have to cope with various supply bottlenecks due to their high dependence on imports (that need hard currencies) and because of periodic feed and other input shortages<sup>3,5,6,9</sup>. The contribution of poultry to egg and meat production can be significant for households. This is illustrated by the fact that in rural Tanzania, by the end of the fifth year of production, 20 cocks, 21 cull hens, 64 pullets, 64 cockerels, about 22 kg of eggs and 47 kg of meat could be the produce of a single initial pullet<sup>79</sup>. According the authors, this would be far in excess of the output expected from a beef cow. Consumers in LIFDCs prefer indigenous chickens above meat and eggs from imported stocks<sup>12,31,32,80,81,82</sup>. Producers therefore fetch premium prices for their products. In 1995, for example, the average indigenous chicken meat prices in Dakar, Senegal, varied from US\$ 2.54 to 3.93 per kg at markets and supermarkets, respectively. These represented increases of about 13% at markets and 27% at supermarkets in comparison with prices of meat from commercial chickens<sup>12</sup>. Consumers with a higher income who shop at supermarkets are willing to pay more in order to get indigenous chicken meat. In Zambia, Sayila<sup>83</sup> reported that an adult village chicken in town might cost US\$ 7.0 compared to US\$ 3.5 for a hybrid chicken. However, in South Western Nigeria, the prices from itinerant retailers for indigenous and exotic growers were the same while market prices for cocks were two to three times higher than for hens, i.e. US\$ 4.08 to 5.10 for mature cocks and US\$ 1.63 to 2.04 for mature hens<sup>42</sup>. With regard to the comparison in egg prices, they were about 30% higher for eggs from the traditional family-based poultry production than eggs from semi-industrial systems in northwestern Nicaragua<sup>61</sup>.

It is worth mentioning the existence of restrictions or bans regarding the rearing of certain poultry species and the consumption of poultry products (i.e. meat, and especially eggs) in some traditional local communities. Although such socio-cultural constraints on family poultry rearing is declining, several examples are reported. Thus, the gizzard is widely reported to be reserved for men in Botswana, Ethiopia, Kenya, Lesotho, Mozambique, Namibia, Swaziland, Tanzania and Uganda. In Zimbabwe, the neck is also reserved for men. In some parts of Tanzania and Kenya, women do not consume chicken meat at all<sup>41</sup>. People of some African communities are reluctant to keep ducks and to consume their products, as these birds are presumed dirty and/or destruc-

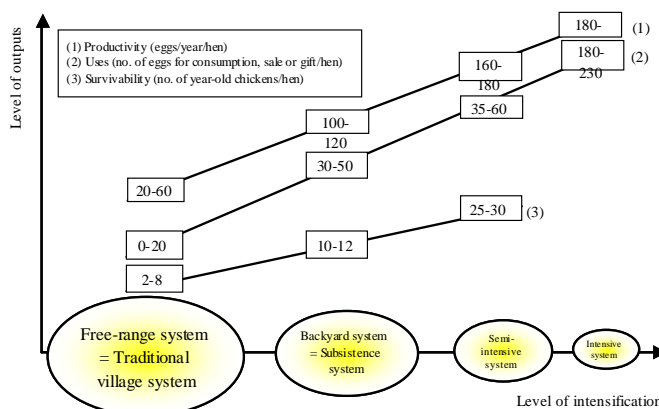
**Table 1.** Purposes mentioned by farmers for keeping poultry in various regions in LIFDCs.

Poultry species	Study area <sup>a</sup>	Reported purposes <sup>b</sup> (%)	Source
Chickens	Kwara, Oyo and Ogun States, Nigeria (353)	C (27.5), I (10.5), I+C (44.7), SCR (3.4), I+SCR (10.5), C+SCR (2.6), O (0.8%)	Atteh <sup>16</sup>
Chickens	Keita region, Niger (47)	C (46.7), I (37.7), G (15.6)	Bell and Abdou <sup>17</sup>
Chickens	Midhill region, Nepal (-)	I (5), C+SCR (90), I+C+SCR (5)	Bhurte <sup>18</sup>
Chickens <sup>c</sup>	Plains of Nepal (-)	C (21), I (10), C+SCR (14), I+C+SCR (55)	Bhurte <sup>18</sup>
Chickens <sup>d</sup>	Central River Division, The Gambia (110)	C (94.0), I (94.0), G (33.0), SCR (9.0)	Bonfoh <sup>19</sup>
Chickens Senegal (150)	Peri-urban area of Dakar,	C (55.3), I (43.3), G (0.7), BS (0.7)	Guèye EF unpublished
Chickens <sup>e</sup> Senegal (150)	Peri-urban area of Dakar,	INC (83.6), C (10.9), I (5.5)	Guèye EF unpublished
Chickens	Chitungwiza, Zimbabwe (85)	I+C (91.8)	Kelly et al. <sup>20</sup>
Chickens <sup>d</sup>	Serowe-Palapy Subdistrict, Botswana (106)	C (100.0), I (65.0), SCR (55.0), H (14.0)	Moreki <sup>21</sup>
Chickens	Faranah region, Guinea (42)	I (45), BS (28), C (12), SCR (10), G (5)	Mourad et al. <sup>22</sup>
Chickens	Coast and Dar-es-Salaam regions, Tanzania (43)	C (67), I (31), SCR (2)	Msami <sup>23</sup>
Chickens	Northern Kaduna State, Nigeria (41)	I (52.3), C (29.3), G (13.8), E (4.6)	Otchere et al. <sup>24</sup>
Chickens	Central Highlands of Ethiopia (30)	I (26.6), SCR (25.0), BS (20.3), C (19.5), G (8.9)	Tadelle <sup>25</sup>
Chickens <sup>e</sup>	Central Highlands of Ethiopia (30)	INC (51.8), I (22.6), C (20.2), G (5.4)	Tadelle <sup>25</sup>
Chickens <sup>e</sup>	Anambra State, Nigeria (429)	I (67.1), C (23.6), S (6.5), H (2.8)	Wosu and Ibekwe <sup>26</sup>
Guinea fowls	Keita region, Niger (47)	I (45.7), C (27.2), G (27.1)	Bell and Abdou <sup>17</sup>
Guinea fowls	Northern Kaduna State, Nigeria (41)	I (43.5), E (23.7), C (20.9), G (11.9)	Otchere et al. <sup>24</sup>
Ducks	Keita region, Niger (47)	C (50.0), G (50.0)	Bell and Abdou <sup>17</sup>
Ducks	Northern Kaduna State, Nigeria (41)	I (52.8), G (28.2), C (19.0)	Otchere et al. <sup>24</sup>
Pigeons	Keita region, Niger (47)	C (42.8), G (42.8), I (14.4)	Bell and Abdou <sup>17</sup>
Pigeons	Northern Kaduna State, Nigeria (41)	C (80.0), G (20.0)	Otchere et al. <sup>24</sup>
Pigeons <sup>e</sup>	Anambra State, Nigeria (7)	H (100.0)	Wosu and Ibekwe <sup>26</sup>
Chickens+ Guinea fowls	Northern Ghana (19)	SCR (34.7), I (27.8), C (15.3), G (12.5), BS (9.7)	van Veluw <sup>27</sup>
Chickens+ Guinea fowls <sup>e</sup>	Northern Ghana (19)	INC (71), I (18), C (5), G (5)	van Veluw <sup>27</sup>
Chickens+ Ducks+Pigeons	Western, Eastern and Northern Cameroon (56)	I (90)	Agbédé et al. <sup>28</sup>
Chickens+ Turkeys	Kenifra region, Morocco (52)	I (52), C (48)	Benabdeljelil and Arfaoui <sup>29</sup>

<sup>a</sup>Values in brackets are numbers of households surveyed; <sup>b</sup>I=Income, C=Consumption, SCR=Socio-cultural and/or religious ceremonies, O=Ornamental poultry, H=Hobby, G=Gifts, S= Security, E=Exchange, BS=Breeding stock, INC=Incubation of eggs.  
<sup>c</sup>Calculated from the authors' data; <sup>d</sup>Non-exclusive percentages; <sup>e</sup>Only eggs are considered; -, Not reported.



**Figure 1.** Level of intensification as a function of the level of resources and inputs<sup>9</sup>.



**Figure 2.** Effect of intensification in production systems on the productivity of chickens

**Table 2.** Contribution of poultry and their products to the household cash income.

Poultry species	Study area (No. of households surveyed)	Contribution	Source
Chickens	Central Highlands of Ethiopia (30)	likely to rank second in importance, after grain	Tadelle <sup>25</sup>
Ducks	West-Java, Indonesia (-)	71% of the annual household income <sup>a</sup>	Setioko <sup>68</sup>
Chickens+ Guinea fowls	Northern Ghana (19)	15% to the annual household cash income	van Veluw <sup>27</sup>
Chickens+ducks+turkeys	Bauchi State, Nigeria (94)	9.5% of total monthly income generated by all the other domestic animals (sheep, goats, rabbits, pigs and cattle)	Kushi et al. <sup>69</sup>
Chickens+ducks+guinea fowls+turkeys	Throughout the country, Dominican Republic (137)	12.9% (for chickens) and 1.0% (for ducks) to the household income generated from animal production	Rauen et al. <sup>34</sup>
All poultry species	East Kalimantan, Indonesia (139)	53.3% of the total household cash income <sup>b</sup>	Ramm et al. <sup>33</sup>

<sup>a</sup> A farm family located in lowland rice based farming system, and keeping 100 native ducks and 2 heads of buffalo and cultivating 0.4 ha of irrigated paddy and 0.1 ha of mixed garden.

<sup>b</sup> Contribution of other domestic animals amounted to 10.1% for goats and 36.5% for cattle.

-, Not reported.

**Table 3.** Uses of income generated by FP keeping.

Poultry species	Study area (No. of households surveyed)	Reported uses (%)	Source
Chickens	Rural area of N'Djaména, Chad (57)	Usual domestic goods such as soap, tea, sugar, oil, condiments, etc. (40), clothes and shoes for household's members (30), business (20), purchasing other chickens (10)	Mopate and Lony <sup>71</sup>
All poultry species <sup>a</sup>	Peri-urban area of Dakar, Senegal (150)	Rice (45.3), thee/coffee (10.7), sugar (10.0), poultry feeds (5.3), acquisition of other poultry (8.0), bread (10.0), children's textbooks (4.7), "tonine" <sup>c</sup> (community savings system) (9.4), shoes/clothes (30.0), oil (21.3), soap/drug (10.0), other domestic goods (12.0)	Guèye <sup>32</sup>
All poultry species <sup>b</sup>	East Kalimantan, Indonesia (94)	Food (67.0), school fees (11.7), house (6.4), others (14.9)	Ramm et al. <sup>33</sup>

<sup>a</sup> Non-exclusive percentages.

<sup>b</sup> Calculated from authors' data.

tive to the water supplies, and/or are seen as associated with evil omen. In Senegal, guinea fowl rearing is considered by some communities as being a sign of poverty, while in other communities, guinea fowls are regarded as good omen. In the *Sereer* ethnic group of west Senegal, the consumption of pigeon meat is prohibited to young girls<sup>84</sup>. It is believed that pigeon meat would have negative effects on virginity and future maternity or prolificacy.

### Strategies for Sustainable FP Development

**Approaches and research needs:** Sustainable FP development programmes are those that are built on current practices and capabilities of beneficiaries. Additionally, they should make efficient use of locally available resources (i.e. farmers' knowledge and practices, feed resources, building materials, equipments). Objectives and activities of FP development programmes in LIFDCs should be related to the perceptions, needs, priorities, interests and suggestions of relevant members of local communities, as well their different component groups, i.e. men, women, boys, girls, young and old, poorer families, wealthier families, members of different socio-cultural groups. From the outset of any FP project, a participatory approach must be adopted<sup>4,6</sup>. The philosophical approach for such interventions must be holistic ('generalistic'), and the scientific approach has to be multi- and transdisciplinary because most farmers in LIFDCs, especially women, undertake a wide range of on-farm and off-farm activities<sup>6,15</sup>. Keeping poultry may compete with these other activities and may not always have priority. This needs to be assessed before the initiation of any FP development programme, hence the need for well-designed research. Furthermore, mutual trust between FP-keeping farmers and poultry scientists/workers is a prerequisite for success. Achieving the full participation and close collaboration of relevant members of the community requires scientists/organizers to spend a lot of time with potential beneficiaries, to inform them thoroughly of the details of any FP research and development programme<sup>9</sup> and to respect their values and beliefs. One particularly appropriate method of investigation might be described as 'relaxed rural (or peri-urban or urban) appraisal'<sup>6</sup>. Many well-intentioned projects have ignored the socio-cultural and economic environments of potential beneficiaries in the design and implementation stages of FP production programmes at community level in LIFDCs. Most of these projects have failed because organizers were not sufficiently sensitive to socio-cultural issues, especially the gender-based constraints. Development in FP production requires improvements at all levels (i.e. flock, household and market), and these improvements should be introduced gradually in order to upgrade farmers' skills on a long-term basis. In FP development interventions, the role and concerns of women should be taken into account by analysing gender-based constraints, needs and opportunities<sup>15,51,53,57</sup>. If an appropriate model is to be built and tested at farm level, there is a need to collect baseline socio-cultural and economic data, to conduct gender research and to gather local knowledge on husbandry practices that tend to be more in the custody of women. Since daily management of birds is generally the women's domain, ideally women should be interviewed during surveys. However, socio-cultural and religious realities in some traditional communities do not always facilitate or allow this. For example, men tend to be reluctant to allow their wives to be in contact with a 'foreign' male interviewer. All this work must be done by multi- and trans-disci-

plinary teams to ensure that the FP husbandry systems are fully understood and their constraints clearly identified. Once the production environment in which farmers, especially women, work is better understood, recommendations on ways to improve the productivity of FP-keeping farmers can then be made. In short, dealing with FP production systems has a lot to do with anthropological studies. Detailed information will help to develop appropriate interventions in areas such as disease prevention and control, predator control, poultry housing, feeding and watering systems, genetic improvement of poultry, marketing of poultry products, training, credit and information exchange system. At national level, it is also important to collect data on the FP sub-sector, and these data must be part of the data on the national economy as a whole, and FP development in LIFDCs must be seen as an integral part of the national development policy.

**The need for technical assistance:** The formation of farmers' cooperatives, whenever possible, will facilitate their training and education with a view to enhancing their skills. The supply of inputs (i.e. feed supplementation, improved birds, drugs and vaccines) would also be easier because of the economies of scale. The cost of buying drugs or vaccines can be shared among several FP-keeping farmers and the marketing of poultry products may be pooled, thus reducing transportation costs. Furthermore, genetic improvement could take place through cock exchanges among cooperative members. Finally, cooperatives would attract technical assistance (e.g. fertile eggs for hatching, veterinary assistance, feeds and credits/loans) that would be virtually impossible for an individual FP-keeping farmer to acquire.

Training and education in FP are difficult and time-consuming tasks<sup>6,9,15</sup>. Although it is essential to improve farmers' skills, this must be done gradually. FP producers, especially women in rural areas, tend to be fluent only in local languages. They generally cannot write. In addition to being illiterate, many of them are also innumerate and have no training in management. These aspects should determine training and communication methods to be used. Thus, unconventional<sup>22,58</sup> methods such as theatres, songs and learning-by-doing should be preferred and simple extension messages must be used. Moreover, since women have a great many other activities, training sessions, as well as meetings, must be brief and frequent. They must be scheduled in those periods when women are not involved in other duties, though this is a challenging exercise. Furthermore, although women, and secondly children, should be the main target groups during training sessions<sup>3,4,51,58,59,70,85,86,87</sup>, it is recommended that the whole family, or special interest groups, also be trained<sup>6,15,31,45</sup>. Similarly, since men and boys seem to be generally responsible for the construction of shelters, they should ideally be trained in the domain of poultry housing<sup>15</sup>.

### Conclusions

Despite efforts to develop the intensive poultry sub-sector, FP are still very important in LIFDCs of Africa, Asia, the Near East, Latin America, Europe and the South Pacific. FP is a valuable asset to local populations because it is not only a source of income, food and well-being, but is also critical to strong socio-cultural linkages in LIFDCs, especially in disadvantaged groups and less-favoured areas. Agricultural policy makers should therefore pay due attention to this very important but generally overlooked sustainable poultry sub-sector. Appropriate interventions should include the improvement of farmers' skills in all aspects of poultry

management by taking socio-cultural, especially gender, issues into account. Indigenous knowledge systems should also not be undervalued, as they are capable of forming a basis for sustainable FP development, which should be backed by well-designed research. Extensive FP production systems, especially free-range and backyard systems – the most practised husbandry systems in LIFDCs – represent the basis on which a sustainable, profitable and well-adapted semi-industrial poultry sub-sector could be progressively developed. As sustainability assumes preservation of natural resources, as well as technical feasibility, economic usability and socio-cultural acceptance, this evolution should be conducted in the most appropriate socio-economic way, taking into account the specific local features and constraints to be overcome. The sensitivity of the gender concept calls for participatory, open-minded and flexible development approaches and strategies for FP. Thus, all relevant members of local communities must be involved in the whole process, and their weaknesses in terms of behaviour, perceptions, constraints and attitudes must be identified and taken into account. This enables FP-keeping farmers to bring about appropriate changes in their farm management. The International Network for Family Poultry Development (INFPD), which has been set up to co-ordinate research, training and/or extension in relation to family poultry production, is well aware of the key role of this poultry sub-sector play in poverty alleviation, food security and the well-being of the human population. The network seizes every opportunity to sensitize policy makers, researchers, extension workers, staff of NGOs, international agencies and donors. Among the objectives of the INFPD is the encouragement of higher standards through reporting results, providing advice, and disseminating these through its trilingual (English, French and Spanish) newsletter. Further information about INFPD activities is available on the Internet: <http://www.fao.org/ag/againfo/subjects/en/infpd/home.html>

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