



FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS

NIGERIA

**Consultative Mission
on**

**Assessment of the Nigerian poultry market chain
to improve biosecurity**



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Abbreviations

AI	avian influenza
ADVS	Assistant Director of Veterinary Services
DDVS	Deputy Director of Veterinary Services
AICP	Avian Influenza Control and Human Pandemic Preparedness Project
DOC	day-old chick
ECTAD	Emergency Control of Transboundary Animal Diseases
FAO	Food and Agriculture Organization of the United Nations
FCT	Federal Capital Territory
FDL	Federal Department of Livestock
FMA&RD	Federal Ministry of Agriculture and Rural Development
HPAI	highly pathogenic avian influenza
LBM	live bird market
LGA	Local Government Area (first administrative division under the State)
LGC	Local Government Council
₦	Nigerian Naira (1 EUR = 162,847 ₦; www.Oanda.com 04/10/08)
NADIS	National Animal Disease Information and Surveillance System
NBS	National Bureau of Statistics
NCD	Newcastle disease
PAN	Poultry Association of Nigeria
ToR	Terms of Reference

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Executive Summary

In response to the outbreak of highly pathogenic avian influenza (HPAI) in Nigeria in 2006, FAO commissioned a study to describe and analyse the local poultry sector. The aim was to identify affordable interventions for improving biosecurity in the poultry market chain. In October 2008, three consultants visited different states in the north, centre and south of Nigeria, where they interviewed a number of stakeholders involved in poultry production and marketing.

Across the different regions of the country, the poultry sector is characterized by a low level of production specialization; the overall picture is of a relatively articulate sector, in which regional particularities reflect important complementarities. Before the outbreak of HPAI, the Nigerian poultry population was estimated at around 150 million, with a large majority of local chickens and a minority of exotic breeds. Following the outbreak, the poultry sector witnessed a brief decline before settling and today, despite many problems, the poultry sector is again in expansion.

This report analyses two principal aspects of the poultry market chain - commercialization and production – and examines and evaluates the husbandry practices of poultry producers and marketing practices in live bird markets (LBMs) from the point of view of biosecurity. Generally speaking, there is awareness about good practices to reduce contact and spread of pathogens between birds; several old habits have partially changed and the veterinary services are implementing activities such as regular disinfection of LBMs.

Nevertheless, biosecurity is still very weak and requires improvement at all levels. One major challenge is represented by the fact that although HPAI has a major impact, the probability of emergence of the disease is low. Currently, the sanitary risk taken by producers is low, is balanced against the prices of inputs and outputs, and is mainly related to poultry diseases other than HPAI. Furthermore, it is widely recognized that enforcement of biosecure practices is often impossible in developing countries.

To increase the chances of effectively improving biosecurity, it is necessary to:

- work at different level and with different actors;
- show the advantages for producers, who require direct benefits;
- involve consumers in order to constrain producers to improve their products; and
- implement information, training and awareness campaigns.

This report also highlights:

- widespread misuse of antibiotics and the direct threat to human health;
- highly unsafe processing points in the LBMs where birds are slaughtered; and
- a discrepancy between observed biosecurity practices and disruption of the cycle of disease in the country.

Against this background, the report explores options for improving biosecurity, identifying several practices that represent a high biosecurity risk and proposing a number of solutions, bearing in mind the need to offer affordable technical advice and to identify the different actors necessary for implementing the recommendations. Introduction of biosecurity measures will not only reduce the risk of the spread of HPAI but will make the entire poultry sector more efficient and profitable, to the benefit of both producers and consumers.

1 Introduction

1.1 Purpose of the mission

According to their Terms of Reference (ToR), the consultants were required to:

- (i) summarize existing management practices and infrastructures in scavenger production systems, on small-scale commercial poultry farms and in LBMs;
- (ii) list the biosecurity measures already in place in these three sectors of the poultry value chain; and
- (iii) identify and prioritize potential improvements in biosecurity measures.

The following were the expected outputs of the assignment:

- (i) a report describing the most appropriate biosecurity measures in scavenger production systems, on small-scale commercial poultry farms and in LBMs, including costing of these measures.
- (ii) an evaluation of the potential for adoption and implementation of possible strategies.

The full text of the ToR is presented in Annex 1.

1.2 Mission timetable

The field work took place from 6-28 October 2008. It was originally envisaged that the mission would visit the states of Kaduna, Kano and Sokoto, all in the north of the country. Subsequently, three different states – Anambra, Katsina and Ondo – were chosen following discussion between FAO and the local counterpart (NADIS) about the need to evaluate different local situations and obtain a more complete picture of the Nigerian poultry sector.

For the same reasons, the evaluation team chose to add a market in Nyanya, Federal Capital Territory (FCT), to be able to assess the entire Nigerian poultry value chain, from producer to final market. More details on the mission timetable and the persons contacted are presented in Annex 2.

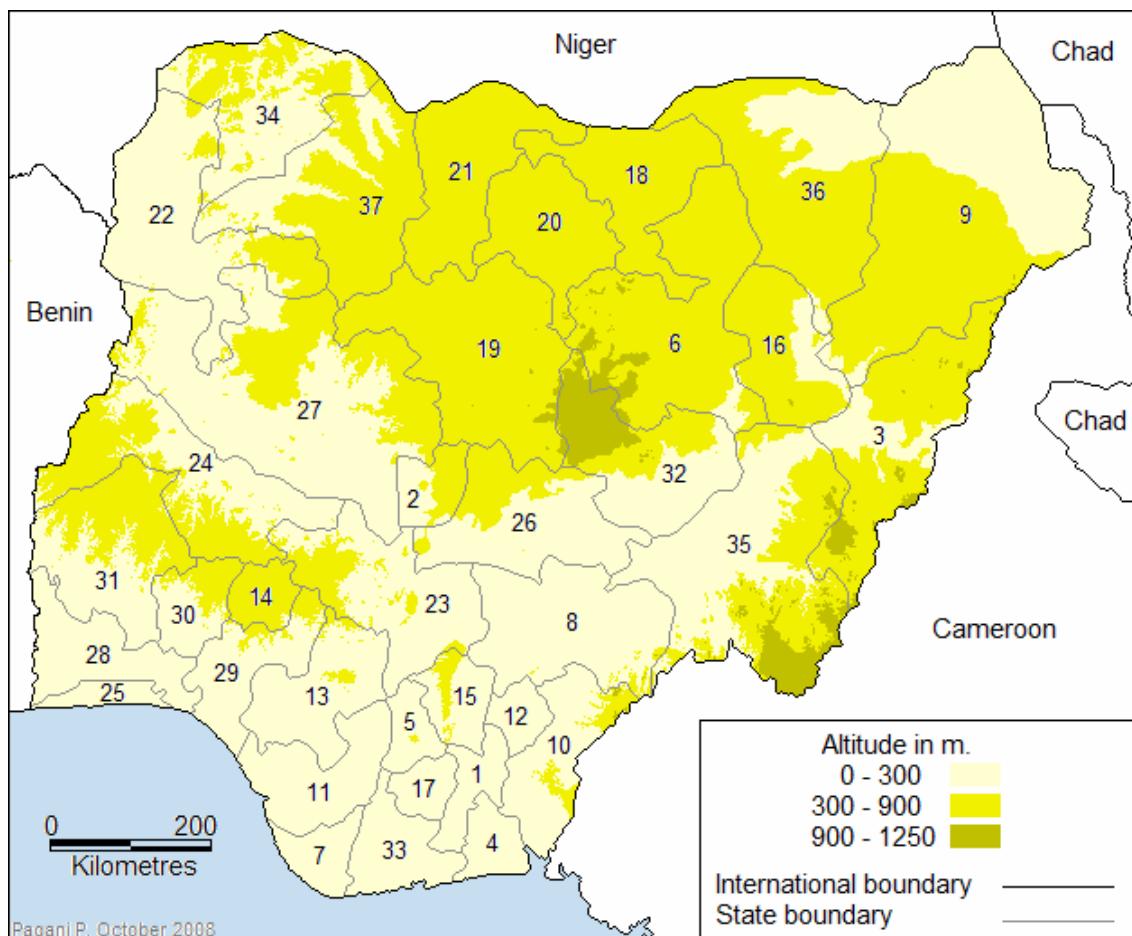
1.3 Methodology

Preliminary preparatory work included research of secondary data, related studies and scientific bibliographies to describe the prevailing status of both the poultry sector and avian influenza in Nigeria.

This was followed by preparation of a list of people and organizations to contact, and a customized questionnaire in the form of a semi-structured checklist of open-ended questions was prepared for each stakeholder in the poultry market chain. This checklist allowed for broad dialogue, an opportunity to look further into specific topics, and the possibility of continuous revision and adaptation to realities in the field. Annex 3 contains information on the semi-structured interviews.

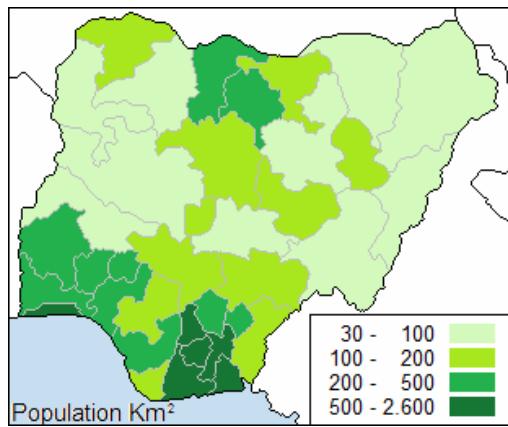
Finally, checklists of biosecurity practices for theoretical implementation in live bird markets and by poultry producers were drawn up. These checklists were intended to be as complete as possible in order to cover all of the most important aspects of biosecurity. Tables 1 and 2 present these checklists.

Graphic 1 States of the Federal Republic of Nigeria



1 Abia	14 Ekiti	27 Niger
2 FCT Abuja	15 Enugu	28 Ogun
3 Adamawa	16 Gombe	29 Ondo
4 Akwa Ibom	17 Imo	30 Osun
5 Anambra	18 Jigawa	31 Oyo
6 Bauchi	19 Kaduna	32 Plateau
7 Bayelsa	20 Kano	33 Rivers
8 Benue	21 Katsina	34 Sokoto
9 Borno	22 Kebbi	35 Taraba
10 Cross River	23 Kogi	36 Yobe
11 Delta	24 Kwara	37 Zamfara
12 Ebonyi	25 Lagos	
13 Edo	26 Nassarawa	

Graphic 2 Nigerian population density



2 Nigerian poultry sector

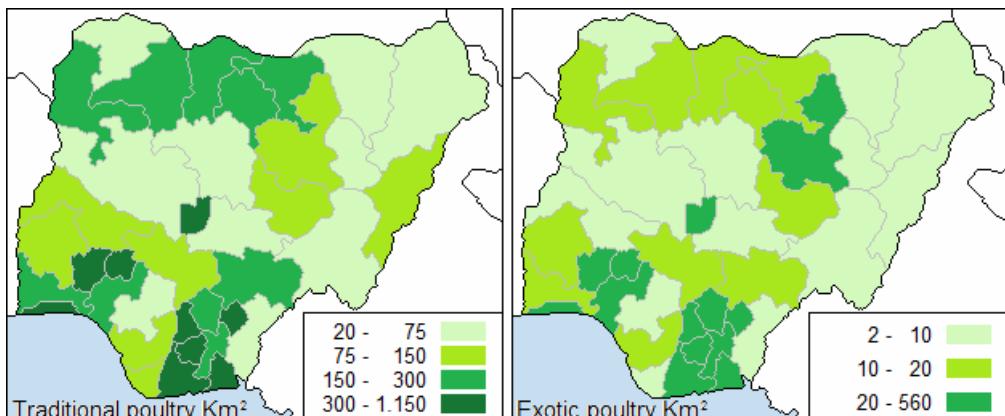
This report focuses on the biosecurity status of the Nigerian poultry sector. Information about other related issues can be found in the documents listed in Annex 4. More general and detailed pictures can be found in Adene & Oguntade (2006), Abimiku (2008) and Oscar Agricultural Consultants Limited (2008); the latter presents the results of a survey of 174 live bird markets and the principal findings are reported in Annex 5.

2.1 Overview

There is no up-to-date or comprehensive information on the size of the poultry sector in Nigeria. The most recent survey in which data are available was completed in 2003; other sources of information include the Federal Department of Livestock (FDL), the National Bureau of Statistics (NBS) and institutional sources of published and unpublished documents. The scarcity and, in some cases, the inaccuracy of the information available represent major limitations to a comprehensive overview of the sector. For the assessment reported here, data were collected mostly from secondary sources.

In Nigeria, before the outbreak of HPAI in 2006, the poultry population was estimated at around 150 million, with a large majority of local chickens and a minority of exotic breeds. Annexes 6 and 7 report available data concerning the Nigerian poultry sector, which are graphically presented in Graphics 2, 3, 4, 5 and 6.

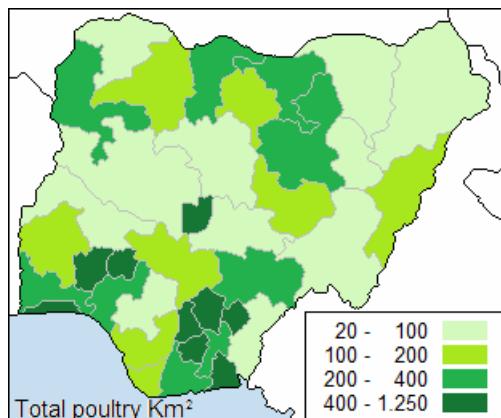
Graphic 3 Indigenous poultry density **Graphic 4** Exotic poultry density



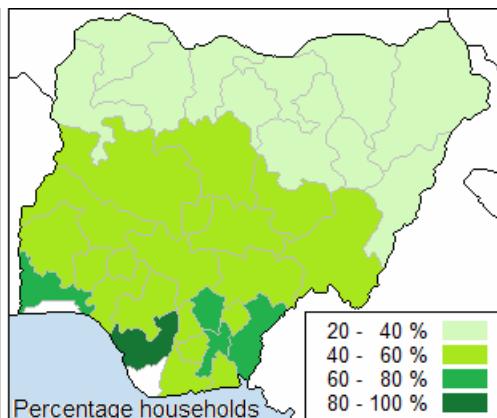
Source: refer to Annexes 6 and 7

In the south and south-west of the country, the chain from producer to consumer is almost exclusively handled by females, the situation is the reverse in the north, and in the south-east the stakeholders are either males or females. This situation has developed over the last 50 years with the emergence of a poultry industry which attracted many males. Today, the market in exotic breeds is dominated by males, while traditional chickens are handled by females.

Graphic 5 Total poultry density



Graphic 6 Households rearing subsistence poultry



Source: refer to Annexes 6 and 7

2.1.1 Poultry producers

For analytical purposes, FAO has divided poultry production into four sectors:

Sector 1	Industrial integrated system
Sector 2	Commercial production system
Sector 3	Small-scale commercial production system
Sector 4	Village or backyard system

Nevertheless, the parameters that differentiate the four sectors vary from country to country.

At this point, it is necessary to clarify interpretation of the term "backyard" because it may generate confusion. In the FAO scheme, "backyard" identifies a low-level input/output production sector, comparable to the village or scavenging system. In Nigeria, however, "backyard" is interpreted literally as "at the back of the yard" and is often used to identify the lowest level of Sector 3, characterized by improved flock management and with a primarily commercial objective; at the same time, the researchers also observed a so-called "backyard" with 1.000 layers and 500 broilers. In practice, therefore, it appears to be more the location than the management system that differentiates "farm" and "backyard" systems in Nigeria.

Drawing on the opinion of representatives of the Nigerian veterinary services, previous studies (Adene & Oguntade, 2006; Abimiku, 2008) and personal observations, the four sectors in Nigeria may be roughly divided as follows in terms of scale of production:

Sector 1	Commercial (more than 10.000 birds)
Sector 2	Medium-scale commercial (2.500 - 10.000 birds)
Sector 3a	Small-scale commercial (500 - 2.500 birds)
Sector 3b	Backyard (a few - 1.500 birds)
Sector 4	Rural (a few - 200 birds or more)

But this is just theoretical because the management practices of Sectors 2 and 3, and part of Sector 1, are the same. Poultry production differs more in relation to the environment than size. In the northern part of the country, for example, marked by drier conditions and notable fluctuations in temperature between day and night, flocks are better protected from the external climate than in the south. Production also differs in relation to scheduled

vaccination; some flocks of 500 or up to 13.000 chickens receive the same treatment thanks to veterinary advice, but the mission also identified one farm of 260.000 layers with poor management.

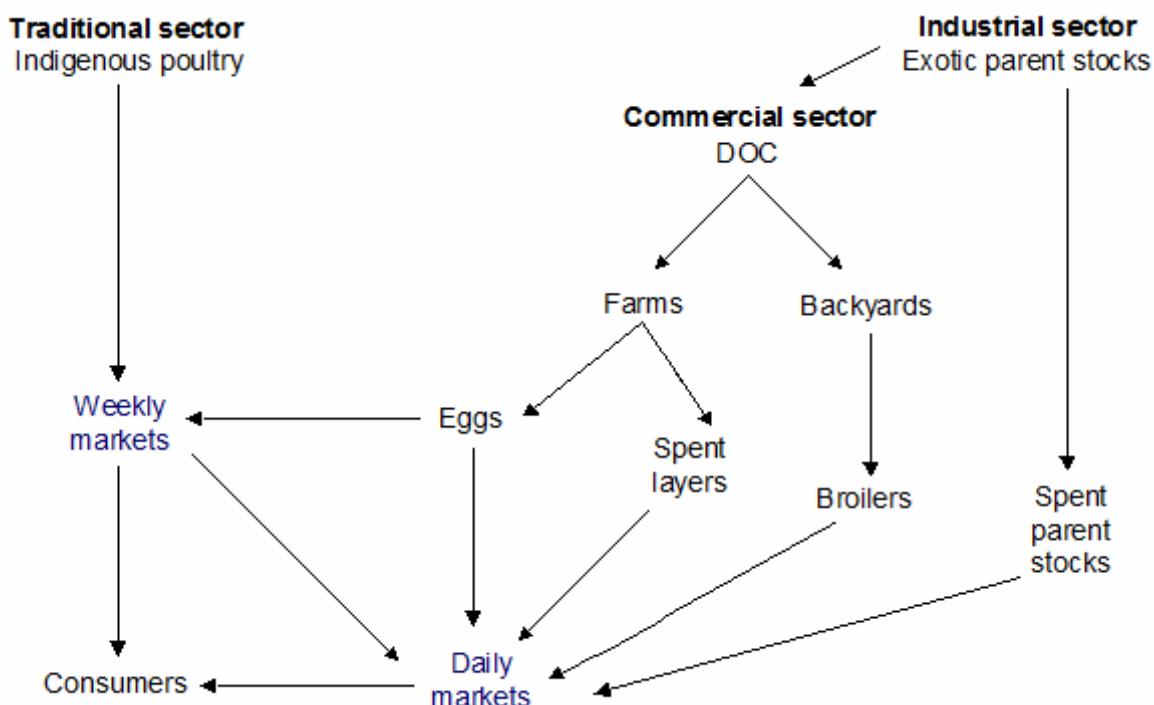
This means that in describing and characterizing the Nigerian poultry sector, certain basic criteria must be taken into consideration: the nature and aim of production, the species of birds involved, flock management, poultry marketing/commercialization and level of investment in biosecurity. This report divides Nigerian poultry production into three sectors:

- (i) Industrial sector (most of Sector 1). This sector is represented by 10 highly integrated industries, most of them with foreign franchising or joint ventures in Europe. They are the foundation of the entire commercial production system, hold parent and grandparent stocks, and produce day-old-chicks (DOCs). They have some level of integration with breeding, rearing/commercial activities and machine automation (feed-mills, incubators, cooling facilities), and produce all or part of their feed requirements. This report does not deal with this sector.
- (ii) Commercial sector (part of Sector 1 and all farms in Sectors 2 and 3). This sector includes the so-called backyard farms.
- (iii) Traditional sector. This sector includes all sorts of scavenging birds, in both rural and urban areas. In Nigeria, this sector is variously called traditional, village, local, rural or free-range.

2.1.2 Commercialization of poultry and poultry products

By way of preamble, it is important to note that all components of the Nigerian poultry market chain have a well-defined role in the overall objective of supplying consumers with poultry products, notwithstanding differences in quantity of demand and products in different periods of the year.

Graphic 7 Nigerian poultry market chain



A large percentage of exotic improved breeds in Nigeria are layers and they provide the large majority of commercial eggs. Exact numbers are not available but it is estimated that 70-80 percent of exotic breeds are layers and the rest are broilers. Normally, spent layers together with local poultry and, to a less extent, spent parent stocks, supply the largest portion of poultry meat. During festive occasions (Christmas, New Year, Easter, end of Ramadan and Tabasky), there is a peak in demand for poultry meat and this is mostly provided by broilers.

Production is concentrated in different locations and there are differences in producers' profiles:

- (i) Indigenous poultry: mostly produced in the north of the country by rural producers.
- (ii) Grandparent stock: concentrated in the south-west and generally brought from Europe.
- (iii) Parent stocks and DOCs: mostly produced in the south-west by big industries.
- (iv) Eggs: produced everywhere, but mainly around the major urban centres, by big and small farms.
- (v) Broilers: scattered all over the country and principally produced in the backyard sector and partially by farms.

The Nigerian poultry sector, despite many problems such as a rise in the price of feed, avian influenza, the global financial crisis and inadequate credit, is still in expansion. This will lead to an increase in backyard and small-scale producers, particularly in urban and peri-urban zones, increasing the concentration of poultry and raising concern about human and poultry health.

2.1.3 Veterinary services and avian influenza

The veterinary services are part of the Ministry of Agriculture and Rural Development, and are headed by the Chief Veterinary Officer (CVO) at the federal level and by Directors of Veterinary Services (DVS) at state level. At both levels they are organized into five divisions headed by Deputy CVOs:

- (i) Animal Health and Disease Control
- (ii) Education and Training
- (iii) Product and Market Development
- (iv) Animal Production and Preservation
- (v) External Relations

Two special units are particularly involved in AI control:

- A) The National Animal Disease Information and Surveillance system (NADIS) or Epidemiology Unit, responsible for collecting, analysing and disseminating data on animal disease. NADIS, which has taken over the function of the former Pan African Control of Epizootics (PACE), ensures regular disease investigation, reporting, monitoring and evaluation, with the overall aim of ensuring the efficiency and effectiveness of the disease control strategy of the National Veterinary Service. The NADIS system comprises a network of about 300 field agents located in high-risk areas for disease transmission (such as LBMs, livestock markets, control posts, quarantine stations, abattoirs, etc.) and a laboratory network comprising a central diagnostic

laboratory and five veterinary teaching hospitals. Private veterinarians and other animal health care service providers are also integrated into the system. Its functions include:

- (i) Passive and active disease surveillance
- (ii) Wildlife surveillance
- (iii) Participatory disease surveillance

Private veterinarians are gradually replacing government veterinary services all over the country, working principally in urban areas and, most often, associated with a pharmacy through which they derive the largest portion of their income.

B) The Avian Influenza Control and Human Pandemic Preparedness Project (AICP), which has the mandate to control highly pathogenic avian influenza (HPAI) and to develop a national Emergency Preparedness and Human Pandemic Plan. Its functions include:

- (i) Strengthening HPAI control and containment plans
- (ii) Strengthening disease surveillance and diagnostic capacity
- (iii) Strengthening veterinary quarantine services
- (iv) Capacity-building at state and local government area (LGA) level to be able to carry out control and containment activities
- (v) Establishment of a veterinary stockpile at state level
- (vi) Distribution of inputs (disinfectants, decontaminants kits, sprayers, sampling materials, etc.) at state level
- (vii) Improving biosecurity in poultry production and trade
- (viii) Economic recovery
- (ix) Communication

The majority of commercial producers have been compensated through the AICP, receiving reasonably satisfactory amounts proportionate to the real price or market value of culled birds, unlike at the beginning of the outbreaks when the amount was low.

It should be noted here that transportation of birds within a state may not necessarily require a sanitary certificates, while outside a state they are compulsory but not always issued. In addition, there are no structures in the final markets for birds to receive and catalogue such documentation. This all leads to making it difficult to trace the origin of birds.

2.2 Rearing techniques

Virtually all Nigerian commercial poultry farms are devoted to chickens and between them the vast majority to rearing layers. Recently, however, a few ostrich farms have emerged in the north of the country, while other species reared include guineafowl, pigeon, duck and turkey, almost exclusively reared in backyards and in the traditional sector. In addition, a few geese and peacocks are reared as ornamental birds.

2.2.1 Commercial poultry sector

In this report, the so-called backyards and all farms of Sectors 2 and 3 and some of Sector 1 (according to the FAO classification), are included in the commercial sector because their management and rearing practices are quite similar. They differ in only a few technical

solutions, particularly among the smallest producers, and usually linked to available economic means and climatic conditions. The scale of production does not significantly affect management and biosecurity practices.

There is a Poultry Association of Nigeria (PAN), but only the bigger producers are active members because, according to those interviewed, the association offers no practical advantage to the smaller producers who, in any case, often have difficulty paying registration and annual fees. Nevertheless, a strong national poultry association could offer important practical support to all producers.

Although production is generally not specialized, bigger farms raise more layers, while the backyards and small producers prefer broilers, in addition to turkeys and other species of birds. Nevertheless, larger flocks of layers are very often associated with smaller flocks of broilers, and batches of birds of different ages are mixed in the same compound. This is typical with layers, where different batches of adult chickens (the mission reported up to four batches) are present in the same farm, although housed in different cages. This habit is practised less with broilers, but the mission reported cases where chicks with one week of age difference were kept together.

The main reason for these practices is economic. Part of the daily income from the sale of eggs is used to purchase daily input for broilers, without an effective expenditure plan. The smallest producers prefer to rear broilers because the turnover rate of the investment is quicker. Buying a small batch of birds requires less cash (DOCs are only purchased with cash). To keep layers of different ages allows constant production without months of interruption in income and constant expenditure. The final result is that the "all in - all out" policy is simply not possible, with the exception of small-scale and backyard producers who often rear only one batch of broilers at a time. Batches of new birds are generally housed in separate cages, but direct and indirect contact with the other birds is common.

Farms and backyards are dispersed throughout the territory with no criteria and different production units are most often relatively close to each other. Equally, there is no modularity or standard in the production process; the closest that exists is the transport crate for DOCs that contains 50 chicks.

As reported above, the smallest backyards may only have a few birds, bought individually at market. The majority of medium and big commercial farmers generally keep good records of input, output, treatment, mortality, etc., while the smaller producers less so.

Photo 1 Backyards - (left) 4 broilers and 3 turkeys; (right) 50 broiler chicks



Photo 2 Cages for backyard at the Katsina Central daily market



Practically all commercials producers implement only confined breeding and have specific structures for rearing their birds, but the solutions adopted and the final quality vary from farm to farm and the protection of birds from external agents is erratic - and not always better for the bigger producers. Generally the frame of shelters is made of concrete in the bigger farms and in wood by the small-scale producers, while the smallest backyards often rely on cages. The roof is commonly of corrugated iron sheets. For example, the mission reported a farm of 8.500 layers, protected only by a roof with little or no protection for the chickens located in the rearing cages (see Photo 11 right). This caging method is quite common in the southern part of the country. The only consideration worth making is that daily and annual meteorological fluctuations seem to be quite limited and suitable to poultry needs. On the other hand, there are very few small-scale and backyard producers with permanent cages (see Photo 8 left). Nevertheless, in the majority of cases, a proper cage/building is provided, although they generally do not prevent wild birds and predators from gaining access. Pests are also quite common but, according to farmers, these are not a major problem.

Photo 3 Backyards - (left) 110 broilers; (right) 310 layers and 42 broilers



Mechanization is practically non-existent on all farms, primarily because labour is cheap and the supply of electricity is quite inconsistent. Climate control is almost zero, ventilation is strictly natural, and lighting is, sometimes, partially artificial (when electricity is available).

Most farmers rely on commercial feed, but the biggest may also produce for themselves and for selling, and the small-scale and backyard farmers may add a few home residues. Feed is generally distributed in feeders; for caged layer these are typically placed in front of the chickens, while for broilers and others birds reared on the ground these may be hung from the ceiling and/or placed in linear feeders. For birds in small-scale and backyard farms, feed may be placed in a bowl or a wooden home-made linear feeder, but this can lead to food loss and contamination by animals walking and defecating on the feed.

The quality of commercial feed is probably not very good and could be improved; this observation is based on the fact that the production of layers is generally lower than 80 percent and this can only be partially explained by the presence of simply natural illumination and is difficult to explain for broilers, which are often reared for longer periods than normal (up to 11 weeks), possibly indicating a weak growth rate, although it is true that the Nigerian market demands big birds. The mission did report one very big egg producer (with up to 260.000 layers) who had a contract with two different producers to prepare a special feed (at the same price as normal feed) and, according to him, the contract stipulated that the feed producers would be held responsible if the layers had any feed-related problems. Generally speaking, the hygienic conditions of feed storage need to be improved.

Depending on local availability, farms rely on tap, underground, superficial or rain water. Given the general sanitary situation of the country, chemical and bacteriological pollution is probable, particularly on farms with surface water supply. One backyard producer reported boiling water before giving it to the chickens. Water delivery is most often effected manually with bell drinkers, although on bigger farms or where tap water is available, some form of automatic drinker may be found. Water spillage may be a source of gastrointestinal pathologies, and this is indirectly confirmed by the widespread habit of giving birds antibiotics on a weekly basis and not following a normal medication schedule. The Implications of this practice for human health may be very important and should be investigated further.

Photo 4 Farms - (left) 1.500 layers and 200 broilers; (right) 8.500 layers of 4 ages



In the southern part of the country, layers are often kept in cages, while in the north they are mainly kept on the ground on sawdust litter. Material for litter is sometimes bought for as much as ₦ 100 for a 25 kg sack (around € 0.60), but in some cases it is obtained at no cost. Old litter is generally packed in old feed sacks and sold as fertilizer (₦ 100-120 per 25 kg sac, around € 0.60-0.75). It should be noted that one sack of sawdust yields around two sacks of old litter.

All producers rely on veterinary advice and services and usually comply with scheduled prophylactic plans. On small-scale and backyard farms, these prophylactic plans may be quite reduced, but farmers also seek the advice of veterinarians. Prophylactic plans are quite standardized, with small local modifications according to veterinary advice.

Vaccination for Newcastle disease (NCD) and Gumboro are always implemented for both layers and broilers. The vaccines against fowl cholera and fowl pox are administered mainly in layers. On request, it is possible to obtain DOCs vaccinated for Marek's and NCD from hatcheries. Other prophylactic treatments such as antibiotics, anticoccidial, de-worming and vitamins are also scheduled. Therapeutic treatment is used if necessary, usually following veterinary advice¹. The utilization of (sub)therapeutic quantities of antibiotics as prophylaxis is extremely common, more common than that normally scheduled in similar conditions, and respect of withdrawal time is not constant.

Sick birds are habitually removed from flocks and placed in quarantine. Regrettably, most of the time, the quality of quarantine space is completely unsatisfactory, either in terms of location or the quality of the separation from the breeding room; often it is simply a cage very close to or inside the breeding room separated by a grid, with no barrier to the exchange of dust and germs. The mission observed that veterinary advice to farmers needs to be improved, as regards both the location and the management of quarantine facilities.

Photo 5 Litter packing



Photo 6 Quarantine - (left) farm of 400 layers; (right) farm of 8.500 layers



At the end of a batch production cycle, all animals are sold to one or more traders. According to producers, traders do not enter breeding rooms but have access to farm yards which lack disinfection facilities. The same is true for egg traders; sometimes, the bigger producers may have specific selling points in town, while the smaller producers may sell directly to the market or at the entrance of their house. Because of this practice, the "live in - dead out" policy is not always respected. One backyard producer (200 broilers) who sold to the market

¹ In Nigeria, it is possible to buy human and animal drugs from pharmacies without a medical prescription.

reported that he had once had a problem of mortality when he brought back unsold birds into his flock; on realizing the problem, he kept the unsold birds aside. He also said that the problem was with exotic not local breeds.

Photo 7 Layers in wooden cage



Because birds of different breeds and ages are often reared in the same compound, the sanitary gap between production cycles is only possible for a single breeding room at a time, not for the whole structure; during the sanitary gap, the room is cleaned, disinfected and left empty for a few weeks or so.

However, in general, hygienic conditions are not excellent. The mission found breeding rooms with dust and spiders' webs on walls and ceilings, and stores, yards and farm surroundings were usually very unclean. Internal disinfection, in periods other than sanitary gaps, was not carried out. Recently, the veterinary services received sprayers and disinfectants from the AICP for a programme of disinfection in markets and outbreak areas (see later in the market section); this material is sometimes also used for farm disinfection but not on a regular basis and only a few farms are covered.

Many farms, including farms with only a few hundred birds, employ permanent workers, and these workers often rear their own birds at home; many small-scale and backyard farms are associated with traditional rearing. This implies frequent indirect contact between different flocks.

Theoretically, visitors are not allowed to enter farms but, whenever the mission asked to see breeding conditions, the gates were opened. There is, however, awareness that visitors can introduce pathogens and spread disease. Possibly the fact that the mission was often accompanied by public and private veterinarians facilitated entry.

Photo 8 Growing awareness



Photo 9 Footbath with rope bag



Other means of avoiding the introduction of pathogens, such as changing of clothes and shoes, disinfection of clothes, workers showering before and after entering, and washing hands before and after handling birds, are not applied. Sometimes disinfected footbaths are used either with water or with impregnated rope bags. On one small-scale farm close to a footbath, the mission observed plastic shoes meant to be worn and disinfected before entering the rearing room. Only recently have footbaths been introduced as a result of awareness-raising campaigns following outbreaks of AI. Other rules such as "first work in the clean, then in the dirty areas" are not implemented, and clean and dirty areas are generally not separated.

Photo 10 Burned chickens



Photo 11 Plastic shoes for working inside



Farmers reported that they generally have their own materials and do not share equipment, including egg crates and collector cages; this is a new habit, acquired mainly as a result of the awareness campaigns. However, cleaning and disinfection of working materials is not carried out regularly.

Before the AI outbreaks and the subsequent information campaigns, it was normal practice to throw the carcasses of dead birds into fields. Today, according to all those interviewed, dead birds are buried or placed in garbage containers (when available). In one case, a farmer with 13.000 layers burned dead chickens and fed them to dogs. The intentions were good, but the practice not to be recommended (see Photo 17).

2.2.2 Traditional poultry sector

In this report, the traditional sector refers to all types of scavenging bird, in both rural and urban areas.

For the majority of sedentary populations in sub-Saharan Africa, poultry is an important part of an integrated food production/security system. Diversification of crops and livestock production has evolved to reduce the risks of food crisis as the result of diseases and unfavourable weather. Agricultural production dominates community development, and the importance of livestock varies according to local environmental conditions.

African indigenous chickens are quite well adapted to the challenges of the local environment and are more resistant than selected poultry to climate and a number of parasites and diseases, but not all; diseases such as Newcastle disease and HPAI are equally lethal for local and exotic breeds. On the other hand, indigenous breeds have low productivity (egg production is estimated at around 60 per year, while for improved breeds stands at around 300 eggs per year). Low productivity is also due to low hatchability and high mortality, particularly for chicks during their first few weeks, mainly due to diseases and predators.

The low productivity of indigenous poultry can also be partially attributed to the fact that traditionally chickens receive little care. Indigenous poultry often coexist in the same households as exotic birds in small-scale and backyard farms. Nevertheless, the conduct of the two rearing systems is completely different. Several times during field investigations, the mission stopped in a village and asked who kept poultry; often the answer was "nobody keeps chickens here". Indicating a specific scavenging bird and asking "who is the owner?", the mission managed to interview a number of people. One village woman was asked where she learned to rear and was told "five years ago I bought two chickens and put them down around the house. They know how to do!". The final impression was clear: villagers do not rear chickens, they only own them, in the same way as a landlord possesses trees. Interestingly enough, the two chickens of five years ago had now become 15 adults and many chicks, even taking into account endemic Newcastle disease and festivities, both regularly disastrous for poultry populations.

Photo 12 Scavenging birds



Photo 13 Hen with guineafowl chicks



Adult birds are destined for both self-consumption and sale, while eggs are only seldom sold or eaten but kept principally for hatching. Live birds are most often sold by their owners in local markets, while bird traders occasionally travel round villages buying poultry (see section on 'weekly markets'). In the northern part of the country, pigeons are more important

for sale because of their quick reproduction period and are usually reared in large flocks. On the other hand, guineafowl are the major source of eggs; because they are "bad mothers", both for brooding and for chicks, many guineafowl eggs are sold and others are given to laying chickens. Some of the guineafowl in the markets are caught in the wild; they are more resistant to local conditions and are rarely affected by diseases (even Newcastle disease is slightly less pathogenic than in other birds). Turkeys are not easy to keep and generally must be regularly supplemented with cereals; however, they command high prices and their production has become more popular. Ducks are kept free range, usually in small flocks. Despite being more vulnerable to predators than are other types of poultry and the low-level management they receive, ducks are reasonably productive.

Ownership of poultry may be acquired through inheritance, gifts or, in some cases, purchase. Experience in poultry production is passed on from generation to generation, and specific skills may not be required. The traditional ways of rearing depend on simple, non-mechanized techniques. Flocks are composed of birds of different ages and species of indigenous breeds. During the day, they are free-ranging around the house and in the streets, seeking food.

Purposely constructed shelters are not the norm. At night, birds may be sheltered in small baskets (see Photo 21) or in a room of the family house to protect them from predators and bad weather, but chickens often spend the night on a tree. The only species with the right to a specific shelter are pigeons, generally in a small room with many nests on the walls (see Photo 22).

Photo 14 Baskets for poultry



Photo 15 Loft for pigeons



Lighting, ventilation and temperature are completely natural, while window grates, fenced ponds and other means of avoiding contact with other animals are clearly inadequate in these systems.

The main source of food is from scavenging and the only feed they receive is a drop of bran, sometimes cereals and residues from the kitchen, when available. In the north, which is drier, water is often provided; in the south, only seldom. Generally a bowl or a simple half plastic tank is used for water.

Photo 16 Feed complementation



Photo 17 Urban scavenging



Hygienic conditions seem to be often, though not always, very poor. Disinfection of yards or shelters is not at all a common practice. Nevertheless, pests such as rodents or parasites are generally not named as a major problem; on one occasion, a red ant was named. The main predators are birds of prey and mustelids.

Photo 18 Drugs on sale in Batsari weekly market



Veterinary advice is not used for either prophylactic or therapeutic treatments; at the same time, people with scheduled prophylactic plans for commercial birds usually do not take any medical steps, not even for such important measures as vaccination against Newcastle disease. This is not (but possibly also) because vaccinations are disliked but more through habit and because local chickens are considered more resistant; this may be true in part but not for Newcastle disease.

Knowledge of poultry diseases is quite poor and the use of traditional medicines in poultry is low. A few local medicines/treatments were named during interviews, but they are not recognized as being very effective. These have generally been replaced with antibiotics such as tetracycline, which is cheap and easy to find in local markets, but treated birds are not isolated from the rest of the flock.

Overall, sanitary practices to avoid direct and indirect contact with other flocks and introduction of diseases are simply not applied. New birds are most often introduced into the flock as young adults and no quarantine is employed when new birds reach the flock. Generally, only a few persons within households look after the birds, and there are no restrictions for the flock to move freely. In addition, the only sign that a bird has died is often the absence of the bird, so that even with the best of intentions carcass disposal is not always possible.

It is clear that policies such as "all in - all out", "live in - dead out", "disinfection between cycles", "sanitary gaps", "change and disinfection of clothing and shoes", and "shower before and after entering poultry areas", are simply not appropriate in this context.

2.3 Structure and dynamics of live bird markets

This section attempts to provide a simplified picture of a complex reality in order to catch the mainstream of a sometimes anarchical situation, even though there are always exceptions. The picture would be more simplified if the situation in the south-east, south-west and northern parts of Nigeria were to be analysed separately, but this picture would be incomplete because the differences reflect important complementarities.

Live bird markets in Nigeria are generally located in specific areas of general markets. Occasionally, this area is roughly sub-divided into different sub-areas for different poultry species, but this delimitation is imprecise and merges with other market activities. This means that bird species are commonly mixed, either with each other or with other animals and products. It is also common to find a few dispersed live bird shops in many towns.

Photo 19 Downloading of spent parent stock at Headbridge LBM in Onitsha town



Organizations of bird sellers are often present in markets, but there are no structures to regulate the overall functioning of the markets, with the result that there is no control of the movement of birds, no documentation or records, no reporting of activities, and no specifications regarding the trucks used to transport birds. At federal level, requirements have only recently been introduced (but not yet implemented) for the training of operators. The only formal exception to this is the fee that traders have to pay to the owner of the land on which the market is held. Operators generally pay this fee on the day of market (₦ 10-30, around € 0.10-0.20) but it may also be paid monthly or annual. The landowners are often Local Government Councils, (always in the northern regions), but in the south the land may

also be owned by associations, individuals or traditional chiefs (such as the Obas²) and market operators do not always have to pay a fee.

Photo 20 LBM in Onitsha town



The facilities of LBMs are very limited. In many major markets, an embryonic garbage disposal service is available, where part of market waste is collected more or less regularly. In other cases, there are private individuals who collect rubbish and whose services are paid for by the marketers. Nevertheless, in all the markets visited, general hygienic conditions were, at the best, very, very poor, for sales points, stores, the market in general and, in particular, slaughtering points.

Tap water or borehole systems are present in some major markets, but the water distribution system is basic; water points are often far from the final user and the water supply is irregular. Again, private individuals often make up for the lack of state services.

Basic facilities such as easy-to-clean shelters, floors and walls, and drains, are not always present but when they are they are often old, badly maintained or do not function. Other facilities such as toilets, public access points, separation between birds and public, bird displays, storage, quarantine for sick birds, and facilities for washing hands and shoes, are organized on an informal basis and are often overcrowded.

Finally, a number of facilities are simply not present, such as areas for disinfecting hands and shoes, as well as trucks, laboratory services, showers, freezer storage, or on-site culling and incineration of birds. Neither are veterinary or para-veterinarian personnel available in most cases for ante and post-mortem examinations, and only a few public or private veterinary services are available for consultancy.

² The Obas are the traditional chiefs in the Southwest regions. They are elected by the "Kings makers", a restraint group of people of noble origins. To inform the populations they use the "Town criers", persons walking around. At present they are incorporate in the administration as a parallel structure to the official one. They receive a monthly salary from the state. As traditional chiefs, theirs directives has an important impact on the population.

Photo 21 Veterinary drug shop

Nevertheless, in many markets, it is possible to find a veterinary drug shop, generally owned by a veterinarian and managed by a paraveterinarian. When a bird is sick, it is often removed from the flock and placed in another cage, where it is treated, usually after advice from a veterinarian or paraveterinarian. In some cases all birds in a flock are treated "just in case". Some bird dealers reported that when birds are sick, they administer one 250 mg capsule of tetracycline to each bird every day for five days (at a cost of ₦ 10, about € 0.10)³. Other retailers reported that when new birds arrive, they indiscriminately administer antibiotics (such as oxytetracycline) to the entire flock to prevent eventual problems. However, even when treated with proper veterinary drugs, birds that are slaughtered and consumed during treatment or soon after without respecting withdrawal time pose a serious challenge to human health.



Dead birds are quickly removed from their cages and hidden from the public, often in a plastic bag. Subsequent disposal of the carcasses varies greatly - throwing away into an empty space, placed in a garbage container, or burial; rarely are they burned. Those interviewed said that the first two methods were those most widely used before the awareness campaigns following the outbreaks of AI in Nigeria, while the third method is now more common. Garbage containers are still used for waste disposal, when they are available, otherwise birds are just thrown away. From the point of view of biosecurity, this may be an acceptable method for the disposal of inorganic material but not for organic material.

Since December 2007, there has been a country-wide programme for disinfecting LBMs, sustained by the Federal Ministry of Agriculture and Water Resources (FMA&WR) and assisted by the World Bank. The public veterinary structure is responsible for routine disinfection of all LBMs. Regrettably, the equipment (particularly sprayers) and the personnel are not always sufficient for the task. Some LGAs have taken the initiative of supplying equipment while elsewhere marketers' organizations support the veterinary services. Nevertheless, in most cases, disinfection is not always regular and even if it is, it is carried out on a two-three week basis. Rules on the use of alternative disinfectants are not regularly respected and the choice of disinfectant depends more on price.

Many markets have places where birds are processed (see details in section 2.3.3). Generally, market capacity varies between a few hundred to several thousand birds; not many markets can cope with many more. The number of traders varies from a dozen to a hundred in each market, with few markets reaching several hundreds of traders.

Given the structure, infrastructure and facilities in markets, the presence of wild birds and pests is inevitable, if not during human activities, immediately before and after. There is little trading of wild animals and where this occurs they are displayed in separate locations even if there are no formal regulations. Neither are wild hunted birds brought to market although in the north, where there is the habit of slaughtering at home and bringing birds to market, hunters may occasionally bring a wild bird for processing.

³ One trader reported that he used to give paracetamol to his birds but later noticed that tetracycline was more effective.

In most markets, birds are kept either in baskets of local material or in the cages in which they were transported, or they are transferred after transport to other common cages and mixed with old stock. The birds receive water and feed, generally from containers, giving rise to considerable spillage of water and loss of feed. Given the generally short life span of the birds, this appears to be a problem of waste rather than a potential source of disease, although dispersed feed may be an attraction for other birds and pests.

Cages may be metallic but are often in wood or other porous materials which are not easy to clean and disinfect. Even the metallic cages, which are most often home-made, have not been constructed in such a way as to allow easy cleaning. From their appearance, the cages do not appear to be cleaned on a daily basis, and disinfection is rarely carried out. Only recently have the veterinary services been providing disinfection services..

Photo 22 Cages



Photo 23 Roasted meat in a market



Borrowing cages or other equipment does not appear to be frequent, but when it happens cleaning and disinfection are as infrequent as for all other cages.

The large majority of LBM are retail markets, apart from a few wholesale markets (such as the Shasha LBM in Ibadan, Oyo State, which is located in a high production area). Retail markets in which birds are sold are either "weekly" or "daily", and have slightly different functions in the commercialization of poultry and poultry products. As a result, their internal organization is different, although there are always exceptions.

2.3.1 Weekly markets

First of all, it is important to note that these markets do not always work on a "weekly" basis. Several, especially in the central and southern parts of the country, have a different frequency, mainly each 4th or 5th day, and are called "intermediate markets". However, because the frequency does not modify the working mechanism, these facilities will be treated as "weekly" LBM.

Markets have different poultry products mediators, referred to here as:

- Collectors - persons who buy poultry directly from small rural and urban producers, at home or at the market.
- Middlemen - persons who buy poultry from collectors or other middlemen.

Weekly markets have three basic functions:

- (i) as places where rural, small-scale and backyard producers sell their products.
- (ii) as drainage of local and some exotic poultry products for other markets.
- (iii) as normal markets, where the final consumer can buy poultry for his/her own consumption, for home rearing and/or for sacrifices (this latter function is more developed in central and southern Nigeria).

Direct interaction between producers and final consumers is rare; interaction between the two is usually via one or more mediators.

Weekly markets are mainly located in rural and semi-urban areas, where they drain products from the surrounding area. Only a small portion of the poultry on display comes from the industrial sector or from far away (e.g. guineafowl, produced mainly in the north, which are sold in the weekly markets of the south).

Photo 24 Weekly markets



Most of the birds on display are chickens of local breeds, but it is also possible to find other species and breeds. Their relative importance may vary from place to place and during the year. Generally, the following is the order of importance of different species of birds:

- In the North: chickens → guineafowl → ducks → pigeons → turkeys
- In the South: chickens → turkeys → pigeons → guineafowl → ducks

Seasonally, other chicken breeds are also present, such as 2-3 week-old broiler chicks (to be reared in surrounding small-scale and backyard farms). In the south, one can also find broilers, spent layers, 2-3 week-old chick cockerels (male of hybrid or layer stock, to be introduced into a local flock to improve productivity) and a few chicks of local chickens (mainly for sacrifices).

In markets, eggs come largely from the commercial sector. Generally, it is possible to find only a few eggs of local chickens and sometimes a couple of eggs of guineafowl or duck. In the north, the presence of local eggs is a little higher. The eggs of guineafowl are commercialized, for the most part, outside LBMs, on the street, either raw or boiled.

Of the three functions of the weekly markets described above, "normal" marketing activities take place for as long as markets are open. Interaction among producers, collectors and middlemen takes place early in the morning in the south and late in the afternoon in the north. This timing allows for the transport of birds in the coolest hours of the day. In fact, birds from the north are mainly conveyed to the final markets in the centre and the south

during the night, while in the South, where transport to the closest urban centres is over short distances, birds are carried to market in the early hours of the morning.

Generally, merchants working over short distances trade a limited number of birds each trip (ten/a few hundred) several times a week. These are the same persons that operate in the daily markets as retailers or their agents. It is widely agreed that the main reason for the reduced number of birds is limited financial capacity because selling is not a problem (the demand for poultry and poultry products is high and growing in Nigeria). The mission observed this high demand in Katsina LBM: on the day that public sector salaries were paid, almost all cages were empty and the slaughtering point was a hive of activity.

Birds may be taken to market in any imaginable way: in cages, tied by the legs, held in the hand, by foot or on a lorry. This said, the mission often saw birds being transported in locally-made cages (of local material or iron wire) on small common means of transport.

Photo 25 Weekly markets

Photo 26 Transport of birds from weekly to daily market



On the other hand, merchants acting over long distances trade hundreds or thousands of birds each time, two or three times a week. They are specialized in this trade and have fixed markets in which to buy and sell. Two methods are used to transport birds over long distances: one is in locally-made cages on trucks; the second is on cage-less shelves in smaller vehicles. A medium truck may be loaded with around 2.700 birds (54 big cages containing 50 birds each); moreover, the cages are generally new and, because they are relatively cheap, are sold together with the birds, allowing quicker sale of birds.

Overall, the methods of transporting birds can be judged satisfactory (although they may not always be pleasant for the poultry). However, a major problem lies in the close proximity of birds, human beings, goods and other animals - one of the best ways to spread diseases among species and in the environment.

The weekly markets are frequented by strange figures, a mix of poultry collector, retailer and middleman. These persons collect poultry in villages and, during market hours, rural producers bring birds to them for sale. At the same time, they act as retailers for the final consumers, and can also act as middlemen for retailers in the daily markets or for long distance trade. They are mostly specialized in poultry, although they may also handle a few other animals (such as goats and turtles). Many of them follow the different weekly markets of the zone. Each day, they move with their unsold birds to the next market, where they start buying and selling again. Some move together from market to market, while a few may be specialized in a single market and work on weekly basis; because they work in a relatively

limited zone, they may return home almost each night with their unsold birds. By comparison, most of the rural producers that sell a few chickens in the weekly markets manage to sell all their birds before returning home.

In the north, all these different actors are connected to specific associations; in the south, associations in the weekly markets are often very weak or non-existent.

2.3.2 Daily markets

Daily markets have two basic functions:

- (i) to offer urban and semi-urban consumers the possibility to buy products for their own consumption, for family rearing and/or for sacrifices
- (ii) to act as the main markets for the sales of commercial producers

As their name implies, the daily markets work on a daily basis, with only a few partially closing during major festivities. They are located in urban and semi-urban areas and receive poultry from the surrounding weekly markets, from the larger poultry industry and, typically in the south, from the north. The place of origin of the products may be either close or distant, but all have a relatively stable flow of origin and destination.

Photo 27 Daily markets



The birds on display are mostly chickens of local breeds, particularly in the north; in the south, spent layers, local chickens and sometimes spent parent stock are common. In proximity to festivities, there is a notable increase in the number of broilers on sale. In terms of other species and eggs for sale in the daily markets, the figures are the same as for the weekly markets and depend on local production.

In the daily markets, the poultry sector is active as long as there is daylight, and all year round. Retailers are mainly the small merchants seen in the weekly markets and almost always organized into associations. The level of dynamism of the associations is very variable, with those which are most active holding regular meetings. Their main tasks are to regulate the number of retailers and the flow of birds to the markets, to share information and to provide basic rules of behaviour. The majority of retailers in the daily markets operate as individuals on the selling side but may buy collectively, with a few members buying birds for a group or one member delegating another member to buy. The various marketers' associations are normally independent, with no links to the others.

In the daily markets, a single batch of birds may remain between 2-5 days before being sold. Overnight, unsold birds stay in the market, locked up into some provisional structure or left in their cages with a guardian. A regular policy of "all in, all out" is not adopted.

2.3.3 Bird processing

Many markets have processing points where the birds are slaughtered. Theoretically, this facility is recommended to reduce contact between public and birds, provided the processing is done under proper and hygienic conditions. Unfortunately, this is never the case.

Photo 28 Slaughtering points



Generally speaking, almost all daily markets have such a facility; it is often absent in the weekly markets. A number of parameters can be used to identify approximately whether birds will be slaughtered in the market or not:

- (i) Age. Chicks of exotic breeds are for rearing, while the few chicks of local chickens are mainly for sacrifices and therefore not slaughtered in the market.
- (ii) Urbanization. In major urban and semi-urban areas, slaughtering in the market is widely used, while in less urbanized and rural areas it is less present or absent; this is clearly linked with habit, but also because birds can be slaughtered at home.
- (iii) Breed. Exotic adult chickens are only for direct consumption and can be slaughtered in the market. Local chickens may be used for sacrifices, so the method of slaughtering is important and, above all, private.
- (iv) Species. Turkeys are exclusively used for eating, while pigeons are used mainly for sacrifices (common in the south and less so in the north); local chickens, ducks and guineafowl may be used for eating or for sacrifice.

Bird processing involves several steps: pre-slaughtering management, slaughtering, hot water body treatment, de-feathering, evisceration, and packaging of the final product. Depending on the location, this processing may be done individually by apprentices/dependants of the trader on a small table placed behind the cages, or by specialized persons. Specialized butchers may work as individuals or collectively.

Pre-slaughtering management of birds is recommended as a measure to reduce the risk of organic pollution of the final product before processing. This involves the withdrawal of feed 8-12 hours before slaughtering, a practice which is never carried out.

In the southern part of the country, slaughtering is generally done by cutting the carotids and the trachea to bleed the bird. In the north, slaughtering require particular procedures

following Muslim rules. The bird has to be placed with the head facing east, with the butcher pronouncing a prayer before cutting the carotids and the trachea. For this reason, many birds in the north are slaughtered at home and then taken to the market for subsequent processing. If the bird is for sacrifice, the slaughtering technique is an important part of the ceremony and factors such as the gender and colour of the chicken are part of the ritual.

Photo 29 Slaughtering points



De-feathering is done manually after the bird has been dipped for a couple of seconds in a cauldron with hot water. Evisceration refers mainly to the removal of the first part of the digestive tracts (crop, oesophagus, proventriculus and the highly keratinized membrane of the gizzard) and of the respiratory system (trachea and lungs). In the south, the intestine is also removed, while in the north it is left with the other internal organs (liver, gizzard, heart, kidney, undeveloped eggs) for the buyer. After evisceration, the bird is washed and, if the client asks, cut into portions. The bird is then put in a plastic bag and chilling of the meat will be done at home if required.

All work is rapid; in 5-6 minutes the bird is ready. However, it is generally executed without any form of protective clothing other than a cotton apron. Other protective material, such as overalls, head covers, rubber hand gloves, rubber aprons and rubber boots, are never used.

Photo 30 Bird processing

Tools are only occasionally cleaned. At the end of the day, some butchers heat some fresh water in the de-feathering cauldron and wash the tools (and sometimes the apron) with the water as a means of sterilizing them. The washing of hands after slaughtering is done irregularly, eventually at the end of the day. Hands are never disinfected. Slaughtering points are disinfected by the veterinary services along with the rest of the LBM.

The prices for processing vary according to the size of the bird. Indicatively, pigeons, local chickens, guineafowl and spent layers cost ₦ 30 (around € 0.20), broilers ₦ 60 (around € 0.40), spent parent stock ₦ 70 (around € 0.45), ducks ₦ 100 (around € 0.60), and turkeys ₦ 150 (around € 1.00).



The waste from processing consists mainly of feathers and a few visceral parts. In the south, the intestines are generally sold (or given free-of-charge) to cat-fish producers, a small amount of feathers are used for decoration, and the rest is discarded and sometimes burned. In the north, the waste is mainly feathers which are generally burned and sold as fertilizer.

3 Biosecurity and the Nigerian poultry market chain

The overall assessment of how major biosecurity practices function in the activities of poultry producers and in LBMs (as described above) is that general management is extremely inadequate and that no basic hygienic practices are implemented, through either lack of knowledge or constraints to their implementation. Table 1 presents a review of the implementation of the principal biosecurity practices by Nigerian poultry producers, and it is clear that general breeding conditions are poor.

Table 1: Review of biosecurity practices implemented by poultry producers
(+ good ; - poor ; - - very poor)

	Commercial	Traditional		Commercial	Traditional
Keeping records of inputs, outputs (traceability)	+ / -	--	Disinfection between batches of birds	+	
Fenced enclosure	+	--	Live in - dead out	+ / -	-
Day housing for the birds	+ / -	+ / -	Good hygiene on the farm	--	-
Night housing for the birds	+ / -	+ / -	Disinfection of premises	--	-
Appropriate distance between farms	-	-	Regular cleaning of storage facilities	--	
Wire mesh on windows and openings	+ / - -		Regular cleaning of environment	--	-
Separation of birds by species	-	-	Disinfection of premises	--	-
Fencing around ponds	-		Avoid poultry unit's workers contacts with other birds	--	--
Separation of birds by age class	+	-	No or controlled access to visitors	-	-
Avoid contact between poultry and wild birds	-	--	Changing clothes and shoes when entering the farm	--	
Avoid contact between poultry and other animals	-	--	Disinfection of clothes and shoes when entering the farm	-	
Avoid contact with rodents	-	+ / -	Workers shower before entering	--	
Feed supplied in protected area	+	-	Wash hands before/after handling	--	-
Water from known source	+ / -	-	Cleaning of working material	-	-
Water from safe source	+	-	Disinfection of working material	-	-
Feed from known and safe source	+ / -	-	No sharing of equipment between farms/units	+	-

Avoid contamination of feed during transport storage	+ / -	-	Disinfection of shared equipment	-	-
Quarantine for newly introduced/returning birds	--	--	Specific entry point for collectors/ with/without disinfection	-	-
Quarantine for sick birds	--	--	First work in clean then dirty area	--	-
Safe removal of dead birds	+	-	Safe disposal of carcasses	+ / -	-
All in - all out	-		Safe disposal of litter	-	-
Rest period between batches of birds	-				

Table 2 presents a review of the implementation of the principal biosecurity practices in LBMs, and it is also clear here that their implementation is poor.

Table 2: Review of biosecurity practices in LBMs (+ good ; - poor ; -- very poor)

	Daily markets	Weekly markets		Daily markets	Weekly markets
Monitor activities on the market	-	-	Availability of cold chain	--	--
Document movement of poultry to/from market	-	-	Quarantine for sick birds	--	--
Control movement of poultry to/from market	--	--	Facilities for culling birds	--	--
Availability of specifications for vehicles carrying birds	-	-	Presence of a lab.	--	--
Formal training of operators	-	-	Presence of an Incinerator	--	--
Location of the market	-	+ / -	Disinfection facilities for trucks	--	--
Fencing and gates around the market	--	--	Reduce density of birds in cages	+ / -	+ / -
Poultry market separate from other stands	-	-	Active poultry sellers association	+	+ / -
Ante and post-mortem inspection of birds	--	--	Separation of birds by species	--	--
Access to para-veterinary services	+	+	Separation of birds by age class	+ / -	+ / -
Access to veterinary inputs	+	+	Control presence of wild birds	--	--
Garbage disposal services	- / --	- / --	Control presence of pests	--	--
All-in all-out policy on the market	--	+	Other animals traded in market	-	-
Segregation of customers and birds	--	--	Wild animals traded in the market	+ / -	+ / -

Mandatory routine disinfections of the market	+ / -	+ / -	Keep new arrivals separated from old stock	+ / -	+ / -
Restrict movement of operators from market to market	-	--	Enclosure preventing escape	+	+
Floor and walls easy to clean	--	--	Improved cages	--	--
Presence of drains on the floor	--	--	Water delivery	-	-
Availability of clean water	+ / -	+ / -	Food delivery	-	-
Availability of hot water	-	-	Cleaning of cages	-	-
Availability of toilets	--	--	Disinfection of cages	-	-
Access to facility to wash hands and shoes	-	-	Prohibit sharing of cages / other equipment	+	+
Access to facility to disinfect hands and shoes	--	--	Disinfection of shared equipment	-	-
Safe disposal of sick birds	--	--	Traceability of origin of birds being sold	+ / -	+
Good hygiene on the market	--	--	Certification system in place for transport of birds	-	-
Good hygiene in storage facilities	--	--	Rest period between batches of birds	--	-
Good hygiene at slaughtering points	--	--	Policy on unsold birds	+	--
Safe disposal of sick/dead birds	+	+	Availability of processing facilities	+	+ / -
Safe disposal of carcasses	+ / --	+ / --	Live in - dead out policy	-	-
Safe disposal of waste	+ / -	+ / -	Improved packaging of slaughtered bird	-	-
Disinfection of infrastructure and equipment	+ / -	+ / -	Cleaning of equipment used for slaughtering	-	-
Disinfection of premises	-	-	Disinfection of equipment used for slaughtering	+ / --	+ / --
Alternate use of disinfectants	+ / -	+ / -	Protective material for people slaughtering birds	--	--
Compensation mechanism in place for culled birds	-	-	Hands washing after slaughter	-	-
Availability of storage facilities	-	-	Hands disinfection after slaughter	--	--

These reviews only partially reflect the reality. The Nigerian poultry market is in rapid expansion with internal demand growing quickly, and Nigerians producers may follow this trend by covering the demand. They also have the capacity to adapt their production cycles to fluctuations in demand. At the same time, while the marketing of poultry products at

individual level appears quite chaotic, overall there exist clear places of production for different poultry products, an informal but structured chain of distribution, and many different actors with complementary and precise tasks. In other words, the overall organization of the market is good and all mechanisms work.

Looking at the traditional sector, the picture that emerges is one of weak management and lack of knowledge. Nevertheless, even in this sector, poultry is managed well and, if the need arises, it is carried out in a rational way. Examples are the habit of giving the eggs of guineafowl to chickens to brood or to effectively adopt new techniques such as the use of antibiotics. From a different point of view, the method of rearing is perfect: there is no need to do anything (or nearly do nothing) and "a harvest can be reaped".

A problem lies with the parameters of evaluation. The rationale of the "assessment" reported here lies in a biosecurity point of view; in everyday life, things may be very different. This is to say that many biosecurity practices are not essential in normal conditions (without HPAI). It is known that HPAI has a major impact, but the probability of emergence of the disease is low. Today, the sanitary risk taken by producers is low, is balanced against the prices of input and output, and is mainly related to poultry diseases other than HPAI. Last but not least, it is also known that enforcement of biosecure practices is impossible for economic, cultural and monitoring reasons. These are major challenges to improvements in biosecurity.

To increase the chances of effectively improving biosecurity:

- we need to work at different level and with different actors

Furthermore, on the one hand we have to propose advantages for the producer, and on the other we have to involve consumers, in order to force producers to improve the quality of the final product. In particular:

**- show advantages to the producer → bioexclusion
- involve consumers in "food safety" → biocontainment**

HPAI H5N1 was confirmed in Nigeria in February 2006, and two months later, the disease was declared endemic (see http://www.oie.int/eng/info_ev/en_AI_factoids_H5N1_Timeline.htm). At the time, probably nobody expected that it would be possible to disrupt the cycle of the disease in the country, at least in such a short time. Today, this goal almost seems to have been achieved, and there are lessons to be drawn. In fact, there is a significant discrepancy between the goal and the results of this evaluation of biosecurity practices which, at best, can be described as very, very poor, both in LBMs and among poultry producers.

It seems clear that the fundamental factor in achieving the goal was the policy adopted - do not vaccinate in order to permit identification of all infected flocks, then cull the infected flocks and, finally, pay compensation in order to give people an incentive to report new cases of suspected mortality.

Other aspects have also played a role in achieving the goal. It is known that a disease spreads when, on average, each infected animal infects more than one other animal, and decreases when this infection rate is lower than 1. Many factors come into play in deciding which will occur. One important factor is the presence of potential healthy carriers, because they may excrete virus for a long period. Another is the possibility of survival of the virus in the external environment, because it increases the chances of coming into contact with a suitable host.

In Nigeria, the mission found a reduced number of domestic waterfowl (possible healthy carriers) in the southern part of the country, where the virus may find a more suitable milieu

for survival in the external environment; in the North, ducks are present but, particularly during the hottest and driest period of the year, conditions are not suitable for the survival of the virus.

Other factors have also played a role:

- the LBM disinfection campaign organized by the veterinary services and the disinfection of farms.
- the information and awareness campaign that made it possible to change certain habits, such as carcass disposal, limits on visitors entering production units, the use of disinfected footbaths before entering farms, and not exchanging egg crates.
- the structure of Nigerian towns and villages, which are clearly delimited and well separated from each other.

Nevertheless, none of these may completely explain disruption of the cycle of disease and none of them alone can stop the spread of infection; each has probably played a small but important role in interrupting the spread. This confirms that it is more important that a single small improvement is adopted by a part of the population, rather than only a few adopting a high standard of biosecurity. Under this scenario, it is necessary to find affordable improvements in order to raise the level of biosecurity, and even the smallest measure is important and may represent a difference in the final result.

To achieve this goal, effective information, training and awareness campaigns are the core requirements

4 Recommendations

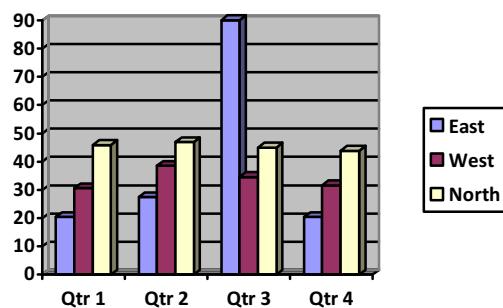
➤ Need for research

Our knowledge of the epidemiology of AI has improved over the years, but is still far from complete, and it is possible that there are specific conditions in Nigeria, or better in sub-Saharan Africa, that prevent HPAI H5N1 from becoming endemic.

Yellow fever, for example, finds the right invertebrate vector and reservoirs, the vertebrate host maintainer and amplifier, the climate and a similar economical milieu in a large part of the tropical band of the world; yet it is highly endemic in West Africa, sporadic in the rest of tropical Africa and in South America and absent from Asia. There is still no satisfactory explanation for this uneven distribution.

Perhaps the situation is similar for HPAI H5N1. While the disease has been confirmed in 10 sub-Saharan African countries, from Cote d'Ivoire to Djibouti, it has been possible to stop the spread relatively easily in a short space of time, yet in Asian countries this has not been possible even with much greater efforts and economic means.

There is another important factor responsible for maintaining the rate of infection at "higher than 1" – poultry concentration; this is relatively low in sub-Saharan Africa compared with Asian countries.



It is not just a question of "bad rearing techniques" but also the changing situation in which growing human and animal populations render previously acceptable activities risky.

There is a need for field research in the 10 sub-Saharan African countries infected with HPAI H5N1 to identify the epidemiological features that have permitted a break in the cycle of the disease

➤ Food safety

During the field assessment, it appeared evident that producers and retailers in the poultry market chain use antibiotics much more than would normally be scheduled under normal practices in other similar situations. Moreover, withdrawal times were not respected.

The abuse of antibiotics represents a strong rationale for producers, given the fragile balance between the input cost and selling price of the final product, reducing the possibility of investment to improve the quality and quantity of production, compounded by the global rise in the price of grains and feed stuffs. Apart from focused therapy in the case of identified illness, producers resort to the use of sub-therapeutic quantities of antibiotics as prophylaxis

to prevent disease, reduce costs, enhance performance, and increase feed conversion and rate of growth, all for minimal inputs of money and work.

For their part, market retailers indiscriminately administer antibiotics (oxytetracycline) to their entire flock when they receive new birds in a move to reduce problems caused by stress. Even when treated with proper veterinary drugs using the correct dosage, there is still a major threat to human health if the birds are slaughtered and consumed during or soon after treatment, without respecting withdrawal times.

The major direct risks for the community are the following:

- (i) the permanent presence of antibiotic residues in poultry meat, eggs excrements, which is one of the best ways to create pathogens with antibiotic resistance
- (ii) the free use of antibiotics, leading to a reduction in general hygienic standards; in other words, reducing biosecurity and permitting the possible presence of different zoonoses in the final product

In many countries there is rising concern about food safety. In the European Union, for example, the use of antibiotics as growth promoters has been banned since January 2006. This is clearly not possible to enforce at present in Nigeria. Nevertheless, the growing Nigerian middle class could be in a position to kick start the process of safer poultry production. The idea is not to enforce something that is impossible to control but to work on the awareness of the final consumer.

Mobilize interested health-conscious consumers who are willing to pay a little more for drug-free birds.

The side effects of this policy have been seen in other countries. The process was beneficial, at first, to small producers, who are faster and more able to respond to the needs of specialized markets, and the value-added benefits allowed to them to improve the quality of production (and biosecurity standards).

This requires a number of pre-conditions:

- Legislation on the selling, prescription and utilization of antibiotics
- Naming of an authority to control and certificate the quality and origin of poultry products
- Organization of awareness campaigns for consumers on food safety

4.1 Poultry producers

Compensation

To a greater or lesser extent, producers have been compensated. The amounts paid were reasonably satisfactory and proportionate to the real market price. It is strongly recommended that this policy be continued. In relation to compensation, the mission noted that:

- (i) given the cost of the operation, culling was carried out only in infected flocks, not in neighbouring flocks

- (ii) in outbreak areas, disease may have been reported in only a part of infected flocks, because dead birds were not compensated and there was therefore no incentive to report when birds were already dead.
- (iii) in one case, more than ₦ 90 million (more than € 0.5 million) were paid out to only one big producer

Minor modification may help prevent the spread of the disease in the case of new incursions and facilitate the identification of all infected flocks in order to permit appropriate destruction and disinfection.

A small amount of compensation could be introduced for birds that are already dead but were previously seen by the veterinary authorities.

This should be done only in outbreak areas and only under the direct control of the veterinary services, and would serve to provide an incentive for also reporting dead birds and permit consequent monitoring of the situation and the necessary disinfection.

A maximum value should be defined for the compensation of infected flocks.

If only infected flocks are culled, the producers concerned would lose the vast majority of their birds, and they are therefore interested in receiving at least partial compensation. This is not valid in the case of uninfected flocks where, if culled, the total value of the flocks would have to be reimbursed.

➤ Flock registration

The demand for poultry and poultry products is in strong and continuous expansion, and not only in Nigeria. This will drive an increase in backyard and small-scale producers, particularly in urban and peri-urban areas. Currently, the veterinary services register only commercial producers with flocks larger than 200 birds and not traditional producers who may own larger flocks.

The veterinary services must also register small-scale and traditional flocks in order to permit effective surveillance and control in the case of outbreaks.

This is particularly true for urban and peri-urban areas because, as a result of the concentration and contiguity of birds, these are the most favourable locations in which a disease may spread and eventually become endemic.

➤ Collaboration with the Poultry Association of Nigeria (PAN)

The quality of commercialized feed is not excellent and this reduces the benefits to producers. This is typically an issue for PAN; the association could carry out lobbying work on prices and the quality of inputs, which may have an important practical impact for all producers. On the other hand, a strong poultry association could be a good vector of information and a mechanism of internal control.

Envisage the possibility of collaboration with and strengthening of PAN, in order to increase producers' profits and improve the quality of poultry products and the production process.

➤ Extension for backyard and small-scale producers

Unlike in many other sub-Saharan African countries, virtually all Nigerian backyard and small-scale producers rely on veterinary advice and services. Veterinaries are one of the main sources of information for many poultry farmers and they enjoy a good reputation.

Veterinarians must be used as important actors in the transfer of information to producers; producers must therefore be one of the major targets for communication.

Carry out extension activities in all aspects of biosecurity that do not require investment; leaflets could be prepared and distributed to veterinarians.

➤ Extension for traditional farmers

The situation is different for traditional farmers who often possess only basic knowledge of poultry breeding; when they do (e.g. backyard producers who also keep scavenging chickens), they apply two completely different rearing methods for the different birds.

For traditional farmers, the main source of information is the radio; organize transmissions on topics that would help improve all simple daily practices.

4.2 Live bird markets

➤ Market infrastructures

There is an ongoing project to improve the infrastructure of several LBMs [Lagos (3), Kaduna (2), Kano (2), Sokoto (1), Ilorin (1), Jos (1), Garki-Abuja (1) and Onitsha (1)]. A good standard plan has already been proposed which will be beneficial to the whole community and more effective for the health of the poultry sector by improving the general hygienic conditions of a larger number of LBMs. This represents a single small collective improvement rather than higher biosecurity standards for a few.

In a first phase, reduce infrastructures to the basics in order to reproduce these minimal facilities in as many markets as possible; the basic infrastructures in this phase are:

- (i) **easy-to-clean soil, and good quality asphalt that is cheaper than concrete**
- (ii) **natural ground slopes for soil drainage which do not require big infrastructure**

(iii)a simple shelter

(iv)improved slaughtering points (protected de-feathering points and an incinerator to burn waste)

(v) where possible, improved water and garbage facilities

This should be accomplished while leaving the possibility for further improvements and in close collaboration with marketers' associations, which must be engaged in routine cleaning and disease reporting.

 **Collaboration between veterinary services and marketers**

Local public veterinary services have had the capacity to instil confidence with bird sellers' associations (they were helped in this by the free distribution of disinfectant). It is important to maintain this confidence and develop more important collaboration to improve the efficacy of the veterinary services (for example, in carrying out disinfection); but it is also important because markets are an excellent checkpoint for any poultry disease in the country and provide rapid alert in the event of problems, which could be very beneficial for the success of outbreak containment. The envisaged improvement of several markets (see next point) could be another important instrument for increasing this collaboration.

Public veterinary services should be involved in the transfer of information to marketers.

It has already been noted that previous awareness campaigns had a positive impact on several aspects of normal market life. Nevertheless, improved habits have not yet been adopted completely by all marketers. There is need for more awareness campaigns.

Carry out extension activities in all aspects of biosecurity that do not demand investment; leaflets could be prepared and distributed to public veterinary services.

Markets are excellent points for a poultry disease early warning system..

In order to improve passive surveillance, daily markets are the priority because:

- (i) they are less numerous than the weekly markets**
- (ii) they receive birds from further away**
- (iii) they are better organized**
- (iv) they are the first step in the spread of disease in densely populated areas.**

Slaughtering points are one of the major problems of markets. It has been noted that in several cases at the end of the day market personnel change the water in which the birds are dipped before de-feathering and with the new fresh hot water wash the tools (some also their aprons) and partially the slaughtering point.

Provide incentives for the use of hot water to clean and disinfect the tools used for slaughtering.

4.3 Recommendations for implementing activities

To provide a framework for the way forward, the following recommendations are suggested and the relevant actors identified for implementing these recommendations.

Compensation

FAO should stimulate an internal debate within the FMA&RD to revise the modalities of compensation. This would be facilitated if FAO were to sponsor and organize workshops with the participation of representatives of all stakeholders in the Nigerian poultry value chain.

The workshops would discuss the problem in such a way as to give to all participants the necessary understanding, and explain clearly the goal of the activity and the rationale for the proposed change of modalities. Participants would evaluate the feasibility of the proposition and identify the best form of implementation.

The output of the workshops would be a clear statement on:

- the minimal amount sufficient to encourage producer to declare also dead birds
- the way to avoid fraud
- the maximum value for the compensation of infected flocks

The workshops could be organized and animated either by an ECTAD team member or by a Nigerian consultant in strict collaboration with the FMA&RD.

Flock registration

This is an internal choice of the FMA&RD but could signify much work for the veterinary services in the field. Before giving instructions to change the current procedure, the mission strongly suggests introducing this point in a future meeting that would group representatives of all veterinary services and discuss implementation.

It may be added as a complement to the already suggested workshop on compensation because the official recording of producers by the veterinary services could be one of the limitations to access to compensation.

Collaboration between veterinary services and marketers Market infrastructures

These two activities are strictly linked and require propaedeutical organization.

The veterinary services must first make a technical choice about which specific market infrastructure has the priority for improvements in general hygienic conditions. They must then calculate in how many markets this would be possible with existing funds and select the markets.

Subsequently, it is envisaged that a workshop would be held, similar to the workshops for compensation but with different participants: representatives of NADIS, AICP and FAO,

marketers from the markets in which infrastructures would be improved, and the respective local veterinary services.

The expected outputs are:

- simple and practical activities for improving the hygienic conditions of markets will have been identified, along with those responsible and the methods of implementation
- marketers will commit themselves to collaborate in maintenance of the infrastructures
- other needs for marketers' training will have been identified for inclusion in a training manual (see below)

FAO, in collaboration with the veterinary services, NADIS and AICP, should prepare a training manual for the local veterinary services. Simple leaflets should be prepared on the training manual topics, targeting marketers. The team responsible for this work should include veterinarians and extension and communication specialists.

The following are the principal training manual topics:

- Cage cleaning
- Destination of unsold birds
- General hygienic conditions
- Removal of sick/dead birds
- Carcass and waste storage
- Carcass and waste disposal
- Pre-slaughter management
- Cleaning and disinfection of slaughter tools
- Use of alternate disinfectants
- Hand-washing after slaughter

Marketers must also be trained in:

- Clinical diagnosis of AI and reporting of diseases;
- Recording and reporting of activities (very important for the traceability of birds' origins
- Proper use of antibiotics and withdrawal time

Because this training is envisaged for all daily markets, a representative of the veterinary services for each federal state must be trained in use of the manual, for subsequent inclusion of this training in their own programmes. These representatives must also ensure training for the members of market associations in the daily markets and, if necessary, in a few major weekly markets.

FAO should sustain the cost of central training and reproduction of the manual and leaflets. The exact number of leaflets to be produced must be calculated on the basis of the exact number of daily and major weekly markets in each state. It is estimated that if each market association were to receive five leaflets, 3.000 copies would be sufficient. The leaflets should be written in English and translated into at least the three major local languages: Hausa, Yoruba and Igbo.

Extension for backyard and small-scale producers

As for the training of marketers, FAO, in collaboration with the same institutional partners, should prepare a training manual for private veterinarians on the topics identified above. Simple leaflets should also be prepared, bearing in mind that the target is the small

producer. As above, the team should include both veterinarians and extension and communication specialists.

Central training on the manual topics should be given to all private veterinarians willing to participate and, at the end of the training, they will receive a number of leaflets. The added value for these veterinarians is that during their normal work they will be able to strengthen their messages with written and visual reminders.

The principal topics are:

- General hygienic conditions
- Cleaning of working material
- Use of shared equipment
- First work in clean then dirty areas
- Presence of visitors
- Change of shoes before entering in breeding rooms
- Wash hands before/after handling
- Water and food delivery
- Collectors' entrance
- Tray for differentiating and separating clean and dirty zones
- "Live in - dead out" policy
- Carcass disposal (including how to burn dead birds)

Emphasis should be placed on the following:

- Quarantine area. On farms it must be physically separated from the main building and have a different entrance; a concrete structure is recommended but it could also be a cage situated at a great distance from other birds
- Correct use of antibiotics and withdrawal time (information on the correct quantities and frequency of antibiotic administration in order to improve the use of antibiotics and reduce residues in food)
- Encourage small-scale producers to keep records of their activities; many already do, but not all. This would help them organize their work and, in the event of an outbreak, would help the veterinary authorities in their epidemiological inquiries to find the source of infection

Here again, FAO should sustain all the costs of training, and of manual and leaflet production. The number of leaflets to produce should be estimated on the basis of the number of participating veterinarians and the number of clients (several thousand could be envisaged). The leaflets should be written in English and translated into at least the major local languages, to be chosen according to the potential clients.

Extension for traditional farmers

Most people have heard about AI and programmes on AI are occasionally broadcast on different radio stations. These programmes are usually either highly technical or too vague and sensational. As a result, very few people really know the disease. A public information campaign aimed at ensuring public knowledge about AI and the basic rules of easily affordable biosecurity would greatly help to improve simple daily practices and reduce the risk of disease. Television would be the best way to inform people but the large majority of Nigerians (particularly rural) have access only to radio.

It is therefore recommended that periodical radio programmes be broadcast on the same topics as for small-producers:

- Simple technical information
- Practical suggestions on how to improve biosecurity and breeding practices
- Examples of risky activities
- Carcass disposal

Information should be added on:

- Newcastle disease vaccination.
- The village as an epidemiological unit. Collectors (people visiting different villages to buy poultry) must find a safe place to deposit birds from previous villages before walking through a new one. Villagers have to make sure that the collectors adhere to this practice. A strong awareness campaign is necessary.
- The benefits of seeking for advice from public and private veterinarians.
- When people breeding both in a traditional way and with a backyard unit treat backyard flocks, they should do the same with scavenging birds. This should be done with an emphasis on NCD vaccination and an easy-to-understand explanation of the cost-benefit of this practice. It is clear that not everyone do so because beliefs such as "the taste of the meat changes" or "it is useless to do so because local chickens are more resistant", etc, are hard to die. Nevertheless, even if only some follow the practice, the door has been opened to further improvement and an example will have been given in the field on upgrading traditional breeding.

This work may be done by a consultant team comprising a communication expert and a veterinarian. However, it seems appropriate that the ECTAD team, in collaboration with NADIS and AICP, should prepare the text for radio broadcasting, and collaboration with local and national radio should be explored.

Food safety

This can be linked to the previous recommendation because it also calls for the organization of awareness campaigns (this time for consumers on food safety in order to create a demand for quality poultry products).

A further two aspects are more internal to the FMA&RD in association with the Ministry of Health. They should prepare a proposal for legislation on antibiotics (selling, prescription, utilization, import, etc.), to present to parliament. This is a very important issue, not only for AI, but also for the everyday life of all Nigerians. Once a legal framework has been introduced, it will be necessary to name an authority to control and certify the quality and origin of poultry products.

Need for research

This is mainly internal to FAO, or in collaboration with other international research institutes such as ILRI. The objective is to study the dynamics of the appearance and, more so, the disappearance of HPAI in the 10 sub-Saharan African countries previously infected. This should be carried out with reference to all possible parameters, including seasonality, frequency, environment and climate, presence and concentration of wild and domestic poultry, other endemic disease, etc. If FAO were to succeed in establishing which

parameters have facilitated the disruption of the disease cycle, this would represent an important lesson learned in fighting HPAI in other countries.

FAO should create a position for a researcher to carry out this investigation.

➤ Collaboration with PAN

FAO should look into the possibility of collaboration with PAN and evaluate the possibility of offering medium/long-term technical assistance designed to improve the services PAN offers to farmers.

ANNEXES

Annex 1: Terms of Reference

International Consultant (WAE)

Development of biosecurity guidelines for scavenger and small-scale commercial poultry production systems and live bird markets in selected states of Nigeria

Under the overall policy guidance and programme responsibility of the FAO Chief Veterinary Officer (CVO) and Head of the Emergency Centre for Transboundary Animal Disease (ECTAD), the operational guidance of the ECTAD Head of Operations, the immediate supervision of the Head of ECTAD Production and Biodiversity sub-unit at HQ and in close collaboration with AGA technical staff (in particular the ECTAD group), and while on mission in close liaison with ECTAD team in Nigeria and guidance of the FAO Representation in Nigeria, and in close coordination with the ECTAD country team leader, the incumbent will be responsible for the following activities:

Duties and responsibilities

- Liaise with ECTAD team in Nigeria to organize the logistics of the mission.
- In collaboration with ECTAD team in Nigeria, develop detailed work plan for the mission.
- Brief Nigerian national veterinary authorities on objectives of the mission.
- Summarize existing management practices and infrastructures in scavenger production systems, on small-scale commercial poultry farms and live bird markets.
- List biosecurity measures already in place in scavenger production systems and both on small-scale commercial poultry farms and in live bird markets.
- Identify and prioritize potential improvements in the implementation of biosecurity measures.
- Assess the costs and value the benefits of the proposed biosecurity measures.
- Assess the potential for adoption of the proposed biosecurity measures by stakeholders.
- Describe schemes and identify potential partners for the rollout and implementation of proposed biosecurity improvements.
- Collaborate with the ECTAD Communication Unit. and the ECTAD team in Nigeria for the development of a communications and training concept to disseminate the proposed biosecurity improvements.
- Debrief Nigerian national veterinary authorities on outcomes of the mission.
- Present results of the mission at FAO HQ in Rome.

Tentative work schedule

	Work	Number of days
1.	Briefing (teleconference), literature review (home)	3
2.	Travel (to Abuja)	1
3.	Liaising with ECTAD Nigeria team, veterinary authorities (Abuja)	3
4.	Field survey location 1 (tentative: Kaduna)	6
5.	Field survey location 2 (tentative: Kano)	6
6.	Field survey location 3 (tentative: Sokoto)	6
7.	Debriefing (Abuja)	2
8.	Travel (Abuja-home)	1
9.	Report writing	5
10.	Presentation of results (FAO Rome)	2
TOTAL		35

Expected outputs of the assignment

A report (length between 30 and 50 pages, font size 12) in electronic format (Word) describing the most appropriate biosecurity measures in scavenger production systems, on small-scale commercial poultry farms and in live bird markets, including costing of these measures, assessment of the potential for adoption and possible implementation strategies.

Duration

35 days (including 23 days in Nigeria), with travel starting on 5 October 2008.

Duty station

Abuja (Federal Capital Territory) with field work in Kaduna state, Kano state, Sokoto state (field work location to be reassessed at the time of the mission).

Travel

The consultant will be expected to travel extensively during this assignment. Exact travel plan will be determined by the AGAP division. All travel needs to be pre-authorized and will be covered as required either by non-staff travel or by adding a lump sum to the contract in accordance with current FAO regulations.

Security

Any travel associated with this assignment must be undertaken and approved by FAO in accordance with its rules and regulations. The Consultant must be aware of the security phase of any country s/he travels to, completes and passes the UN online security course both basic and advanced and understand the implications for her/his own security. Immediately after arrival at the duty station s/he must contact either directly or through the FAO representation the designated security officer to be briefed on all the recommended security measures. If this procedure is not properly followed, the consultant may not be covered by insurance.

Vaccinations

The consultant must ensure that s/he has received all necessary medical vaccinations/medical care before departing from home.

Annex 2: Mission timetable and persons contacted

a) Timetable

Saturday	Sunday	Monday	Tuesday	Wednesday	Thursday	Friday
	5/10 Departure	6/10 Arrival in Abuja FAO Rep. FAO staff	7/10 <i>FCT</i> ECTAD Security briefing	8/10 <i>FCT</i> Dir. FDL, AICP & NADIS	9/10 <i>Ondo</i> Travel to Akure	10/10 <i>Ondo</i> DVS Market producers
11/10 <i>Ondo</i> Market producers Private veterinarians	12/10 <i>Ondo</i> Producers Reporting	13/10 <i>Ondo</i> Producers	14/10 <i>Anambra</i> Travel to Akwa	15/10 <i>Anambra</i> DVS Market producers	16/10 <i>Anambra</i> Market producers	17/10 <i>Anambra</i> Market producers
18/10 <i>Anambra</i> Producers Reporting	19/10 <i>Anambra</i> Reporting	20/10 <i>FCT</i> Travel to Abuja	21/10 <i>Katsina</i> Travel to Katsina	22/10 <i>Katsina</i> DVS Market producers	23/10 <i>Katsina</i> Market producers	24/10 <i>Katsina</i> Market producers
25/10 <i>Katsina</i> Producers Reporting	26/10 <i>FCT</i> Travel to Abuja	27/10 <i>FCT</i> Market Reporting	28/10 <i>FCT</i> Debriefing	29/10 Departure	30/10	31/10

b) Persons contacted and places visited

In all three states visited

Sellers
 Collectors
 Traders
 Transporters
 Slaughterers
 Providers of veterinary drugs and inputs
 Consumers
 Heads of markets
 Rural producers
 Urban, peri-urban and rural backyard producers
 Urban, peri-urban and rural small-, medium- and large-scale producers

FEDERAL CAPITAL TERRITORY

Abuja

Mr MUTEIA Helder
 Mr TSEGGAI Tesfai

FAO Representative in Nigeria
 HPAI Team Leader and CTA ECTAD Team

Mr NYAGER J.	DD Animal Health, Federal Department of Livestock
Mr SAIDU M. D.	CC Avian Influenza Control Project (AH)
Mr AHMED I. G.	AD Epidemiology Unit (NADIS)
Mr MUHAMMED G.	AICP
Mr ALABI O.	NADIS
Mr KABIR Junaidu	Epidemiologist, FAO ECTAD Team
Mr MUZAMIL Zein	Operations Officer, FAO ECTAD Team
Mrs KWANGE Dooshima	National Project Coordinator, FAO ECTAD Team
Mr MAINA Ahmed Garba	Epidemiologist ,FAO ECTAD Team
Mr DELQUINY Thomas	Technical Advisor, FAO ECTAD

Markets

Nyanga daily market, Abuja

ONDO (state)

Akure town

Mr OGUNJI F.A.	DVS, Ondo State
Mr AKINBADE Felix	DDVS
Mr OMOLEYE O.S.	AICP Desk officer
Mrs OJUMU F.O.	Federal Epidemiology Officer

Ondo town

Mr OLOMIYE C.O. Solomon Private veterinary and pharmacist

Markets

Oja Oba daily market, Akure
Ogbese weekly market, Akure North LGA
Ondo daily market, Ondo

ANAMBRA (state)

Akwa

Mr OBELE D. I.	AICP Desk Officer, DDVS
Mr EMEJURU C. O.	Federal Epidemiology Officer
Mrs OBINEME Charity	Awka South Desk Officer.
Mr MOLOKWU Omeisi	MD/CEO, Aroma Hatchery

Markets

Afor-Nnobi weekly market, Idemili South LGA
Head Bridge daily market, Onitsha
Eke Awka daily market, Awka
Eke Nobi weekly market, Awka South LGA

KATSINA (state)

Katsina

Mr MAIKAITA Ango	Permanent Secretary
Mr YAHAYA Aliyu	ADVS, Katsina State
Mr LADAN Yakubu	ADVS Disease Control (Federal Epidemiology Officer)
Mr ABBA Isa	AICP Desk Officer

Basari

Mr SANI Ibrahim

Desk Officer, Batsari LGA

Markets

Kankia weekly market, Kankia LGA

Batsari weekly market, Batsari LGA

Katsina Central daily market, Katsina

Annex 3: Semi-structured interviews

- 1 **FAO Nigeria**
 - Personnel tasks
 - Activity in the field
 - Activity not carried out. Why?
 - External support (money / logistic / labour)
 - Financial and material resources
 - Politics and strategy of the ministry on avian flu - Data
 - Current responses
 - How are AI cases reported? By whom?
 - Active and passive surveillance (markets, border, wild, etc.)
 - Diagnostic capacity
 - Veterinarians in markets
 - Transport control
 - Presence of private veterinarians in the zone
 - Utilization of private veterinarians and para-veterinarians
 - Monitoring and evaluation system for diseases
 - Programmed / compulsory sanitary controls
 - Compulsory treatments / prophylaxis for poultry breeders (AI,ND)
 - For backyard / small breeders / big farmers
 - Are they carried out?
 - AI vaccination - Why? Where? By whom?
 - Principal poultry sanitary problem in the country (apart from AI and NCD)
 - Linked research and training institutes
 - Name
 - Land coverage
 - Activity in the field
- 2 **National Veterinary Services**
 - Identification of the person interviewed
 - Date - Name - In charge of ... - Contact address
 - Organization and operational system
 - Land coverage

3 Local veterinary services

- Identification of the person interviewed
 - Date - Name - In charge of ... - Place - Contact address
 - Organization and operational system
 - Land coverage.
- Number of technicians (including private veterinaries)
- Implemented tasks - Activities not carried out - Why?
 - Training received training - When? - Subjects
 - Central / external support
 - Financial and material resources
 - Possibility to enforce sanitary control
 - Availability of sampling sets
 - Availability of sprayers and disinfectant
 - Different market in the state
 - Linked research and training institutes
 - Activity in the field
 - Small-scale poultry producer and backyard chickens in the zone
 - Importance
 - Breeding techniques and planned medical actions
 - Principal problems of the service
 - Possibility to enforce legislation
 - Weak and strong points of actual legislation
 - Farmer organizations in the zone
 - Name and activities
 - Poultry sanitary problems in the zone
 - Action taken to fight avian flu - Data
 - Farmer's knowledge of composting?
 - Poultry infrastructures in the zone (marketplaces, slaughterhouse, laboratories)
 - Large-scale poultry producers

4 Heads of poultry markets

- Identification of the person interviewed person
 - Date - Name - In charge of ... - Place
 - Market associations (regulations, ownership, management, financial support)
- Records of animals
 - Typology of the market (producer→consumers / producers→collectors / ...)
 - Exposed animals
 - Zone of origin of animals - Species - Quantity - Alive or dead
 - Why people buy this kind of product?
 - Market frequency
 - Importance during the year?
 - Presence of veterinary services.
 - Presence of cleaning service
 - Presence of slaughtering points
 - Water availability
 - Scheduled disinfections of tools / cages
 - Unsold animals?
 - Restricted areas
 - Loading and unloading areas
 - Slaughterhouse or slaughtering areas in the market
 - Frequency of the market - Closing days
 - When was the last case of disease in the market? Action taken
 - Presence of wild birds / animals
 - Compartmentalization of different areas
 - Other markets nearby (Relations)
 - Markets before and after AI.
 - Typology of sellers (small / large producers, middleman ...)
 - Typology of buyers
 - Problems of the market (sanitary, logistic, ...)
 - Taxes for retailers / consumers

5 Small-scale poultry breeders

- Identification of the person interviewed
 - Date - Name - Age - Gender - Place
 - Since when has (s)he been doing this work?
 - How did (s)he learn?
 - Did (s)he follow training on poultry breeding? Which, where?
 - Source of information on breeding (neighbours, relatives, veterinarians, radio, ...)
 - Other activities
 - Animals bred animals (chickens, ducks, geese, turkeys, quails, pigeons, others)
 - Local - Improved local - Exotic? How many cycles / year? How many birds?
 - Do they live together? (pigs, quails, others)
 - Do wild birds mix with the flock?
 - Destination of old animals Age
 - Poultry rearing and zootechnical knowledge
 - Who takes care of the birds?
 - Feeding - How - When
 - Watering - How - When - Source of water
 - Mineral and vitamin complementation - How - When
 - Housing (hen-house, night shelter, enclosed, house, litter)
 - Origin of the flock and reproduction.
 - Introduction of adults / chicks / eggs to the flock.
 - Origin of other inputs (drugs, food)
 - Quarantine facilities
 - Use of footwear / footbath / shoe scrubbing before and after contact with birds
 - Hand washing before and after bird handling
 - "Wild-bird feeders" or "pond" on the property that attracts wild waterfowl
 - "All in, all out" policy
 - Custom of moving birds to locations (fairs, shows, market, etc.) where other birds are present and returning the birds to the flock
 - Custom of visiting places with live birds (poultry markets, feed stores with birds, fairs, neighbours' flocks, etc.)
 - Someone in the household has worked for a commercial poultry production, processing facility, poultry market, etc.
- Number of birds that have died in the last 12 months and carcass disposal (incineration, burial on premises, compost, taken to a rubbish tip or trash, fed to other animals, fed to humans, other)
- Poultry litter / manure disposal
 - Use of shared farm equipment and vehicles
 - Type of crates used (sharing, disposal)
 - Do other people have contact with the flock?
- Ethno-veterinary knowledge.
 - Known diseases - How to recognize - Danger for humans - Annual frequency - Origin - Prevention - Therapies (modern / traditional)
 - Planned medical action (vaccination, external/internal de-worming, antibiotics)
 - Hen-house and yard cleaning / disinfection
 - Availability of veterinarians and drugs
 - Isolation period for all new stock
 - Knowledge of avian flu - Response to the outbreak
 - How birds are obtained (purchase, self breeding, entrusted ...)
 - Animal ownership
- Utilization of poultry and poultry products
 - Eggs, meat, manure, feathers ...
 - Selling - Which - Who sells - When - Where - How
 - If previously infected with AI
 - Describe the process from detection of the disease, culling method, cleaning and disinfection to compensation
 - Do you receive credit for your breeding
 - Bank or similar - Dealer of inputs / birds - State - Friends - Other
 - Principal concern (feeding, water, theft, loss, sale, health, predators, inputs, knowledge, place ...)
 - Member of producers' organizations?
 - Relations with veterinary and training services
- To indicate the reliability of the answers given by the person interviewed

6 Scavenging traditional breeders

- 1 Identification of the person interviewed
 - Date - Name - Age - Gender - Place
- 2 Principal activities
 - Agriculture - Breeding - Fishing - Hunting - Apiculture - Crafts -
 - Employment - Commerce - Other
- 3 Since when has (s)he been doing this work?
- 4 Where did (s)he learn to breed poultry?
- 5 Did (s)he follow training on poultry breeding? - Which? - Where?
- 6 Source of information on breeding (neighbours, relatives, veterinarians, radio ...)
- 7 Animals bred.
 - Chickens, ducks, geese, quails, pigeons, guineafowl, turkeys, pet birds, other birds - How many? Local? - Improved local? - Exotic?
 - Bovines, small ruminants, pigs, asses, horses, camels, rabbits, guinea-pigs, bees, dogs, cats, others
 - Do they live together? (pigs, quails). Is it a problem to divide different species?
- 8 Ownership of animals
 - How did (s)he obtain the birds?
 - Entrusted animals - From/to - Why - When
- 9 Use of shared farm equipment and vehicles.
- 10 Do wild birds come into contact with the flock?
- 11 Do you exchange cocks for reproduction?
- 12 Do you buy birds in the market for your consumption?
- 13 Poultry rearing and zootechnical knowledge
 - Who takes care of the birds? - What does (s)he do?
 - Feeding - How - When
 - Watering - How - When - Source of water
 - Mineral and vitamin complementation - How - When
 - Housing (hen-house, night shelter, enclosure, house, litter)
 - Would it be a problem to fence poultry in?
 - Origin of the flock (adults / chicks / eggs - male / female ratio)
 - Isolation period for all new stock.
 - Origin of other inputs (drugs, food)
 - Destination of old animals - Age
 - Have other people come into contact with the flock?

- Use of footbath / shoe scrubbing before and after contact with birds -
- Hand washing before and after bird handling
- "Wild-bird feeders" or "pond" on the property that attract wild waterfowl
- Custom of moving birds to locations (fairs, shows, markets, etc.)
- where other birds are present and returning the birds to the flock
- Custom of visiting places with live birds (poultry markets, feed stores with birds, fairs, neighbours' flocks, etc.)
- Has someone in the household worked in commercial poultry production, processing facility, poultry market, etc.
- Number of birds that have died since the last Ramadan / Christmas -
- Carcass disposal (incineration, burial on premises, compost, taken to a rubbish tip or trash, fed to other animals, fed to humans, other)
- Poultry litter / manure disposal (placed in manure shed / composted, left in an outdoor pile, spread on garden at premises location, taken to a rubbish tip or trash, sold or given away, not enough litter to deal with, food for fish, other)
- Use of shared farm equipment and vehicles
- 15 Ethno-veterinary knowledge.
 - Known diseases.
 - Planned medical action (vaccination, external/internal de-worming, antibiotics)
 - Availability of veterinarians and drugs.
 - Knowledge of avian flu - Response to the outbreak.
- 16 Composting knowledge
- 17 Presence of collectors of birds
- 18 Utilization of poultry and poultry products
 - Eggs, meat, manure, feathers ...
 - Function (saving, self-consumption, religious, social relations, manure, prestige, hobby)
 - Sale (which, reason, who sells, when, where, to whom?)
- 19 Do you receive credit for your breeding
 - Bank or similar - Dealer of inputs / birds - State - Friends - Other inputs, knowledge, space)
 - Principal concern (feeding, water, theft, loss, sale, health, predators, Member of producers' organizations?)
 - Relations with veterinary and training services
- To indicate the reliability of the answers given by the person interviewed

7 Retailers, middlemen and collectors of poultry

- Identification of the person interviewed
 - Date - Name - In charge of ... - Place
 - Origin of birds / species
 - Means of transport (problems, laws, certificates, blockages...)
 - Places for selling.
 - How long do you keep birds?
 - What you do with unsold birds?
 - Procedures to protect the health of the birds
 - Garbage disposal services
 - Slaughtering facilities
 - Other facilities (water, shelter)
 - Wild bird / animals in the market
 - Buying and selling (credit or cash?)
 - Markets before and after AI - Other sanitary problems
 - Products that consumers prefer - Prices for different products
 - Principal problems in work
- Market association - Rules
- Prices of buying different products (if possible)
- Relations with veterinary services

8 Training and extension services

- Identification of the person interviewed
 - Date - Name - In charge of ... - Contact address
 - Place
- Organization and operational system
- Land coverage
- Tasks implemented - Activities not carried out - Why?
- Financial and material resources
- Principal problems of the services
- Action implemented action in response to avian flu - Data
- Relations with small-scale and backyard chicken producers in the zone

9 Traditional village authority

- Identification of the person interviewed
 - Date - Name - In charge of ... - Place - Village
 - Since when has he had this role?
 - Traditional laws that regulate traditional chiefs?
 - Description of activities / duties (in the agricultural / animal / poultry sector)
- Describe the duties of the community he supervises
 - Importance of poultry for farmers
 - Problems of farmers.
- Local poultry markets - How are they regulated
 - Problems linked with AI
 - Relations with official authorities
 - Possibility of intervention in the family poultry sector

10 Official village authority

- Identification of the person interviewed
 - Date - Name - In charge of ... - Place - Village
 - Importance of poultry for farmers
 - Problems of farmers
 - Local poultry markets - How are they regulated
 - Problems linked with AI
 - Relations with the traditional authorities.

11 Consumers

- Identification of the person interviewed
 - Date - Where encountered (market, road ...) - Place
 - Where do you buy your chicken (meat)?
 - Which meat do you prefer (birds, other)? – Do you prefer to buy alive or dead? - Why?
 - Price differences
 - Where birds are eviscerated?
 - Do you have poultry breeding at home?
 - If yes, why do you also buy?
 - Have you heard about AI?
 - If yes, what have you done?

12 Resource persons for legislation, tax and trade control	<ul style="list-style-type: none"> - Identification of the person interviewed - Date - Name - Place - In charge of ... - Contact address - Bird-rearing legislation (primarily concerning AI) - Strong and weak points of actual legislation - Need for change - Possibility of enforcement - Public support for poultry breeders (little) - Import / export data - Meat, eggs, live animals, DOCs, food, integrators, vaccine, antibiotics - Data on inner production - Meat, eggs, live animals, food, integrators, vaccine, antibiotics - Duty level - Meat, eggs, live animals, food, integrators, vaccine, antibiotics. - Reliability data 	14 Heads of industrial poultry production <ul style="list-style-type: none"> - Identification of the person interviewed - Date - Name - In charge of ... - Place - Origin of animals, feed, drugs - Possibility to check safety of input - Sanitary rules in farming - "All-in, all-out" - Persons allowed access to birds - Compartmentalization. - Places where (s)he sells - Buyers - What - Price - Why - Veterinary services. - Knowledge of AI - Response - Do small producers have any impact on your market?
13 Slaughtering points	<ul style="list-style-type: none"> - Identification of the person interviewed - Date - Name - In charge of ... - Place - Slaughtering organization (ownership, management, sponsor) - Slaughtered animals - Zone of origin of animals - Species - Quantity - Destination - Presence of veterinary services - Presence of cleaning service - Disposal of residual - Cleaning and disinfection of places and tools - Compartmentalization of different areas - Typology of users (small / big producers, middleman ...) - Problem of the slaughterhouse - Taxes for slaughtering - Interview with owners of animals, buyers, users ... (if possible) 	15 Producers of poultry zootechnical and veterinary inputs <ul style="list-style-type: none"> - Identification of the person interviewed - Date - Name - In charge of ... - Place - List of material - Purchase price and origin of input - Production capacity - Places of sale - Problems of provisioning / importing commodities 16 Suppliers and distributors of poultry zootechnical and veterinary inputs. Veterinary pharmacies <ul style="list-style-type: none"> - Identification of the person interviewed - Date - Name - In charge of ... - Place - List of material - Purchase price - Origin of products - Places of sale - Problems of provisioning / importing - Possibility of ordering products - Time of deliveries - Minimal quantities - Black market - Medical prescription to sell - Ease of finding products - Legal aspects (tax and authorization) - Visit store and check storage and out-of-date material (if possible)

17 Private veterinarians

- Identification of the person interviewed
 - Date - Name - In charge of ... - Place
 - Zone of work
 - Since when has (s)he been practising?
 - Principal interventions requested by poultry breeders of Sectors 1, 2, 3 and 4.
 - Importance of poultry for small breeders
 - Sanitary problems in the region
 - Availability of sampling sets
 - Zootechnical knowledge of breeders.
 - Other activities related to the private practice (trade inputs, vaccination campaign ...)
 - Presence of false drugs
 - Principal problems encountered - Impact of AI
 - Popular beliefs with regard to AI

18 (Micro)-finance institutions

- Identification of the person interviewed
 - Date - Name - In charge of ... - Place
 - Do they provide credits to farmers? - Which activity?
 - Credit protocols
 - Who can be accepted? - Duration - Warranty - Minimum / maximum
 - Interest
 - Zones of intervention

19 (Small) farmers' organizations

- Identification of the person interviewed
 - Date - Name - In charge of ... - Contact address
 - Place
 - History
 - Operation
 - Land presence
 - Services and activity
 - Conditions of support
 - Benefit for members
 - Financial and material resources
 - Priority needs for the recipient
 - Principal problems
 - Future plans
 - Relations with others state and private structures working in the poultry sector

Annex 4: Selected bibliography

To receive a copy of one or more of these documents, please send a request to paolo.pagani@virgilio.it

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Annex 5: Statistical data on daily live bird markets

Source: Oscar Agricultural Consultants Limited (2008). Consultancy on the development of live bird markets in Nigeria. For the National Avian Influenza Control Project.

- 79% of the LBMs surveyed are situated inside the general market and the remaining 21% are separated.
- 56% of the LBMs are located either within a residential area (27%) or close to one (29%).
- About 60% of LBMs have sheds, 28% operate in open spaces and 12% have a built-up accommodation.
- 78% of the respondents operate as individuals in the markets, while 21% belong to some level of cooperative.
- 41% of the operators keep their flock in wooden cages (mainly in northern Nigeria). 29% use metal cages (mainly in southern Nigeria). Another 26% use all manners of local materials such as straw, bamboo and sticks.
- 77% of the sellers obtain the birds from outside their LGA.
- Transport of birds to markets - 43% in closed vehicles, 38% in open vehicles, 12% conveyed by humans in baskets.
- 48% of respondents convey birds only, 47% transport birds with humans in the same vehicle.
- 66% of respondents separate new arrivals from old stock in the market, 34% mix new stock with the old.
- When birds get sick, 41% of respondents organize salvage slaughter, 31% isolate the sick bird for treatment and 27% sell the sick birds at low prices.
- 61% of respondents have some facility for slaughtering / processing birds but 77% are inadequate.
- 71% of respondents' processors have the capacity to slaughter more than 100 birds per day, 15% range from 50 to 100 birds per day and 14% rank below 50 birds per day.
- 10% of respondents use some form of protective clothing in handling birds during slaughter, 90% do not.
- 24% of respondents disinfect their slaughter tools after use, 76% do not.
- 23% of respondents sanitize their hands with disinfectant after slaughter, 77% do not.
- 29% of respondents use proper disinfectant, 71% other unspecified disinfectants, apparently a mix of water and detergent.
- 100% of slaughter/dressing of birds in the market is manual. 95.5% of respondents neither wear gloves nor masks in their operations.
- Disposal of waste and dead birds - 55% throw waste into refuse dumps, 12% burn, 9% bury, 9% dig a pit, 15% use other means (human consumption?) [NoA]. Waste is also sold to catfish producers.
- 50% of respondents disinfect their cages and 50% do not.
- Of those that disinfect their cages, 62% do so weekly, 33% do so monthly; 33% use a proper disinfectant and 67% employ some other unspecified disinfectant.

- At one time or another, 40% of respondents have borrowed or lent cages and other equipment, 59% have not.
- 57% of respondents confirm that veterinary services are available, 43% deny receiving such services.
- Of the veterinarians available to live bird operators, 90% are government veterinarians and 9% are private.
- 34% of respondents receive visits and services on a weekly basis, 15% on monthly call, and 6% have access on a daily basis.
- 14% of respondents confirm seeing wild migratory birds in the vicinity of the market especially the cattle egret (49%).

Annex 6: Census (2006) by States of the Federal Republic of Nigeria

State	Capital *	Area km ² *	Males **	Females **	Population **
Abia	Umuahia	4 857	1 434 193	1 399 806	2 833 999
Abuja FCT	Abuja	7 569	740 489	664 712	1 405 201
Adamawa	Yola	37 957	1 606 123	1 561 978	3 168 101
Akwa Ibom	Uyo	6 788	2 044 510	1 875 698	3 920 208
Anambra	Awka	4 761	2 174 641	2 007 391	4 182 032
Bauchi	Bauchi	48 197	2 426 215	2 250 250	4 676 465
Bayelsa	Yenagoa	9 363	902 648	800 710	1 703 358
Benue	Makurdi	30 755	2 164 058	2 055 186	4 219 244
Borno	Maiduguri	72 767	2 161 157	1 990 036	4 151 193
Cross River	Calabar	22 112	1 492 465	1 396 501	2 888 966
Delta	Asaba	17 095	2 074 306	2 024 085	4 098 391
Ebonyi	Abakaliki	6 342	1 040 984	1 132 517	2 173 501
Edo	Benin City	19 584	1 640 461	1 577 871	3 218 332
Ekiti	Ado-Ekiti	5 797	1 212 609	1 171 603	2 384 212
Enugu	Enugu	7 560	1 624 202	1 633 096	3 257 298
Gombe	Gombe	17 428	1 230 722	1 123 157	2 353 879
Imo	Owerri	5 135	2 032 286	1 902 613	3 934 899
Jigawa	Dutse	23 415	2 215 907	2 132 742	4 348 649
Kaduna	Kaduna	44 217	3 112 028	2 954 534	6 066 562
Kano	Kano	20 389	4 844 128	4 539 554	9 383 682
Katsina	Katsina	23 822	2 978 682	2 813 896	5 792 578
Kebbi	Birnin Kebbi	36 320	1 617 498	1 621 130	3 238 628
Kogi	Lokoja	29 063	1 691 737	1 586 750	3 278 487
Kwara	Ilorin	33 792	1 220 581	1 150 508	2 371 089
Lagos	Ikeja	3 475	4 678 020	4 335 514	9 013 534
Nassarawa	Lafia	26 633	945 556	917 719	1 863 275
Niger	Minna	72 065	2 032 725	1 917 524	3 950 249
Ogun	Abeokuta	16 850	1 847 243	1 880 855	3 728 098
Ondo	Akure	15 019	1 761 263	1 679 761	3 441 024
Osun	Oshogbo	8 585	1 740 619	1 682 916	3 423 535
Oyo	Ibadan	27 036	2 809 840	2 781 749	5 591 589
Plateau	Jos	26 539	1 593 033	1 585 679	3 178 712
Rivers	Port Harcourt	10 361	2 710 665	2 474 735	5 185 400
Sokoto	Sokoto	32 146	1 872 069	1 824 930	3 696 999
Taraba	Jalingo	59 180	1 199 849	1 100 887	2 300 736
Yobe	Damaturu	44 880	1 206 003	1 115 588	2 321 591
Zamfara	Gusau	33 667	1 630 344	1 629 502	3 259 846
4.3.1.1.1 Total		911 521	71 709 859	68 293 683	140 003 542

* Source: <http://www.statoids.com>

** Source: Official Gazette (FGP 71/52007/2500(OL24)

Annex 7: Geographical distribution of poultry in Nigeria

This distribution does not take into account the fact that there are commercial poultry farms based on exotic birds operated on a backyard poultry basis and that subsistence household poultry rearing can be based on exotic birds.

State	Poultry *			Percentage of households rearing subsistence poultry **				
	Traditional	Exotic	Total	Chicken	Guineafowl	Duck	Turkey	Other Birds
Abia	1 282 050	127 339	1 409 389	58,5	0	1,1	0,6	1,2
Abuja FCT	3 465 000	347 288	3 812 288	41,7	0	7,1	0	0
Adamawa	3 780 000	347 288	4 127 288	26,5	2,9	5	0,1	0
Akwa Ibom	2 772 000	277 830	3 049 830	48,1	0	0	0	0
Anambra	2 483 250	248 889	2 732 139	44,6	0,4	0	0,7	6,7
Bauchi	5 832 750	5 846 006	11 678 756	22,3	11,4	5,2	0,2	0,4
Bayelsa	900 900	90 295	991 195					
Benue	6 121 500	613 541	6 735 041	51,2	0	3,5	0,4	0
Borno	5 313 000	532 508	5 845 508	17,3	1	1,5	0,1	0,1
Cross	1 155 000	115 763	1 270 763	59,6	1,7	0,6	0	0
Delta	2 356 200	236 156	2 592 356	100	0	0	0	0
Ebonyi	2 347 514	3 542 333	5 889 847	49,1	0,3	0,5	0,3	0
Edo	1 120 350	112 290	1 232 640	53,6	0	1,7	0	0
Ekiti	2 656 500	266 254	2 922 754	47,7	2,4	2,2	0,4	0
Enugu	1 859 550	1 863 776	3 723 326	58,9	0,1	0	1	0
Gombe	462 000	46 305	508 305	27,3	4,7	4,6	0	0,5
Imo	5 832 750	584 601	6 417 351	48,8	0	0	0,9	0
Jigawa	4 389 000	439 898	4 828 898	16,4	4,3	2,2	0,1	0,4
Kaduna	2 564 100	256 993	2 821 093	34	2,8	5,1	1,1	0,4
Kano	3 528 000	324 135	3 852 135	17,3	7,1	3,7	0,4	0
Katsina	4 735 500	474 626	5 210 126	19,8	8,4	7,1	1,2	1
Kebbi	6 930 000	694 575	7 624 575	26,5	1,8	0,3	0	0
Kogi	3 349 500	335 711	3 685 211	42,1	0,3	8,4	0	0
Kwara	3 037 650	304 455	3 342 105	43,6	0,3	3,6	0,7	0
Lagos	2 852 850	285 933	3 138 783					
Nassarawa	531 300	53 251	584 551	40,1	2,6	4,9	0,1	0
Niger	2 772 000	277 830	3 049 830	43,4	3,1	6,1	0	2,1
Ogun	3 234 000	324 135	3 558 135	71,2	2,8	0	0	0
Ondo	3 003 000	300 983	3 303 983	54,7	1,1	0	0	0
Osun	3 234 000	324 135	3 558 135	56,6	0	0,3	0,1	0,3
Oyo	2 829 750	283 618	3 113 368	41,5	0	0,9	0	0
Plateau	3 453 450	346 130	3 799 580	41,7	2,4	4,9	0	0
Rivers	3 465 000	347 288	3 812 288	56,4	0,4	0	0	0
Sokoto	1 339 800	134 285	1 474 085	21,1	2	0,5	0,2	0
Taraba	2 460 150	246 574	2 706 724	43,7	0	2,4	0	0
Yobe	3 118 500	312 559	3 431 059	18,2	2,2	1	0,4	0
Zamfara	5 313 000	532 508	5 845 508	14,7	8,3	0,8	0,7	0
Nigeria	115 880 864	21 798 084	137 678 948	27,2	4,6	3,3	0,4	0,4

* Source: Federal FDL&PCS. February 2006 (data from 2003)

** Source: Estimates based on raw data, National Bureau of Statistics, 2006

Annex 8: Status of HPAI in Nigeria (2006-2007)

Between February 2006, when the first outbreak was confirmed, and December 2007, a total of 1,126 suspicions were recorded and investigated. Of these, 298 cases were positive for HPAI and spread across 99 out of 774 local government areas in 25 states and the Federal Capital Territory. In 2008, there were only a few cases.

Summary of affected States and LGAs (January 2006 – 31 December 2007)

States	Local Government Areas
Adamawa	Girei, Metropolis, Jimeta, Lamorde, Numan
Anambra	Idemili, Awka South, Aguata, Aniocha, Onitsha south, Anambra east
Bauchi	Toro, Katagun, Tafawa Balewa, Bauchi metropolis, Missau
Benue	Oturkpo
Borno	Metropolis, Jere
Delta	Ughelli North, Oleh Isoko south
Edo	Benin, Oredo, Ikpoba-okita, Etsako west, Egor
Ekiti	Ado-Ekiti
Enugu	Nsukka, Igbo Eze
FCT	Bwari, Kuje, Municipal
Jigawa	Hadeija, Auyo, Jahun, Dutse
Kaduna	Igabi, Kaduna north, Kaduna south, Chikun, Sabon Gari, Giwa
Kano	Kumbotso, Tofa, Gezawa, Municipal, Ungogo, Dala, Dawakin kudu, Dawakin Tofa, Gwale, Nasarawa
Katsina	M/fashi, Kankara, Daura, Municipal, Maiadua, Batagarawa, Dutsinma, Kaita, Bakori, Kadarko Quarters
Kwara	Ilorin west
Lagos	Ojo, Agege, Ikorodu, Alimosho, Badagry, Eti-osa, Amowo-odofin, Ifako-Ijaiye, Shomolu
Nasarawa	Akwanga, Kokona, Lafia, Karu
Niger	Minna
Ogun	Ifo, Ijebu-ode, Remo, Ado-Odo/Ota, Obafemi-Owode, Ewekoro
Oyo	Afijio, Ido
Plateau	Jos north, Jos south
Sokoto	Kebbe, Bodinga, Wamako, Metropolis
Rivers	Municipal
Taraba	Ibi, Wukari
Yobe	Nangere, Jakusko, Potiskum
Zamfara	Bungudu, Gusau
26	99

Source: NADIS