Challenges and opportunities for small-scale family poultry production in developing countries

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The spectre of widespread food insecurity has become a global issue with the human population reaching 7 billion in 2012 and extreme weather events impacting on food production. Increased production of poultry, both commercial and family, is a vital contribution to food security at both the household and community levels. The paper reviews the long history shared by people and poultry and looks at the challenges to and opportunities for achieving ecologically sustainable small-scale family poultry production. Key issues discussed include: enhancing food security and safety through improved poultry disease surveillance, prevention and control; improving linkages between poultry producers and animal health services; involving multidisciplinary and gender sensitive teams in problem solving; minimising waste through composting; improving producer education; improving the quality of educational curricula relating to family poultry production; and improving information sharing using digital technologies.

Many commentators are suggesting that the world is on a precipice as we face both environmental and financial global crises. Family poultry production brings people together across many divides and links us to the natural world in a very positive and unassuming manner. While cost-efficient and ecologically-sustainable small-scale poultry production may not hold the answers to all of the problems, it does provide both producers and consumers with an options that are low-cost and relatively carbon-neutral.

Introduction

Poultry and people have had a shared history for thousands of years and current trends suggest that this is not about to change in the near future. Family poultry comprises extensive and small-scale, intensive poultry production and is still important in Africa, Asia, Latin America and the South Pacific (Sonaiya et al., 1999; Figueiredo, 2012; Guèye, 2012). As we review the challenges and opportunities for small-scale family poultry production, it is crucial that we remember that poultry are frequently an essential part of the fabric of human societies in both “developed” and “developing” countries. This paper will focus on extensive family poultry production in “developing countries” but will also draw on parallels with backyard poultry production in “developed countries.”

Domestication of poultry species

Those involved with Communication for Development and Behaviour Change Communication know only too well that it can be extremely difficult to change human behaviour which relates to issues deeply embedded within our “habitus” (the set of socially learnt dispositions, skills and ways of acting; Bourdieu, 1996, 2004). The bond between humans and dogs is well recognised and evidence suggests that the domestication of the wolf occurred around 9,000 years ago (Scott and Fuller, 1974). The domestic pigeon (Columba livia f. domestica) is considered the world’s oldest domesticated bird. Mesopotamian cuneiform tablets mention the domestication of pigeons more than 5,000 years ago, as do Egyptian hieroglyphics. Research suggests that domestication of pigeons was as early as ten thousand years ago (Blechman, 2007).

Archaeological evidence suggests that domesticated chickens existed in China 8,000 years ago (Alders, 2004). Domestication may have occurred separately in India or domesticated birds may have been introduced from Southeast Asia. Accounts of cock fighting in India from 3,000 years ago...
ago indicate that chickens have been part of the culture for a long time. Recent genetic studies have pointed to multiple maternal origins in Southeast, East, and South Asia, but the clade found in the Americas, Europe, the Middle East and Africa appear to have originated in the Indian subcontinent.

Domestic geese (Africa, Europe and West Asia: Anser anser domesticus; or East Asia: Anser cygnoides,) have a place in Roman mythology and archaeological evidence suggests that they were domesticated in Egypt more than 4,000 years ago where geese were key elements of the agricultural production system. Domestication of other poultry species has occurred all around the world: the Guinea fowl (usually Numida meleagris) in Africa; the Muscovy (Cairina moschata) in Central and South America; the domestic turkey descends from the wild turkey (Meleagris gallopavo) from Mexico; the Mallard duck was most likely domesticated from the wild duck (Anas platyrhynchos) in Southeast Asia.

Reasons for raising poultry

The long history of domestication in many parts of the world and the different types of poultry keeping activities developed as a result of the different roles that poultry fulfilled. The reasons for raising poultry are closely linked to the production system under which they are raised. The larger and more intensive production systems focus on the production of poultry meat and eggs by commercial entities for sale to consumers, especially urban consumers. Family poultry farmers raise poultry for various reasons, from the need to create an income to the simple pleasure of watching the healthy birds. In general, family poultry provide animal protein in the form of meat and eggs; they are available for sale or barter in societies where cash is not abundant. Family poultry fulfil a range of functions that are difficult to value in terms of money; they provide pest control and manure, they are used in festivals, ceremonies, treating illnesses and for meeting social obligations (Alders, 2004). Village poultry are generally owned and managed by women and children and are often essential elements of female-headed households (Guèye 2000; Bagnol, 2001).

Poultry are also involved in human recreational activities in many parts of the world, from pigeon racing to cock fighting. This can frequently result in the raising of many different poultry species (local breed chickens, ducks, pigeons, game fowl and geese or quail or Guinea fowl) within the same small area of land where the owners themselves also live. The relationship between owners and game fowl in Southeast Asia is particularly strong as described in the writing of the anthropologist Clifford Geertz (Geertz, 1973). The relationship of the birds with their owners remains quite intimate with chickens being considered an integral part of people’s lives (Restuadhi et al., 2010). Domestic chickens appeared in Africa many centuries ago; they are now an established part of African life. The rooster frequently appears in the emblems of political parties (Alders, 2004). In the following extract, a cockerel plays a role in the creation story of the Yoruba, who were the rulers of the ancient state of Ife in what is now Nigeria:

According to the Yoruba myth of creation, Ife was the original home of Man. Olorun, the supreme god of the Yoruba, let his son, Oduduwa, down from heaven on a chain carrying a five-toed cockerel, a palm-nut and a handful of earth. The earth was scattered by Oduduwa over the water. It was then scratched by the five-toed cockerel and became dry land in which the palm nut germinated to become a palm tree. This palm tree had sixteen fronds which represented the sixteen rulers of Yorubaland. (Crowder, 1977).

The large commercial poultry producers in the USA are well known. Less well known is that the US game fowl industry was estimated to be valued at over US$ 2 billion in 2007 (Leber, 2007). The following statement by the President of the United Game Breeders Association in the USA clearly indicates the importance of gamefowl to the association’s members:

The culture and heritage of gamefowl is a part of our nation’s history. From the beginning of our country to this very day gamefowl have had a significant impact. Only one vote kept the Gamecock from becoming our national symbol. It has been reported that former Presidents have bred, raised, sheltered, and competed gamecocks on the White House grounds. The culture and tradition have been passed from generation to generation. For many Americans gamefowl are the heart and soul of their existence. The breeding and raising of gamefowl has held families together, created a sense of unity, trust, and love for life due to the simple presence and aura for which the gamecock is noted. In thousands of families, gamefowl provides significant to total income for the entire family. Income from gamefowl, in some
instances has kept these families from relying on financial support from the government. (Leber, 2007).

**Contribution of family poultry to human wellbeing**

Intensive large and medium scale poultry production has grown dramatically over the past two decades. However, family poultry continue to make a significant contribution to poverty alleviation and household food security in many developing countries (Alders and Pym, 2009; Guèye, 2012). Village poultry, in particular, make highly significant contributions to extremely vulnerable households and their improved production can also support HIV/AIDS mitigation and wildlife conservation initiatives (Alders and Pym, 2009). Village poultry production is ideally suited to rural areas where the conditions for a successful commercial poultry sector are rarely met. Indigenous poultry breeds are excellent scavengers, transforming feed resources considered unsuitable for human consumption into high quality products such as poultry meat and eggs. The ability of indigenous breeds to scavenge, to flee predators, to lay and hatch their own eggs and to contribute to pest control results in a production system that complements other farm activities without directly competing with humans for cereal crops.

**Increasing human population, urbanisation, food insecurity and climate change**

Since the XXIII World Poultry Conference in 2008, the spectre of widespread food insecurity has become a global issue with the human population reaching 7 billion in 2012 and extreme weather events impacting on food production. In 2009, the Food and Agriculture Organization estimated that a record 1.2 billion people suffered from chronic hunger or undernourishment (FAO, 2011). Of the 925 million people estimated by FAO to be undernourished in 2010, 906 million were to be found in developing countries. Increased production of poultry, both commercial and family, is a vital contribution to food security at both the household and community levels. However, the need to increase food production is occurring at a time when the availability of key resources, such as phosphorus and fresh water, are peaking (Cribb, 2010). Given the crucial role of food security in political stability and its inextricable links to the environment, the efficient use of available resources has become even more important.

The food security debate has also contributed to the rise of the concept of food sovereignty which is broadly defined as the right of nations and peoples to control their own food systems, including their own markets, production modes, food cultures and environments (Wittman et al., 2010). While political scientists can debate the political aspects of food sovereignty, the movement highlights two very practical issues: 1. local production for local consumption; and 2. the vital contribution of indigenous plant varieties and animal breeds to human wellbeing. As fossil fuel costs increase, the cost of transporting food around the globe is increasing significantly. As discussed by Figueiredo in this Congress, the competition between producing crops for animal feed or biofuels has already negatively impacted on the price of key cereal crops (Figueiredo, 2012). The preservation of indigenous seeds and breeds is not only important from the biodiversity perspective, but also because they are the product of an evolutionary process that has yielded biological entities that are uniquely adapted to their environments. This is illustrated by the robustness and appropriateness of indigenous chicken breeds under resource-limiting conditions which continue to exist with minimal inputs while “improved birds” that have been distributed to villages have rarely survived, let alone made a lasting contribution to the village chicken gene pool (INFPD, 2011).

**Food security and food safety**

Food safety is an integral part of food security (Cahill, 2009) and it has been highlighted by the highly pathogenic avian influenza (HPAI) subtype H5N1 pandemic. In the wake of the pandemic, millions of poultry have been killed or slaughtered and the livelihoods of many households, especially women, severely impacted (FAO, 2009). Widespread culling of family poultry has impacted on vulnerable households, contributing to increased stunting in children under five in Egypt (FAO, 2009) and decreased enrolment of girls in school in Turkey post HPAI H5N1 control activities (Bagnol, 2009a).

The public health community is increasingly worried about emerging infectious diseases, especially those of animal origin (both domestic and wild animals; Jones, et al., 2008). The HPAI H5N1 pandemic has also highlighted the readiness of vulnerable households to consume carcasses of poultry that have died of infectious disease because of food insecurity, a practice which pre-dates the HPAI H5N1 pandemic. The harvesting of wildlife is also increasing as demand for bushmeat or “specialty” wildlife products increases in urban areas in Africa and Asia. Communities living near wildlife areas continue hunting and gathering lifestyles as part of their basic livelihood strategies (Golden et al., 2011).
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Achieving safe and secure family poultry production

Achieving food security and safety remains difficult while vast numbers of poultry die annually from preventable diseases, such as Newcastle disease (ND), and family poultry producers remain disengaged from national animal health services. Despite the millions of dollars invested in the control of HPAI H5N1, there would still appear to be some way to go with developing cost-efficient and robust poultry disease surveillance, prevention and control systems.

Investing in adequate biosecurity practices remains difficult for small-scale intensive poultry producers with low profit margins, especially with huge fluctuations in feed prices. Lack of access to information and education continues to result in households and producers who are unfamiliar with the germ theory of disease and the science behind good nutrition and poultry husbandry. Recommendations or directives that caution households against the raising of family poultry fly in the face of centuries of experience of the positive contribution of poultry to family wellbeing. The result is a lack of compliance with biosecurity and other recommendations.

There would also appear to be a lack of understanding by many animal scientists of living conditions and resource-limitations facing family poultry producers. The result is that expert recommendations regarding biosecurity and other husbandry measures for family poultry have rarely been developed in collaboration with the farmers themselves (Hickler, 2007).

Inadequate surveillance and under-reporting of poultry diseases remains a chronic problem in many countries, both “developed” and “developing.” (Ogundipe et al., 1989; Cattoli et al., 2010). An evaluation of the animal health information system in Nigeria in the 1980s, which used Rinderpest and ND as their target diseases, found that the system was characterised by late, inaccurate and gross under-reporting; less than 25% of ND outbreaks were reported to national authorities during the study period.

This lack of data makes it difficult to estimate the true impact of poultry disease on communities and therefore its contribution to food insecurity. For example, basic estimates of the direct economic impact of ND in Tanzania range from around USD 22 million (Harun et al., 2009) to over USD 34 million (Minga et al., 1986) annually. Even the response to the HPAI H5N1 pandemic would not appear to have significantly strengthened poultry disease surveillance as suggested by data submitted to the World Animal Health Organization’s (OIE’s) World Animal Health Information Database (WAHID). While the data submitted to the OIE is not a reliable way of comparing surveillance activities between countries, it does serve as an indicator of the importance given by animal health surveillance systems to poultry diseases. Sensitive disease surveillance systems that provide the earliest warnings possible are those which are capable of detecting diseases which have clinical signs compatible with priority diseases.

In the case of HPAI, the list of differential diagnoses includes: ND, acute fowl cholera (FC), infectious laryngotracheitis (ILT) and infectious bursal disease (IBD, Gumboro disease) (Alders and Bagnol, 2007; OIE, 2012a). Each of these diseases also has a significant economic impact on poultry production in addition to presenting a clinical picture similar to HPAI. A summary of reports to the OIE in 2005 and 2010 for these five poultry diseases across five countries suggests that surveillance for poultry diseases remains a significant challenge (Table 1).

<table>
<thead>
<tr>
<th>Country</th>
<th>Year</th>
<th>HPAI</th>
<th>ND</th>
<th>IBD</th>
<th>ILT</th>
<th>FC</th>
</tr>
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<tbody>
<tr>
<td>Brazil</td>
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<td>0</td>
<td>0</td>
<td>104</td>
<td>0</td>
<td>351</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
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<td>3</td>
<td>20</td>
</tr>
<tr>
<td>Egypt</td>
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<td>0</td>
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</tr>
<tr>
<td></td>
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<td>446</td>
<td>...</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Indonesia</td>
<td>2005</td>
<td>+</td>
<td>+</td>
<td>+...</td>
<td>+...</td>
<td>0</td>
</tr>
<tr>
<td></td>
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<td>+</td>
<td>+</td>
<td>...</td>
<td>...</td>
<td>...</td>
</tr>
<tr>
<td>Nigeria</td>
<td>2005</td>
<td>0</td>
<td>8</td>
<td>1</td>
<td>...</td>
<td>?</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>11</td>
<td>8</td>
<td>...</td>
<td>...</td>
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<tr>
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<td>0</td>
<td>19</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>2010</td>
<td>0</td>
<td>0</td>
<td>25</td>
<td>...</td>
<td>4</td>
</tr>
</tbody>
</table>

0 = Disease absent. +... = Disease present but without quantitative data. + = Disease presented with quantitative data but with an unknown number of outbreaks. ? = Disease suspected but not confirmed. ... = No information available

Table 1 - Summary of reports of outbreaks of HPAI and its differential diagnoses to the OIE in 2005 and 2010 in Brazil, Egypt, Indonesia, Nigeria and Thailand (OIE, 2012b).
complicating factor is that in some countries, donor support for HPAI control has targeted this disease in isolation and so funds were not made available for testing for differential diagnoses. This means that samples negative for HPAI were not processed further and farmers were left wondering what caused the mortality in their birds.

The efficient and effective control of a number of infectious poultry diseases require the quarantining, vaccination where appropriate and slaughter of affected flocks. This approach has been successful where prior agreements have been made between producers and government agencies and both parties are in accord and trust the other party to uphold their side of the agreement. In cases where quarantine and slaughter have been used by animal health authorities without prior agreement and adequate compensation of producers, the long-term consequences for disease control have been seriously impacted as producers no longer report diseases and handle outbreaks by salvaging what value they can from infected flocks (i.e. consumption and sale). This situation simply aids the further spread of the infectious agent.

**Achieving ecologically sustainable small-scale family poultry production**

Feed is a vital component of both intensive and extension poultry production. As noted above, rising prices of cereals such as maize and soyabean are having a huge impact on small-scale poultry producers. The monoculture production of these cereal crops using irrigation, chemical fertilizers and irrigation can also have long-term negative impacts on fragile environments; impacts which are magnified if these cereals are transported significant distances prior to use (Cribb, 2010).

Extensive family poultry production is limited by the scavenging feed resource base and/or the ability of producers to provide supplementary feed (Ahlers et al., 2009). The development and efficient utilisation of supplementary feedstuffs that complement and strengthen mixed farming activities, without directly competing with human food requirements is a major challenge for the coming years.

The importation of subsidised poultry products (products that are low priced because of discounting of the real environmental costs of production and/or transport) is a major threat to local poultry production.

**Opportunities for small-scale family poultry production in developing countries**

The challenges listed above also provide an opportunity for human ingenuity. With diminishing resources, producers and animal health authorities will be encouraged to work together to achieve cost-efficient and sustainable approaches.

**Enhancing food security and food safety**

Indeed, the benefits of cooperation are already yielding encouraging results in Indonesia. The Village-based Biosecurity Project in South and West Sulawesi demonstrated that it is possible to develop biosecurity approaches for family poultry production that are feasible under village conditions (FAO, 2010). Another project focussing on cost-effective biosecurity for non-industry commercial poultry operations in Indonesia has made excellent progress by involving all key stakeholders in poultry health activities (ACIAR, 2010).

The development and application of thermotolerant ND vaccines has greatly reduced the impact of this disease in both family (Alders et al., 2009) and are also being administered to commercial poultry flocks in some tropical countries (Kafi et al., 2003). The control of ND has contributed to improved links between producers and animal health services (Alders et al., 2010). Sustainable ND control provides a solid foundation on which to build cost-efficient surveillance and diagnostic services in collaboration with producers. Once family poultry flocks stabilise, producers become more interested in the control of other diseases and improved husbandry practices such as supplementary feeding (Maulaga and Msami, 2012).

**Appropriate disease surveillance, prevention and control protocols**

Cost-efficient disease surveillance activities will be enhanced by the combination of classical and participatory epidemiology methodologies (Catley et al., 2012). The knowledge and perspectives of producers and communities obtained through participatory epidemiology activities enables the targeting of more costly classical epidemiological activities, establishes or strengthens linkages between stakeholders and provides valuable insights into local perspectives relating to disease prevention and control to help tailor future interventions. Effective disease outbreak responses occur where prior agreements have been made between
Practicing ecologically sustainable small-scale family poultry development

Feed is a major input into poultry production. Many researchers are now working with poultry producers to identify alternative feed sources that are available locally and that can be sustainably produced. Two examples that illustrate this work are the use of cowpeas (Vigna unguiculata) and pigeon peas (Cajanus cajan) in poultry rations in Mozambique (dos Anjos et al., 2010) and termites and Moringa oleifera as supplementary feed for village chickens in Tanzania (Maulaga and Msami, 2012).

Building multidisciplinary teams is increasingly recognised as the way to solve complex problems. Involving anthropologists, marketing specialists, ecologists and ecosystem specialists, in addition to producers, poultry scientists and economists, in the challenges facing small-scale family poultry producers will facilitate the development of ecologically sustainable family poultry production. Initiatives in countries such as Madagascar (Bagnol and Alders, 2012; Alders et al., 2012), Mozambique (Swisher et al., 2010) and Zambia (Swisher et al., 2010) to reduce the need to hunt wildlife by increasing family poultry production reveal the benefits of such multidisciplinary initiatives.

Poultry litter is an excellent fertilizer and adding poultry by-products to compost is increasingly common (Hoornweg et al., 1999; Milligan et al., 2008; Tinning 2008). The composting process assists with inactivating harmful pathogens and transforms waste into useful fertilizer. Minimising waste and turning waste products into useable resources is a vital contribution to the efficient use of natural resources (Bradfield-Moody and Nogrady, 2010).

Investing in people

Improved family poultry production has been demonstrated to increase the number and percentage of school age children attending school in participating households (Sonaiya et al., 2002). Improving the education of producers (men and women) will, in turn, increase the efficiency of their poultry enterprises. Curricula on small-scale family poultry production can enrich the material available to primary and secondary school teachers and those involved in adult literacy programs. Poultry modules within Farmer Field Schools and Junior Farmer Field and Life Schools contribute to improved skills of and information sharing between farmers (IRPC, 2006).

Increased access to education and training for producers will yield benefits beyond simple increases in production. Improved education of women, in particular, will lead to better health of their families as well as their poultry. With increased education of women, child survival improves and the number of children born decreases (UN, 2011). Given current predictions for increases in the human population, allowing women access to education and control over their reproductive health would seem to make good sense.

Those involved with small-scale family poultry production from the producers to Ministers of Agriculture need access to reliable information. Ensuring that accurate and timely market information is available to poultry producers is also critical to enable them to make sound decisions relating to the purchase of inputs and the sale of their products. The use of digital technology (i.e. mobile phones and the internet) is benefiting producers across the globe (Bradfield-Moody and Nogrady, 2010). Digital technology is linking the growing numbers of backyard poultry producers and urban agriculturalists. Strengthening relationships between people with an interest in poultry production will potentially increase awareness of the difficulties faced by producers and the diverse natural and production systems involved with food production.

Conclusions

Many commentators are suggesting that the world is on a precipice as we face both environmental and financial global crises. Family poultry production brings people together across many divides and links us to the natural world in a very positive and unassuming manner. While cost-efficient and ecologically-sustainable small-scale poultry production may not hold the answers to all of the problems, it does provide both producers and consumers with options that are low-cost and relatively carbon-neutral.
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