

**EXTENDED ELECTRONIC VERSION**  
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## POULTRY IN THE 21<sup>ST</sup> CENTURY AVIAN INFLUENZA AND BEYOND

International Poultry Conference  
Bangkok, November 2007



**Cover photographs:**

Left image: Olaf Thieme

Centre image: Paolo Pagani

Right image: Anan Sirimongkolkasem

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## Editors' details

### Olaf Thieme

Livestock Development Officer  
Animal Production Service  
Food and Agriculture Organization of the United Nations  
Rome, Italy  
olaf.thieme@fao.org

### Dafydd Pilling

Consultant  
Animal Production Service  
Food and Agriculture Organization of the United Nations  
Rome, Italy  
dafydd.pilling@fao.org

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During the conference Ms Jenni Kiilholma, Ms Ruchdaporn Choksombatchai (Lek) and staff from ECTAD, Bangkok, undertook the administrative and operational arrangements. Mr Terry Clayton recorded the discussions and prepared a summary report of the conference. Ms Nancy Morgan (FAO, Bangkok) and Mr Antonio Rota (IFAD) facilitated the Round Table discussions on Large Poultry Production and Small Poultry Production, respectively.

Mr Frands Dolberg (consultant) reviewed all the draft papers and made editorial suggestions. Graphic design and layout was undertaken by Mr Pablo Giallo.

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# Introduction

The global poultry sector is characterized by faster growth in consumption and trade than any other major agricultural sector. Structural changes in poultry production and marketing have been driven by the growing demands of urban markets. While the majority of poultry in developing countries are still kept by smallholders, a strong and internationally linked poultry industry has evolved by utilizing economies of scale and technology. Experiences in recent years have shown that smallholder poultry production systems can offer a useful entry point for development programmes addressing extreme poverty and food insecurity, especially where traditional and small commercial flocks are the domain of women. While these are positive features, the outbreaks of highly pathogenic avian influenza since 2003 have led to criticism of smallholder production systems.

In response, the Animal Production and Health Division (AGA) prepared the concept and programme of an international poultry conference to assess the current and future trends in the poultry sector and their social, environmental and health implications. The findings and conclusions of the conference are expected to assist in the identification of policy measures that address the consequences of structural change in the poultry sector.

Three main themes were identified for the conference:

- sector trends and impacts
- risks and opportunities for poultry production
- poultry as a development tool

For each of the themes, several authors were identified to prepare background and review papers on specific topics. Five poultry sector country studies were commissioned for important poultry producing countries, namely: Brazil, China, Egypt, India and Thailand. An expert consultation, including key authors, was held 3-4 May 2007 in Rome to further develop the topics and scope of the conference.

Participants were personally invited in order to ensure a balanced geographical, technical and institutional representation. All sectors of the poultry industry were represented including multinational corporations, poultry breeding companies, international agencies, as well as the research, development and NGO communities. It was this unique “coming together” of key stakeholders in the poultry sector that made this conference so stimulating and valuable.



The accompanying CD-Rom contains all presentations that were given during the conference as well as the background papers prepared by the authors. The booklet provides only the summary of the conference and of the background papers. This publication is intended to provide information concerning the global development of the poultry sector and to provide policy guidance for the future.

**The organizers:**

Olaf Thieme, AGAP (Conference Coordinator)

Jan Hinrichs, AGAL

Jenni Kiilholma, AGAP

Simon Mack, AGAP

Anni McLeod, AGAL

Jan Slingenbergh, AGAH

Henning Steinfeld, AGAL



# Welcome address

*He Changchui*

FAO Assistant Director-General and Regional Representative for Asia and the Pacific

Bangkok, Thailand

Distinguished participants,  
Ladies and gentlemen,

On behalf of the Food and Agriculture Organization of the United Nations, my colleague Dr Samuel Jutzi, Director of the Animal Production and Health Division, and my own behalf, I welcome you all to this important International Poultry Conference being held in the beautiful capital of Thailand.

It is a great pleasure and honour for me to open this conference, which has attracted a wide and impressive range of distinguished experts and decision makers. Participants in the conference come from the whole spectrum of the poultry sector: commercial and small scale producers, traders, research and development partners, as well as representatives from the non-governmental and donor communities. You have come together with the ambitious objective to explore and advise on best scenarios for the future of the poultry sector – a sector which faces many crucial challenges.

Meeting expanding global demands for livestock products - particularly poultry meat and eggs – the poultry sector has grown rapidly over the last couple of decades. Aided by technological advances in production, processing and marketing, annual growth in poultry production has outstripped all other agricultural commodities for many years. The rapid intensification of poultry production in developed and many developing countries was largely driven by specialization, concentration, greater biological efficiency, economies of scale and vertical integration. This trend has been particularly evidenced in Asia where annual production gains of over 6 percent allowed the industry to provide a competitive source of low-priced animal protein to consumers – although concerns have been raised about industry integration, linkages to the spread of animal diseases and environmental impact.

At the same time traditional, less intensive low input poultry production has continued to be a common and important practice in most developing countries. These traditional systems have diverse functions and respond to different social, cultural and economic objectives. While large scale, intensive production supplies rapidly expanding urban markets, the smaller scale production systems continue to satisfy local and often niche markets, as well as contributing to household food security in poor and vulnerable communities. Increasingly, there is also a growing, and economically important small to medium scale commercial sector that does not readily benefit from the economies of scale associated with the large scale sector nor from easy access to either traditional or more sophisticated urban markets.



Ladies and gentlemen,

Highly Pathogenic Avian Influenza started in Asia in late 2003 and in the meantime has spread to several continents, affecting over 60 countries. The human cost of the bird flu has attracted world attention and intense media scrutiny of the role played by the poultry sector. An international meeting dealing with poultry production can and should thus not ignore the issue and impact of the Highly Pathogenic Avian Influenza emergency.

The poultry sector has suffered severe economic losses and very substantial investments needed to be made – both by the sector itself and the donor community – in disease prevention and control. It can not be overemphasized that the international community must continue unabated efforts for the prevention and control of HPAI. HPAI has become endemic in many parts of the world, and the consequences of failure to stem the spread of the virus are just too great to ignore; in particular the risk to human health has never disappeared. This challenge is daunting, confronting nearly 19 billion poultry in the world, half of whom are resident in Asia.

FAO and its partners are addressing the multiple challenges and are committed to do so at all necessary levels. Over the past four years, FAO has designed and implemented more than 116 projects in assisting countries to fight the HPAI crisis and has mobilized more than 156 million dollars. Another 37 projects costing 66 million dollars are in the pipeline. This programme endeavours to supplement and support the substantial investments undertaken by governments of affected countries through their own domestic budgets.

Effective control of avian influenza will require, in addition to the core veterinary interventions that target the virus itself, changes in attitudes of everyone involved in the poultry food chain from production through to marketing and consumption. Certainly the challenges posed by Avian Influenza, or any other disease, raise questions about how policy makers need to respond and whether industries need to be restructured. Dialogue on these issues is critical since some of these changes may have to be radical, implying major social, environmental and public health dimensions as well as potential impact on livelihood of millions of poor and small producers.

Ladies and gentlemen,

It is clear that important technical, institutional and policy issues need to be addressed by the poultry sector as a whole if the objective of safe, environmentally and socially sound development is to be achieved. This will require innovative and courageous solutions. Given that the poultry sector is the most vigorous, dynamic and fast changing livestock sub-sector, the challenges faced by scientists, technicians, practitioners, producers and policy makers are particularly significant.

This conference provides an opportunity to assess the challenges and opportunities facing the world's poultry sector and to explore the social, economic, technical, environmental and biodiversity implications of change. The conference is expected to explore future scenarios for the sector, identify possible roadmaps for industry development, and, most importantly, to discuss priorities for action.

The wide range of expertise assembled today, representing all aspects of the poultry sector, will hopefully enable a well informed, balanced and comprehensive assessment of the challenges facing the poultry sector and the overall opportunities for contributing to sustainable agricultural development. It is my sincere hope that this consultation will serve



as an important milestone and reference point in the future development of the poultry sector.

Ladies and gentlemen,

Before concluding, may I wish you open, stimulating, constructive, productive and innovative - but also enjoyable - deliberations and debates. Let us try to turn this conference not into just another meeting but into a real opportunity to advise and guide this important agricultural sector that has such potential to support agricultural livelihoods and economic development, not only in Asia but globally.

Thank you.





# Summary report

## OBJECTIVES OF THE CONFERENCE

Approximately 100 participants from across the world participated in the FAO-sponsored International Conference “Poultry in the 21<sup>st</sup> century – avian influenza and beyond”. All sectors of the poultry industry were represented including the poultry breeding companies, other multinationals and international agencies, as well as the research, animal health, development and NGO communities. The objective was to review the global poultry sector in its entirety, to assess past developments, and to explore scenarios for its future. Special attention was given to the social, environmental and health implications of changes in the poultry sector and to the policy measures needed to address such change. The conference was opened by Mr Changchui He, Assistant Director General of FAO’s Regional Office for Asia and the Pacific.

An introductory presentation highlighted the following points for participants to bear in mind during their deliberations:

1. The poultry sector is an indicator of a fundamental problem facing the global livestock sector. Largely unregulated growth in response to rapidly growing demand has created human-health and environmental risks; there is growing pressure to reduce these risks.
2. The poultry sector is flexible and responsive to external pressures – it offers opportunities to address the above-mentioned problem.
3. There is more than one possible development pathway. “Twin-track” or even “multi-track” development is likely and desirable, with backyard and industrial systems continuing to exist within the same countries; however, these very different systems should be located in different spaces.
4. Change will provide opportunities for some people, but may create negative externalities for others including vulnerable people.
5. Policy can provide an environment for economic growth while at the same time offering protection to vulnerable people.

## PAPERS AND WORKING GROUPS

The conference was divided thematically into three sessions with presentation of papers followed by plenary discussions.

The first session examined sector trends and underlying drivers, and considered some of the impacts of sector development. Papers were presented on:

- Global poultry sector trends and external drivers of structural change.
- Country case studies from China, Thailand, India and Egypt.
- Assessment of inter-country differences in structural changes and expected trends.
- Future trends and developments in poultry nutrition.
- Future trends for poultry genetic resources.



- Perspectives on the global markets for poultry products.
- Challenges for global feed industries.
- Feed production inducing structural change in the poultry sector.
- Social impacts of structural change.

The second session focused on risks and challenges for poultry production. Papers were presented on:

- Risks associated with poultry production systems.
- Poultry production and the environment.
- Long-term impacts of HPAI on poultry production systems.
- OIE standards related to trade and poultry diseases.
- Animal welfare in poultry production systems: impact of European Union standards on world trade.
- Health and socio-economic impacts of contract poultry growing for rural communities: a review of the experience in the United States of America.
- Response of the Thai poultry industry to HPAI.
- A video clip on HPAI in Cambodia.
- The importance of poultry products in human nutrition.
- Risks caused by bioaerosols in poultry houses.
- Veterinary services for poultry production.

The third session reviewed the potential for small-scale poultry keeping in the future and for poultry as a development tool. Papers were presented on:

- Poultry production for livelihoods and poverty alleviation.
- Poultry production as a tool for general development initiatives.
- Opportunities for small commercial poultry producers in the future.
- Experiences in transferring and adapting the BRAC model for the development of small-scale poultry producers to other countries.
- Impact of chicken development projects on small-scale producers in Thailand.
- Formal and informal poultry contract farming in Bangladesh.
- Getting the private poultry sector involved in the development of Africa.

Two working groups examined the development of the sector and made recommendations regarding future directions. One group reviewed the future for small family-owned flocks and was asked to suggest policies and interventions that might allow this system to survive for long as it is needed to support livelihoods. The second group reviewed the future for commercial poultry systems, particularly those supplying food to urban consumers.

## **FINDINGS**

The findings reflected in the following three sections summarize material from the presented papers and the discussions.

### **The likely pathway of poultry development for the foreseeable future**

The poultry sector continues to grow and industrialize in many parts of the world. Demand-side factors – increasing population, purchasing power and urbanization – have been strong drivers of growth. As incomes rise so does the consumption of poultry products, rapidly at



first but than at a diminishing rate. Over the past 15 years, the demand for poultry products has grown in countries of all income levels. The exception is a slight decline in egg consumption in high-income countries, where the effect of income growth may have reached a peak and demand may be more strongly influenced by changes in consumer taste. Despite upward trends in income and in the output of poultry products, it should be noted that the poor can still only afford to consume very small amounts of poultry meat and eggs.

On the supply side, advances in breeding have given rise to birds that meet specialized purposes and are increasingly productive, but which need expert management. The development and transfer of feed, slaughter and processing technologies have increased safety and efficiency, but favour large-scale units rather than small-scale producers. Subsidies on feed and taxes or quotas on imports have shielded the development of some national poultry industries. There has been a decline in the price of poultry and poultry products in absolute terms.

A trend towards urbanization, together with the globalized nature of the poultry sector, is creating an increasing emphasis on animal health, product safety, quality and convenience in poultry value chains. Structural changes are driven by the objectives of reducing transaction costs and improving the management of value chains so that they can deliver poultry products that are low in price, but have high food safety and quality standards.

Together, these developments have led the poultry industry and the associated feed industry to scale-up rapidly, to concentrate close to input sources or final markets, and to vertically integrate. These trends have affected high-income countries such as the United States of America; upper-middle income countries such as Brazil and Turkey; lower-middle income countries such as Thailand, China and Egypt; and, to some extent, low-income countries such as India. One element of the structural change has been a move towards contract farming in the rearing phase of boiler production, allowing farmers with medium-sized flocks to gain access to advanced technology with a relatively low initial investment.

Notwithstanding its rapid growth, the sector continues to be very diverse in structural terms. Traditional small-scale, rural, family-based poultry systems continue to play a crucial role in sustaining livelihoods, providing poultry products in rural areas and, importantly, supporting women farmers. Small-scale poultry production will continue to offer opportunities for income generation and quality human nutrition as long as there is rural poverty. A clear division is developing between industrialized production systems feeding into integrated value chains, and extensive production systems supporting livelihoods and supplying local or niche markets.

Highly pathogenic avian influenza (HPAI) has been a big shock to the industry, but is by no means the only external pressure that it faces. Concerns about environmental pollution, shortages of water, rising costs of feed and (at least in the European Union) rising animal welfare standards are all putting pressure on the poultry industry and the livestock sector more broadly. Efforts to contain HPAI and reduce its impact have accelerated moves towards greater division and differentiation among production systems and value chains. There is increasing interest in compartmentalization, a system under which the whole or part of a value chain can be identified as having a distinct health status on the basis of a specified set of biosecurity management practices. A compartment can to some extent be protected from the trade-related impacts of disease or food-safety emergencies that affect other parts



of the country's livestock sector. There is also a move within the industry to differentiate poultry meat that originates from "safe" sources in order to reassure consumers.

There are strong country differences in production trends. The most rapid expansion has been concentrated in the lower middle-income group of countries, where poultry meat production has grown steadily at an annual rate of over 8 percent over the last 20 years. Low-income countries started from the lowest base and have experienced the slowest growth. Egg production has grown at similar rates.

In high-income countries, the number of birds kept under extensive conditions is low. Nonetheless, there has recently been an expanding part of the sector – including birds produced for niche markets (e.g. organic production) as well as "hobby" flocks. In low and middle-income countries, while industrialized systems are growing and taking an increasing share of the market, extensive production is practised by the majority of poultry keepers. There are also quite large numbers of independent commercial producers with small flocks kept under conditions of low biosecurity and with small profit margins.

In many countries where the sector starts to concentrate, the development of slaughter and processing facilities tends to lag behind production. Live-bird markets provide an outlet even for large commercial farms in many middle and low-income countries because of consumer preference, lack of alternative facilities, or taxation systems that disadvantage slaughterhouses. One consequence is that "spent" hens from large commercial layer units often find their way into rural markets. Countries that have an export orientation are generally more advanced in the way that poultry value chains are organized and in the management of risk.

Regional differences can also be seen within countries, driven by economic differences or by the location of the feed source or the final market. In China, growth in poultry production has been faster in the more prosperous east than in the west. In Thailand, the broiler industry is concentrated in the central region, close to the hatcheries, feed mills, and processing plants. In Brazil, grain production is moving towards the Centre-West region and chicken production is following.

A general consensus at the conference was that, the sector will continue to scale-up, concentrate and integrate, and that there may be greater segmentation of the market. Despite these trends, the assumption that modern, commercial industrial poultry production will everywhere lead to the disappearance of smallholder poultry production is probably erroneous. Twin or even multi-track poultry development is the more likely pathway for the foreseeable future.

One of the challenges facing the conference was to classify poultry production systems in a way that facilitates the analysis of these "twin tracks". FAO has previously used a classification based on four "sectors" or production systems, numbered 1 to 4 in decreasing order of biosecurity and commercialization. The conference decided that something simpler would be more useful for the task in hand. The most important distinction was considered to be between commercial flocks (of any size) selling into food chains that supply urban markets, and small family-owned flocks kept for home consumption and local sales. The primary role of the former is to supply cheap and safe food to populations divorced from the source of supply, while the role of the latter is to act as a livelihood safety net, often as one part of a diverse portfolio of income sources.



Each of the systems will face its own particular challenges, and will require specific government policy measures as well as support from the service sector and the development community. Some of these differences are summarized in the following paragraphs, while others will be discussed in the next two sections.

The large-scale commercial sector has considerable flexibility and capability to respond to challenges. One of the case studies presented at the conference described the Thai poultry sector – for some time before the onset of HPAI, the country's poultry exporters had been investing in product processing, in anticipation of the time when Thailand's relatively high wage rate would make it less competitive in the chilled meat export market, particularly in view of the prospect that China and Viet Nam would eventually be able to comply with the food-safety and animal-welfare requirements of premium import markets. The companies that showed the most foresight in making investments for the future have survived the HPAI crisis and have prospered.

The poultry sector has advantages over some of its direct competitors in terms of its environmental sustainability and its effects on human health. Poultry production has a smaller physical footprint than other livestock systems (although perhaps not less than farmed fish) and may contribute less than other segments of the livestock sector to environmental pollution. In a world where populations suffering from malnutrition and obesity co-exist within the same cities, poultry has the advantage of providing both relatively cheap products and meat that is relatively low in fat.

Small family-owned flocks kept in rural areas for home consumption or to supply local markets may be buffered from the impacts of structural change for some time. The advantages of these systems are the low levels of inputs that they require and the unique products they produce – which still command a premium price in many places. They are accessible to people who have few other options and provide a way to turn limited inputs into useful outputs very quickly. They seem likely to survive as long as there is rural poverty or as long as there are “traditional” products that are in demand and are produced mainly or only in such systems. The latter condition will be undermined if, as is now happening in Thailand, similar products produced by the commercial sector start to compete in rural markets.

It is important that small-scale systems survive as long as they are needed for social functions, food security and livelihood support among poor households. The main task for policy-makers and development organizations may be to minimize disruption to these producers: to assist them with information and basic services, to promote market linkages in areas where markets are segmented, and to tailor regulations so that they are appropriate for the markets targeted. Improvements to productivity are possible, particularly if disease and predation can be reduced by simple means, although these flocks are generally well adapted to their environments. In the experience of the PKSF, an NGO in Bangladesh, which is the world's largest apex lending and capacity-building institution, the provision of microfinance and technical services for poultry to poor women increases their income and reduces the periods of the year when they suffer food scarcity. In the future, small-scale household systems are likely to be found in the poorest countries or regions and those affected by weak governance or conflict. The conflict zones of Sri Lanka and Afghanistan were given as examples of locations where the backyard system has prevailed and where even small flocks



of poultry have served an important role as a development tool, particularly for women.

The future of small commercial flocks as a development tool is more questionable. This was a particularly difficult subject for the conference participants, and clear conclusions were not reached. In spite of the simplified two-system classification of the sector, there was still a blurred line between small family-owned flocks kept on low inputs for home consumption and local sales, and small commercial operations where the owner makes a larger investment for purely commercial purposes. Poultry has been promoted as a first step onto the ladder of capital accumulation, requiring a smaller initial investment (smaller loans) and less land than other livestock, and allowing progressive growth from a small-scale scavenging family flock to a higher-input but still small commercial unit, which in turn can be a springboard to larger livestock or other enterprises. Some people still see this as a viable development pathway, while others are more cautious, noting that there have been failures as well as successes, and that given the way the sector as a whole is developing, there are likely to be barriers to the entry of small-scale producers into any markets other than the very local.

The profits of small commercial producers are marginal; they cannot benefit from economies of scale by applying the technology available to the larger producers. In low and middle-income countries, they have limited access to services, particularly animal health. Their value chains may be severely disrupted for public-health related reasons, and they may have less flexibility to regroup and relocate than larger operators. There is already evidence that when faced with increased regulation and higher expenses some will upgrade and flourish, while others drop out. A move to contract farming is a possibility for some, and it can offer a fairly rapid pathway to capital asset accumulation, but this form of production is not risk free and is accessible only to limited numbers of people. Female owners of small commercial flocks are likely to be losers when structural change occurs, because in many places they lack access to land titles or credit.

If sustaining small-scale commercial production is considered to be an important objective, there will be a need to provide continued support in the form of physical infrastructure, technology transfer through extension, and promotion of business models that help such producers to compete in the market. Approaches that have worked in different places include cooperatives, producer companies, self-help groups, contract farming, and commercially-driven value chains that do not exclude operators who can only afford to make small investments. The need for research into small-scale poultry production systems was highlighted at the conference. While the development of new technologies for large commercial producers will be undertaken by the private sector, investment in research and development for small-scale systems requires public support.

In Europe, extensive livestock systems are commercially viable without government subsidies when they supply specialized markets (e.g. for organic produce) that demand higher standards of animal welfare and environmentally friendly production. Similar opportunities may exist in Asia for extensive duck systems. However, there is little evidence that other types of specialized extensive poultry systems are developing, and if they do develop, they may not be owned by the people who currently keep small family-owned flocks or small commercial units, but by new entrepreneurs. Thus, the survival of extensive poultry production does not necessarily mean that the livelihoods of the traditional owners will be protected.



The future of small commercial flocks is likely to be at greatest risk in countries that have already experienced HPAI, or where economic growth has already led to increased concerns about food safety, and particularly in the areas around large cities. In places where these conditions do not apply they will be more financially viable and are likely to survive for longer.

Two questions that were touched upon at the conference, but not answered, relate in a more general way to equity in development. One was the question of opportunities for people who are forced to leave the poultry sector because of increased regulation or structural changes: to what extent should they, or can they, be helped to enter other kinds of livelihood? The other question related to employment potential in the poultry industry. It is sometimes assumed that development of the sector, while it reduces employment in primary industry, will create employment in other parts of the value chain. However, it is not certain that the gains will match the losses, and it is likely that the losses and gains will be experienced by different people.

### **Public health risks must be addressed, and this may best be done by segregating production systems facing different types of risk**

The poultry sector is associated with considerable public-health risks arising from zoonotic disease and contamination of products. These are exemplified by, but not confined to, events related to the HPAI H5N1 crisis. To reduce the level of risk, adjustments in the way poultry is produced and marketed are required (and are feasible) across the entire spectrum of the commercial poultry sector – from small to large. Poultry products supplying the cities must be seen to be safe. This will require improvements to feed safety, biosecurity and hygiene in farms, markets and slaughter and processing facilities, accompanied by certification processes appropriate to the levels of risk involved. Each system and part of the value chain carries its own disease risks; none is exempt from the need for improvements.

Quality feed is an important contributor to poultry product safety, and requires raw materials that are free of contamination and state-of-the-art processing equipment. In high-income countries and global value chains requirements have been met through careful sourcing of supply and consolidation of feed manufacturing. Ever more legislation, regulations, recommendations and guidelines are being applied to the feed industry in high-income countries; this will affect the import of poultry products into the European Union and other premium markets. In low and middle-income countries it can be difficult to find local feed sources that are not contaminated with mycotoxins.

In well-controlled industrial systems the risks of infection is reduced by the implementation of high-level biosecurity measures. However, large commercial units without good biosecurity and without safe trading practices can pose a great risk. If any large farm becomes infected with a serious disease the number of birds lost will be great and there is a high probability of subsequent local spread of the infection (depending on the density of farms in the vicinity). Biosecurity threats from the exhaust fans of poultry houses need more attention.

Medium-sized to small commercial producers, when their biosecurity is low, are deemed to represent the highest risk of infection and virus spread, because in many parts of the world most sales from these farms are through live poultry markets. Grazing duck systems



are believed to have played a critical role in the genesis of the H5N1 HPAI panzootic. Small family-owned flocks face lower risks when they are segregated from the commercial sector. It may be possible to further reduce risk by applying biosecurity measures at the level of the village flock as well as good hygiene practices in the management of individual flocks.

Biosecurity is, in principle, more a matter of management than of system and scale, although the costs of biosecurity measures and certification tend to favour large-scale production, slaughter and retail operations. Sector development policy needs to support and guide moves towards higher levels of biosecurity. Much more needs to be done to raise awareness at all relevant levels through effective animal health risk communication and to foster public–private partnerships. Risk assessment needs to be made a routine part of animal health and food-safety planning, as in many farms there is still a mismatch between the biosecurity measures implemented and the risk routes and level of infection pressure with which they have to contend. Increasing the resistance of poultry through vaccination, and other biosecurity measures applied at farm level need to be appropriate to the production system.

Legislation, financial incentives and capacity for biosecurity planning are important considerations for policy-makers. High-income countries have guidelines related to the biosecurity of farms and markets, regulations to be applied in the event notifiable disease outbreaks, and financial incentives in the form of price penalties on the final product or private–public financing of emergency control including compensation. However, such provisions are not always present in countries with newly developed poultry industries. If farmers are to be given help to carry out risk assessment and develop appropriate biosecurity plans, trained personnel (often in short supply) or clear and widely applicable guidelines need to be available. There is a need for incentives that promote the development of safe marketing channels for processed poultry products, as these usually lag behind structural changes in production.

Countries are implementing various measures to regulate the type and location of poultry production and sales. Examples include specifying production zones, banning production and sales within city limits, restricting certain types of production, and specifying “farm standards”. The private sector is effecting its own structural adjustments. Interest in compartmentalization (described above) is mostly driven by large companies. Contract farming, once an attractive option for the contractor and the contractee, may decline as a result of heightened food-safety regulations and compartmentalization (as has happened in Thailand).

As noted above, small family-owned flocks and commercial systems face different types of risk, and require different risk-mitigation strategies. The biggest animal health and food-safety problems occur when the systems are in close contact and adversely affect the risk status of the other. The rapid evolution of mixed, quasi-biosecure systems and of live-bird markets has brought systems that were previously separated into overlapping space. An option for the future may be to try to reverse the process and segregate the different types of production so that both can continue to meet their respective roles without creating risk for the other. One example proposed during the conference was to create clusters of licensed producers, certified HPAI-free, which only supply the live-bird markets allocated to them, and to allow no other access to these markets. This idea could be expanded to



include certification of biosecurity standards on the farm (thus protecting against other food-borne diseases) and of safe feed sources.

HPAI has drawn attention to the lack of resources faced by the veterinary services in many countries, which almost as a rule do not reach out to the many small-scale backyard poultry keepers. There is now an opportunity to use the impetus provided by HPAI to improve veterinary services. It was argued that veterinary services need to get better at communicating and that there is need to build private veterinary services. A particular challenge is to identify institutional mechanisms with which to reach out to poor farmers with small poultry flocks. One novel example described at the conference was the involvement of micro-finance organizations and NGOs in delivering such services in Bangladesh. The UN System Senior Coordinator for Avian and Human Influenza made a strong plea for a future unified health system that combines human health and veterinary services.

### **Feed and water shortages may change the shape of the sector in unexpected ways**

As large-scale poultry production expands, so too will demand for feed. Maize (for energy) and soybean meal (chiefly for protein) are the main components of most compound poultry feeds. However, this picture may change.

While over the past few decades the poultry sector has benefited from a long-term decline in world market prices for feed grains, it is now facing rising prices as a result of competition from direct grain consumption by a still-growing human population and use of grain for biofuel production. Protein sources are also under pressure. Cost and environmental factors may make soybean imports less attractive as a protein source, and lead countries to seek alternatives in the form of other legumes or oilseeds. Fish farming which is a competitor in the lean protein market is also a competitor for feed ingredients.

Alternative energy sources are being evaluated, including sorghum (which is not used in biofuel manufacture), molasses from sugar cane, and by-products such as rice bran, wheat bran and screenings. Alternative protein sources are also being investigated, including sunflower meal, peanut meal and rapeseed residues (including those from biofuel production); utilizing these feeds would, however, bring poultry into competition with dairy cattle. Production of feed from by-products of ethanol production such as dried distillers' grains with solubles (DDGS) has some potential, but there are questions about the cost of production. A wider range of potential feed sources increases the possibility for local sourcing of feeds in low-income countries. However, there is some health risk associated with alternative feed sources, as plant protein sources other than soybean are often more susceptible to mycotoxin contamination.

Future directions for the feed industry and their effects on the poultry sector were the most speculative discussions during the conference, as changes to the underlying drivers are relatively recent and may not be stable (e.g. biofuel produced from maize may be superseded by other renewable fuel sources). Diverse views were expressed regarding the significance of biofuel production as a future competitor for grains. One point of view was that this threat is a myth, as biofuel production is not sustainable. Conversely, it was argued that the expansion of biofuel production needs to be taken seriously as it puts both direct and indirect pressures on the poultry industry – direct when feed ingredients are diverted to



biofuel production, and indirect when land is converted to growing crops for biofuel production, reducing the area available for producing poultry feed ingredients. In both cases the likely scenario is that the prices of poultry feed will rise. Research into alternative crops for feed as well as for biofuel should be encouraged. It seems clear, that the question of the sustainability (environment and health as well as profit) of poultry production systems, including their feed sources, is likely to become increasingly prominent in the legislation of high-income countries and in industry strategy.

Large-scale operations taking advantage of their economies of scale will be at an advantage in researching new feed sources and in scaling-up their production, or in breeding birds adapted to changing nutritional or environmental conditions. They will be better able to feed precisely and reduce feed contamination.

In the future there will be more emphasis on designer diets for different bird types and different conditions. Competition for feed stocks, including demand for fishmeal for aquaculture, may require some new priorities in poultry breeding. There is an urgent need to look at specific efficiencies, particularly nitrogen and phosphorus efficiency and the problems nitrogen compounds pose with respect to global warming. There will be more discussion of productivity in terms of income relative to feed cost rather than in terms of feed efficiency – restructuring will be driven by profitability. Some countries in Africa that use alternative feed resources may become more competitive.

Given that the factors affecting poultry nutrition have a similar impact on other monogastric livestock, poultry as highly efficient feed converters may be at an advantage. Feed manufacturing capacity and expertise is increasing in countries with rising consumption of poultry products, such as China and India, suggesting the possibility that much feed production and processing could be shifted to these areas. However, most Asian countries are currently net importers of feed grain. For countries to be self-sufficient in poultry feed they not only need production capacity, but also storage capacity, which may be a limiting factor in African countries. Large-scale poultry meat suppliers have the option to relocate their production internationally or within a country to be close to the sources of feed or to take advantage of more favourable climates. However, these benefits have to be balanced against the advantages of being closer to consumers if feed production and final-product consumption are in different locations.

Widening the acceptable portfolio of feed ingredients will encourage the use of alternative feed sources at national and local levels, and may promote stronger efforts to improve storage and reduce contamination of locally available feeds used for family poultry and small-scale commercial flocks. There is also the potential to breed for birds that can perform well on lower planes of nutrition. This approach would also be relevant for village conditions in developing countries (even if the birds could not be reproduced in the villages) – some such examples already exist. A niche market with high product prices for birds kept under “natural, ethical, ecological” conditions could be envisaged, although this might be hard to achieve and certify under village conditions in developing countries.



## CONCLUSIONS

With such a diverse participant list and range of topics, the conference did not aim to come to a consensus or firm recommendations on every issue. However, it was possible to arrive at some broad conclusions, which were presented by the Director of FAO's Animal Production and Health Division, Dr Samuel Jutzi, in his closing remarks as follows:

The conference noted the very strong poultry sector dynamics at the global scale (growth, consolidation, structural change, trade flows); this confirms the sector as possibly the most dynamic and most globalized agricultural subsector. Sector growth is primarily demand-driven. The sector is likely to look very different in the future. It faces considerable and multiple challenges which concern public health (e.g. HPAI H5N1), social objectives such as poverty alleviation and gender equity, and environmental threats. The task ahead is multifactorial and requires inputs from a diversity of disciplines and the engagement of all relevant stakeholders

While the evidence from research shows that smallholders are not always less efficient than large-scale enterprises in market production, they tend to be at a disadvantage in the context of traceability and quality/safety compliance as well as in government-led disease prevention measures. More detailed studies of the competitiveness of smallholder poultry production and its determinants are required, so as to assess the viability of these units and pathways for possible upgrading and up-scaling.

The assessment of the enormously dynamic growth and structural change of the commercial poultry sector in many countries needs to take into account the large differences that exist both between and within countries, with non-commercial or informally commercial systems often persisting and co-existing with large and medium-scale operations. The determinants and dynamics of system changes deserve more analysis for risk management, particularly in terms of public health and social objectives.

Three core messages related to the further development of the global poultry sector were identified by Dr Jutzi:

- 1 The poultry sector is growing and industrializing in many parts of the world, but continues to be very diverse in structural terms. Traditional small-scale, rural, family-based poultry systems continue to play a crucial role in sustaining livelihoods and, importantly, supporting women farmers. As long as there is rural poverty, poultry will be there to offer opportunities for income generation and quality human nutrition. The assumption that modern, commercial industrial poultry production will lead to the disappearance of smallholder poultry production everywhere is probably erroneous. Under many conditions, twin-track or even multitrack poultry development is the likely pathway for the foreseeable future.
- 2 The poultry sector is associated with considerable public-health risks as exemplified by the HPAI H5N1 crisis. Adjustments in the way poultry is produced and marketed are required and feasible across the entire spectrum of the commercial poultry sector – from small to large. Biosecurity is, in principle, more a matter of management than of system and scale, although the costs of biosecurity measures and certification tend to favour large-scale production, slaughter and retail operations. Sector development policy needs to support and guide moves towards higher levels of biosecurity. For this to happen, much more needs to be done to raise awareness at all relevant



levels through effective animal health risk communication and to foster public–private partnerships.

- 3 While over the past few decades the poultry sector has benefited from long-term declines in world market prices for feed grain, it is now facing rising prices as a result of competition from direct grain consumption by a still-growing human population and use of grain for biofuel production. This development is likely to be to the advantage of large-scale operations which can take advantage of their economies of scale; on the other hand, it will encourage the use of alternative feed sources at national and local levels.