A manual for practitioners in community - based animal health outreach (CAHO) for highly pathogenic avian influenza

International Livestock Research Institute (ILRI)

Food and Agriculture Organization for the United Nations (FAO)

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Acronyms and Abbreviations

CAHO	Community-based Animal Health Outreach
CBPP	Contagious bovine pleuropneumonia
ECF	East Coast fever
ECTAD	Emergency Centre for Transboundary Animal Disease Operations
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot-and-mouth disease
GOVS	General Organization for Veterinary Services
GPS	Global Positioning System
HPAI	Highly pathogenic avian influenza
ILRI	International Livestock Research Institute
LPAI	Low pathogenic avian influenza
MALR	Ministry of Agriculture and Land Reclamation
ND	Newcastle disease
OIE	World Organization for Animal Health
PA	Participatory appraisal
PDS	Participatory disease surveillance
PE	Participatory epidemiology
PPE	Personal protective equipment
PPR	Peste des petits ruminants
PRA	Participatory rural appraisal
RVF	Rift Valley fever
SAIDR	Strengthening Avian Influenza Detection and Response
SOP	Standard operating procedure
USAID	United States Agency for International Development
WHO	World Health Organization

Preface

As part of the Strengthening Avian Influenza Detection and Response (SAIDR) project in Egypt which was funded by the United States Agency for International Development (USAID), a number of training courses in highly pathogenic avian influenza (HPAI) participatory disease surveillance (PDS) later elaborated to be Community based Animal Health Outreach (CAHO) have been conducted for 108 veterinarians (making 54 teams) in 15 governorates. The purpose of this manual is to provide a reference for veterinarians during and after CAHO training. The main focus of the manual is on HPAI but the methods can be easily adapted and applied to address other livestock diseases.

From PDS to CAHO

Outbreaks of Highly Pathogenic Avian Influenza (HPAI) had spread in 21 governorates in Egypt within less than three months after the disease was originally diagnosed in three Governorates on 17 February 2006. The Government attempted to control the outbreak through a stamping out procedure, which included culling of all poultry within a 1km radius of the confirmed outbreak. By the end of 2006, nearly 30 million birds had been culled. Outbreaks continue to be reported from 23 out of 29 governorates in the country and the disease has become endemic in 2007.

In response to the continued threat of HPAI to Egypt, the Food and Agriculture Organization of the United Nations (FAO) has been providing technical assistance through its Emergency Centre for Transboundary Animal Disease Operations (ECTAD) to the Ministry of Agriculture and Land Reclamation (MoALR). FAO assistance has been supporting MoALR with all aspects of HPAI control through the implementation of the SAIDR project funded by the United States Agency for International Development (USAID). The animal health component of this project has the potential to address several critical issues related to rectifying deficiencies in the prevention and control of HPAI in Egypt.

Within the framework of the SAIDR project, a pilot participatory disease surveillance (PDS) program was started in 10 selected high-risk governorates with a view to enhance HPAI disease surveillance and thereby to support HPAI control program. From January to September 2009, the PDS teams detected 42 confirmed HPAI outbreaks, indicating that the investment made in PDS started to show tangible results in improving HPAI detection under the complex Egyptian reality. In addition, the very presence of PDS teams at grassroots level could be considered as an opportunity for value adding and improving in other core areas where critical gaps are identified in such domains as animal health communication and outbreak investigation. This new approach entails a certain level of modification (addition) to the content of the training on top of the traditional PDS modules, hence referred to as 'community-based animal health and outreach (CAHO). The teams trained under the CAHO will therefore be involved in traditional PDS activities as well as in conveying tailored messages and involved in outbreak investigation efforts. In addition to enhancing the contribution of PDS to the overall HPAI prevention and control efforts, the CAHO approach will ensure the longer term sustainability of the program.

1

Introduction to Participatory Epidemiology

1. Introduction to Participatory Epidemiology

1.1. Participatory epidemiology

Epidemiology is the study of the patterns of diseases in populations.

Participatory epidemiology (PE) is the use of participatory approaches and methods to improve our understanding of the patterns of diseases in populations. These approaches and methods are derived from participatory appraisal.

Participation is the empowerment of people to find solutions to their own development challenges. It is both an attitude and a philosophy that encourages learning, discovery and flexibility.

Participatory appraisal (PA) is a family of approaches and methods that enable people to present, share and analyze their knowledge of life and conditions, to plan and to act. It is participatory, flexible, lightly structured, adaptable, exploratory, empowering and inventive. Types of participatory appraisal include rapid rural appraisal, participatory rural appraisal (PRA), farming systems research and participatory impact assessment.

A group of PE practitioners and trainers developed the following statements to describe PE:

- PE is an approach to epidemiology, including active surveillance, which is conducted by professionals and is sensitive and beneficial to the community.
- It is an interactive dialogue conducted within the community, combining scientific and traditional information with the aid of PRA tools to allow for discovery by the interviewer and the community.
- It is flexible, semi-structured and adaptable to changing situations. Data from multiple sources are rapidly analyzed for quick feedback and response.
- It is founded on equal partnership with mutual respect and trust, encouraging positive attitude to enable community empowerment.

Key principles of participatory appraisal

- **Behaviour and attitude**: Listen, learn and respect. Be open-minded. Be a facilitator, not an expert.
- **Co-learning**: Share knowledge, experience and analysis. Combine local and professional knowledge for effective, acceptable action. Be prepared to unlearn.
- **Understanding**: People make rational decisions based on the information available to them. If it appears that people are not behaving rationally, it is probably because we have failed to understand some key factors in the situation.
- **Existing knowledge**: People accumulate a body of knowledge on subjects that are important to their livelihoods. Certain individuals have unique and very valuable perspectives on situations.

- **Optimal ignorance**: We do not need to know every possible detail of a problem in order to solve it.
- **Action-oriented** rather than data-driven.

In epidemiology, disease occurs due to the interactions among the host (animal), the agent (e.g. viruses or bacteria) and the environment in which the host and the agent are present (Figure 1). The factors influencing the occurrence of disease are called determinants (see Table 1). Part of the environment in which disease occurs is the social context, which is determined by the behaviour of people. PE is a useful approach for exploring the social context in which a disease occurs as well as other aspects of host-agent-environment interaction.

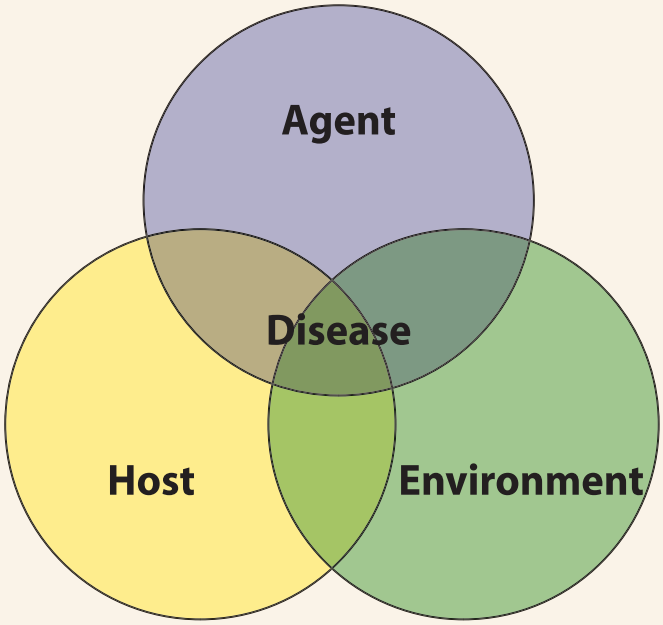

Figure 1: Interaction of host, agent and environment in the occurrence of disease.

Table 1: Disease determinants related to agent, host and environment

Determinants associated with the agent	Determinants associated with the host	Determinants associated with the environment
Virulence Pathogenicity	Genotype Age Sex Species and breed Immune status Stress	Location Climate Husbandry

Example: East Coast fever

For clinical cases of East Coast fever (ECF) to occur in a cattle population, there need to be susceptible cattle (the host) that become infected with *Theileria parva* (the agent) via the tick vector (*Rhipicephalus appendiculatus*). The susceptibility of the cattle is determined by their age, breed, previous exposure to T. parva, vaccination status, etc. For *T. parva* to be present in the area, the environment must be suitable for the maintenance of *R. appendiculatus*, for instance, suitable temperature and humidity which may be determined by vegetation, altitude and availability of suitable hosts. The exposure of cattle to ticks is determined by management practices such as grazing methods and tick control.

Participatory epidemiology methods

PE is based on communication and transfer of knowledge, using a variety of methods. There are three main groups of methods:

- **Informal interviewing**: Semi-structured interviews with key informants, focus-group discussions or individual livestock keepers.
- **Ranking and scoring**: Simple ranking, pair-wise ranking, proportional piling, matrix scoring.
- **Visualization**: Mapping, timelines, seasonal calendars, transect walks.

These are complemented by:

- **Secondary information sources:** Obtained before going to the study area and as the study is conducted.
- **Direct observation** of animals, farms, villages, etc. while in the study area.
- **Laboratory diagnostics:** If available, field diagnostic tests are used, complemented by sample collection and testing by a regional or national laboratory for confirmation.

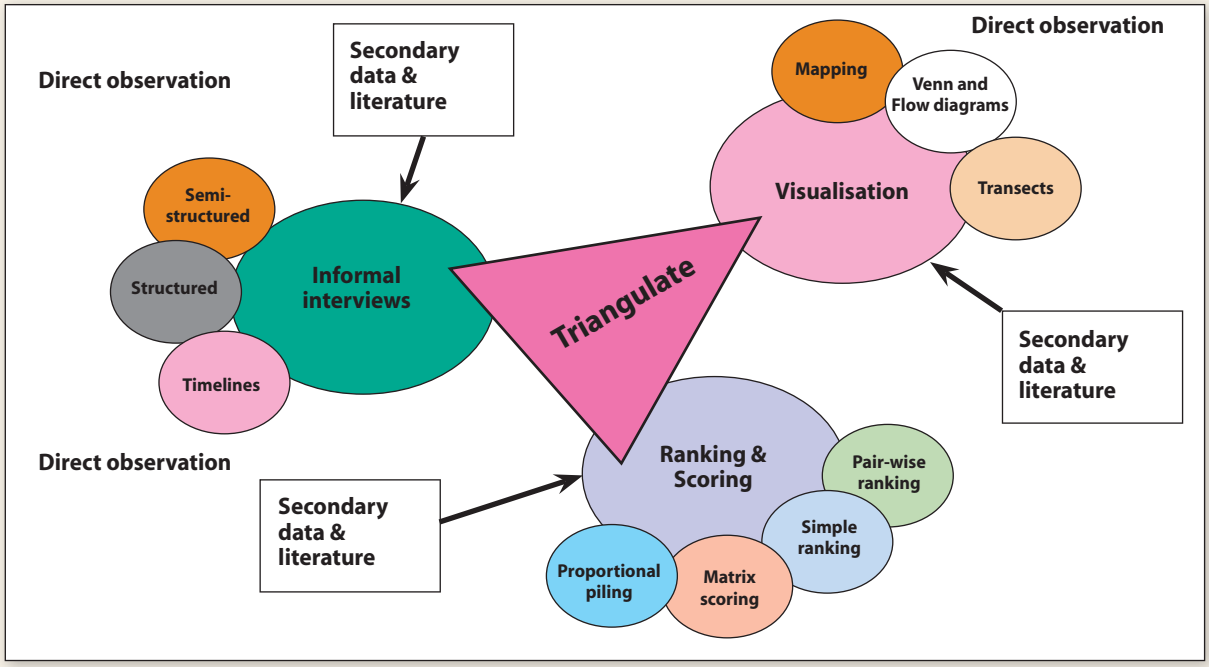

Fig 2 : Data is cross checked by probing, triangulation and laboratory diagnostics.

Participatory epidemiology is based on two important principles which are designed to improve the quality and reliability of the information gained. These include:

- ***Triangulation*: -** Information is gained from several different perspectives. Various levels and sources of information are tapped with the aim that they should be used to cross-check and verify each other. (Iterative analysis of results).
- ***Flexibility*: -** the techniques used and questions asked can be changed at any point during the investigation.

Data Sources in Rapid Appraisals:

In applying the principles of flexibility and triangulation, a number of data sources must be tapped. These may be classified either as primary or secondary, depending on their closeness to the actual subjects of study. Sources within the communities studied would be seen as primary; all other sources would be secondary.

1. ***Primary sources***: - These include direct observation, group and individual interviews of farmers, interviews with key informants such as village elders, local religious leaders and government officials familiar with the area.
2. ***Secondary sources***: - There are a number of possible secondary data sources - previous studies and reports, government statistics and records, maps of the area in question, research papers and even historical texts. It is usual to consult as many secondary data sources as possible before undertaking field work; the results of this study may highlight issues to be given priority attention in the field study.

Advantages of Participatory Methods in Epidemiological Studies:

1. Often the only way of gathering data from certain areas or conditions.
2. Usually cheaper and more feasible than full-scale randomized surveys (cost effective).
3. Results are usually available very rapidly.
4. More flexible and able adapt to new issues uncovered during the appraisal.

Participatory methods build on what local people already know; enables them to use their own knowledge and skills in disease surveillance and control.

Potential Sources of bias in Participatory Appraisals:

All epidemiological studies, even those that are randomized, need to be designed so as to minimize bias. Bias is subjective reasoning, preconceived idea or opinion. Classically, there are six sources of bias which may affect rapid appraisals, and these sources are:

Spatial bias: - Investigators often travel on better roads and the farmers they are able to reach are determined by proximity of roads and villages.

Project bias: - Visitors and researchers are often directed to areas where projects have been active and most of the work will then concentrate on these places.

Person bias: - Influential persons interviewed (particularly as key informants) are often either biased against poor people or ignorant of their needs and can give the wrong impression.

Season bias: - Some diseases tends to be common in summer and others tends to be more in winter, so if you only work in one season your results will be biased.

Diplomatic bias: - For many communities, poverty is the subject of shame, and the needs of the poorest are sometimes glossed over or even concealed, either by the poor themselves or by officials working with them. "Politeness" and "diplomacy" will try to hide the problem.

Professional bias: - Professional training may in itself be an obstacle, because it can prevent the researcher from being able to recognize variation in disease presentation in different environment.

References:

Jeffrey C. Mariner and Roger Paskin (2000): MANUAL ON PARTICIPATORY EPIDEMIOLOGY, FAO, pages 1-10

Catley, A. (2005). Participatory Epidemiology: A Guide for Trainers. African Union/Interafrican Bureau for Animal Resources, Nairobi, pages 1-5

1.2. Epidemiology and surveillance systems

Epidemiology: The study of the patterns of diseases in populations.

Surveillance: The collection of action-oriented information and intelligence within a realistic timeframe (information for action).

A **surveillance system** is a collection of activities that complement each other, e.g. case finding, disease reporting and laboratory confirmation.

According to a modified definition of Thacker et al. (1988), the seven characteristics of an effective surveillance system are:

- *High detection rate:* The system should be able to detect as many disease events as possible.
- *Sensitive and specific:*
    - **Sensitivity** is the number of true cases a system correctly identifies out of the total number of truly diseased subjects studied. The higher the sensitivity of the system, the more truly diseased cases are identified (hence a lower number of false negative cases).
    - **Specificity** is the number of non-diseased animals a system correctly identifies out of the total number of truly non-diseased subjects examined. The higher the specificity of a system, the more truly non-diseased animals identified (hence a lower number of false positive cases).
- *Timely:* The system should be able to detect, investigate, provide feedback and allow for action on a suspect disease event within a timeframe relative to the infectious cycle of the disease.
- *Representative:* The system should reflect the true occurrence and distribution of the event in all communities, production systems and social strata.
- *Flexible*: The system should be able to detect and accommodate emerging diseases.
- *Simple*: If the procedures are too difficult farmers and surveillance staff will probably not be motivated to report, act and control suspect disease events.
- *Ownership*: Stakeholders should feel a sense of ownership based on their participation in the design of the system and the relevance of the output to their needs.

In practice, no single surveillance system will have all these seven characteristics, so a surveillance system must integrate different activities to meet stakeholders' needs and achieve its goals and technical objectives.

Livestock disease surveillance systems may include the following elements:

- **Passive surveillance**, which captures information from existing data sources such as disease reports from livestock keepers, community-based animal health workers, and public and private veterinarians; diagnostic laboratory submissions and abattoir reports. It is a continuous process that involves routine collection of information on a wide range of diseases, e.g. in form of monthly reports from veterinary officers to the national disease information system.
- **Active surveillance**, which is a specific exercise or set of exercises to search for a specific disease or infection in a population or provide evidence of absence of a disease or infection. Methods of active surveillance include the search for clinical disease and/or collection of samples for laboratory analysis. Surveillance may be randomized (e.g. serological surveys) or purposive, depending on its objective.
- **Epidemiological studies** to develop a deeper understanding of the manifestation of a disease in a population.

Community based Animal Health Outreach (CAHO) uses Participatory Disease Surveillance (PDS) tools which are the application of PE to disease surveillance. PDS is a method of disease surveillance where PA approaches and methods are used to combine local veterinary knowledge with conventional methods to establish the presence or absence of a specific disease in a particular area.

In CAHO/PDS, the method of sampling is usually purposive rather than random. The investigator uses outbreak reports and risk factors to determine the target areas for PDS; areas most likely to harbour the disease are chosen. As the PDS is carried out and information is gathered, the investigator will follow the information to places that are likely to have the disease of interest. The investigator makes contact with livestock keepers, farmers and key informants who are likely to know about the local disease situation. Livestock keepers and the investigator discuss together about animal health issues. Livestock keepers' knowledge and experience (existing veterinary knowledge) is listened to and respected. A range of tools and methods are used that are open-ended and flexible, and can be used to crosscheck information gathered.

1.3. Existing veterinary knowledge

Most livestock keepers know a lot about the animal diseases and their different clinical presentations as they occur in the local area. They have local names for the different disease syndromes that commonly occur, especially if the disease has been present in the area for a time. They often understand the pathology, vectors and reservoirs linked to the occurrence of disease. PE aims to explore this existing knowledge with communities and key informants to better understand the local disease situation.

Existing veterinary knowledge encompasses indigenous knowledge, livestock keepers' experience and information that livestock keepers have obtained from extension workers, other livestock keepers, the media etc.

The existing traditional knowledge of farmers is based on experience and observation and many of the traditional practices reflect a good understanding of the disease. Familiarity with the traditional practices will help to improve the ability to communicate with livestock keepers.

Some practices can be effective and can work for sound scientific reasons, some are ineffective and some may cause harm. In Egypt, different local terms are used in different localities both for poultry species or diseases (Table 2, 3); and it should be considered during interviews.

Table 2: Examples for the local names of poultry diseases used by Egyptian poultry keepers:

Disease	Local name
Newcastle disease HPAI or any disease cause sudden death or high mortality	Shotta – Ferra – El hia – El haffa – El wahla – El hool – El seem
CRD	Tashma – Kakha
Pox	Megadara
Coccidiosis	Kasha – mekanfesha
Cannibalism	El nahsh
Ectoparasites	Fash – Zoreik
Recumbence in duck	Merakez – barakan – mrokab

Table 3: Examples of local names for different poultry species as used by poultry keepers in Upper and Lower Egypt:

Poultry species	Local name in lower Egypt	Local name in upper Egypt
Chickens	Frakh	Faroog
Ducks	Batt	Beh
Turkey	Roomy	Dendi
Egg	Beyd	Dahrog
Pigeon	Hamam	Frakh

1.4. Clinical case definition

A clinical case definition lists the key clinical signs of the disease of interest, based on what the farmer or poultry keeper is likely to know and see and can tell you or show you. The clinical case definition should be designed so that it picks up most of the truly diseased animals (high sensitivity). If cases meet the case definition, further action should then be taken, such as a field diagnostic test to confirm or refute the clinical diagnosis.

Example: Sudden death outbreak in poultry case definition (Indonesia, HPAI)

Sudden death (less than 4 hours)

With or without

Petechiae and swelling of feet, cyanotic comb, swollen head, petechiae over chest and legs, nasal discharge, salivation, head drop, drop in egg production, decreased food intake.

N.B. Applies to outbreak not to an individual bird.

Example: Stomatitis-enteritis clinical outbreak definition (Rinderpest)

Ocular discharge

Nasal discharge

Plus two or more of the following

Fever, oral erosions/lesions, salivation, corneal opacity, diarrhoea, death.

N.B. Applies to an outbreak not to an individual animal.

Table 4a: Clinical Case Definition (Egypt, suspected HPAI outbreak)

Sudden death and or high mortality with or without …	
Distinctive signs	**General signs**
• Cyanosis, swelling of combs, wattles and legs • Respiratory signs • Nervous signs (blindness in ducklings, torticollis and beak on ground in duck layers)	• Diarrhoea (greenish, haemorrhagic), • Drop in egg production, • Drop in food intake, • Haemorrhages, • Ruffled feathers

The definitions apply to a flock of birds not an individual bird. In all species of domestic poultry HPAI causes sudden death and/or high mortality with or without distinctive or general signs.

In some instances, sudden death or high mortality may not be observed:

Table 4b: Cases where HPAI may not result in sudden or high mortalities

Cases	**Common clinical presentations**
Ducks and geese (both vaccinated or unvaccinated flocks)	• Increased mortality and/or nervous signs • Drop in egg production and shell-less eggs • Ducklings – staggering gait and walks using wings to balance, recover after a few days
Vaccinated chickens and turkeys	• Increased mortality
Vaccinated commercial layer chickens	• Decreased egg production, deformed eggs and/or above normal mortality
Pigeons	• Nervous manifestations and greenish diarrhoea in the presence of other poultry species fitting the above case definitions. (NB: in addition to tracheal and cloacal swabs, it's necessary to send the heads of pigeons for confirmatory laboratory diagnosis of HPAI

N.B: When the above 'distinctive' signs are shown at the early stage of infection (before death), HPAI must be considered in the differential diagnosis.

2 Participatory Epidemiology Tools

2. Participatory Epidemiology Tools

Below we give an overview of the different tools based on several key reference publications (Pretty *et al.,* 1995; Mariner and Paskin, 2000; Catley, 2005).

2.1. Semi-structured interview

Interviewing is a specialized skill that improves with practice. Although just about anyone can collect useful information through an interview, the amount and reliability of information obtained can be greatly improved with experience.

"At the heart of all good participatory research and development lies sensitive interviewing. Without it, no matter what other methods you use, the discussion will yield poor information and limited understanding. It may create feelings of suspicion, fear or even hostility in the local people.

Semi-structured interviewing can be defined as: guided conversation in which only the topics are predetermined and new questions or insights arise as a result of the discussion and visualized analyses." (Thacker *et al.,* 1988)

The interview method is informal but has a defined objective.

2.1.1. Checklist

In PA, an interview questionnaire is not used. Instead, the study team prepares a checklist of important points and exercises to be covered. This allows the interview to be flexible and permits the respondents to express their thoughts in their own words within their own conceptual frameworks.

An example of a checklist for a participatory study meant to identify and prioritize animal health problems in a community is presented in Box 1. The checklist provides overall direction and ensures that no major points are missed in the interview. The checklist is flexible, allowing the respondents to discuss issues of special interest to them, and the appraisal team to investigate specific themes raised by the respondents. Not all items on a checklist need to be covered with every group of participants; this is a matter of judgement.

Box 1: Sample checklist for identifying and prioritizing animal health issues

1. Introduce the appraisal team
2. Identify the respondents
3. Livestock species kept
4. Husbandry systems
5. Grazing locations (mapping exercise)
6. Identify and describe three diseases for each major species
7. Proportional piling exercises on disease importance
8. Direct observations (transects and clinical examinations)

2.1.2. Place and time

The place and time when the interviews are conducted influence their success. Unfortunately, the study team does not always have control over these aspects, but every effort should be made to arrange a quiet and comfortable location. Ideally, the interview team and respondents should feel relaxed and on an equal footing with each other. Traditional community meeting sites make good group interview sites. Although community and training centres may make acceptable interview sites, official offices or the appearance of an official enquiry should be avoided.

With rural societies, 9 am – 2 pm are often the best times to find key informants and poultry owners, but may not be the best times to interview them. Always ask if it is a convenient time and if not, when you could meet. The interview should be planned to last about 30 minutes to an hour; if it lasts longer than this, participants will begin to lose interest and the quality of information provided will decline. Learn to watch for signs of fatigue and boredom. Fidgeting and side conversations are a sign that either the interview needs to be enlivened by a shift to topics of greater interest to the respondents or that it is time to wrap up and ask any key questions that may remain.

2.1.3. Introduction

The first step in any interview is introduction of oneself. Members of the study team should introduce themselves and ask the participants to introduce themselves if this is culturally correct. Your introduction should be accurate, but should not bias the response of the participants. For instance, if you place emphasis on a particular subject such as cattle or highly pathogenic avian influenza (HPAI) in your introduction, the respondents will frequently put undue emphasis on these topics in their replies. Normally, the study teams should record the names and community memberships of the respondents but in some communities it may be difficult to ask names of respondents. At this point, the interviewers should also try to identify if the respondents are suitable participants for the appraisal at hand.

The appraisal team must be careful not to raise community expectations concerning future projects or services. The introduction is a good opportunity to diffuse some of these

Figure 3: Semi-structured interview, Al Menia governorate, Egypt

expectations by stating that the appraisal is only a study and the members of the appraisal team are not the decision-makers regarding future programs.

2.1.4. Questions

It is essential to the reliability of the information collected that questions are open-ended rather than leading questions that restrict or direct the respondent to a particular response or type of response. In an animal health appraisal, it is often best to begin with a question such as ***'What animal health problems are you experiencing?'***

A good question does not make assumptions. For example, if the respondents have described a current disease problem that is consistent with HPAI and you wish to know when previous outbreaks occurred, you might wish to ask: ***'When was the last time this disease occurred?'*** However, it would be better to ask: ***'Have you seen this disease before?'***

The first question assumes that the disease has occurred before and communicates the assumption to the respondents, who may state a year for the sake of being polite or out of fear of appearing uninformed. The second question allows the respondents greater freedom to state what they confidently know.

For CAHO data collection, the practitioners are collecting data about the village, so it is important to ask the questions about the village as a whole and avoid asking questions to person by person during the group interviews. you might wish to ask: ***'What are the sources of your birds?'*** However, it would be better to ask: ***'What are the common sources of birds in this village?'***

Questions should be ordered so that the interview progresses from general themes to specific ones. As much as possible, the respondents should determine the direction of the interview. As a result, most questions cannot be pre-planned. They must be designed on the spot in light of the information already presented and investigators must be able to think on their feet. The fact that most questions cannot be pre-planned does not mean that a limited number of ***key questions*** cannot be worked into the interview. For example, the CAHO team may have a special interest in unravelling the local epidemiology of HPAI and wish to ask in every interview about the last occurrence of HPAI. This can be done, but very careful attention must be paid to when the question is asked in the flow of the interview to avoid leading the discussion. If the disease is endemic, the participants will probably raise the subject of HPAI and the CAHO team can safely ask their standard question. If the participants do not introduce the subject of HPAI, the HPAI question can be asked at the end of the interview. However, the appraisal team should note that the community did not introduce the subject and that this probably reflects that HPAI is not a local priority or they are worry from speaking about the disease due to previous aggressive response measures.

Quantitative questions on subjects such as mortality rates and herd size do not receive very accurate responses. It is usually best to avoid such types of questions. In the authors' experience, herders do know exactly how many animals they own; it is their main form of wealth. However, as in most societies, it is impolite or brings bad luck to directly enquire about wealth in quantitative terms. If people do respond, poor farmers may exaggerate and rich ones may depreciate their holdings. McCauley and others (1983) apparently collected accurate data on herd sizes to calculate mortality rates by triangulating three pieces of information:

- owner information
- direct observation of the herd
- information from neighbours about the subject's livestock holdings

Quantitative data like:

- species and breeds kept, flock size of each species
- mortality rate

- number of eggs laid, hatchability rate
- number of birds consumed/week
- for how long can a bird live and lay eggs

The above information is often not volunteered directly by the respondents because a variety of reasons.

It is important to use open, general and indirect questions. In some areas, persons believe that if they mention the number of birds they have the birds will die or something wrong will happen. Therefore in some occasions there is a need to give overestimated or underestimated information in the form of a leading question to get the right result from the respondent for example:

"For how long a layer duck could be kept in the household?" the answer will be nobody knows, until it dies but if the question was asked like **"A layer duck can be kept for 10 years, right?"** so the answer could be no, not more than 5 years.

2.1.5. Probing

The term probing means to ask detailed questions on a specific subject raised by the respondents. Probing is both a data gathering and data quality control technique. Probing can be used to verify the internal consistency of information or simply to gather more detailed information on a particular subject. In the case of PE, probing is often used to obtain a more detailed description of a particular disease entity volunteered by a respondent. For example respondents might mention a disease causing sudden death of birds, the appraisal team could enquire which species affected and what ages and what were the signs and when the disease started and for how long and what might caused the disease to occur, do other households have the same problems ,where and when? Detailed information might lead to suspect about a specific disease problem as HPAI. Quality of the information gathered could help for rapid response and rationale decisions and help in further investigation.

Verifying internal consistency of information is an important means of data quality control in CAHO. Probing helps to establish the plausibility of statements made by the participants through gathering more detailed information and background of the issue. This does not mean that 'trick questions' or attempts to lead the participants into self-contradiction should be made. The process of CAHO is founded on enlightened respect for individual opinions and observations. One respectfully evaluates the quality and merit of all statements from all individuals.

2.1.6. Observation

During interviews, it is very important to observe as well as listen. Are the respondents relaxed and confident? Is there eye contact? What types of body language are being expressed? Are some topics sensitive? Is everyone participating? Who is not participating? Are some people comfortable and others not? What are the differences in appearance between those participating and those who are not? Is gender, wealth or age the issue (don't ask, observe)? Follow-up interviews can be arranged with 'non-participating' participants in groupings where they may feel more comfortable.

In general, livestock owners enjoy talking about their livestock. PE is about letting people share their knowledge and learning from them. Listen. Be patient and open-minded.

2.2. Ranking and scoring

2.2.1. Simple ranking

Simple ranking is arranging items in order based on defined criteria. For example:

Common poultry species by population in the village

1. chickens
2. duck
3. turkey
4. pigeon
5. geese

Common poultry diseases/syndromes by frequency of occurrence

1. bloody diarrhoea
2. recumbancy
3. ectoparasites
4. cyanosis

Common poultry diseases/syndromes by mortality

1. cyanosis
2. recumbancy
3. bloody diarrhoea
4. ectoparasites

Simple ranking as part of CAHO for HPAI is used for ranking of:

- common poultry species in a village
- diseases based on mortality or frequency of occurrence
- seasons/months of buying new poultry stocks
- types of husbandry systems
- density of different poultry species
- sources of poultry

Method for simple ranking

It is often best to think of PE tools in terms of steps the first few times you use them.

1. Have your simple ranking question clear in your own mind and write it down in your notebook. For example: *'Rank poultry disease problems in order of impact on household livelihood'.*
2. To develop the list of items for ranking, begin with an open-ended question: For example: 'What are some common disease problems that affect the poultry in this village?'
3. Probe the responses. Ask for descriptions of the diseases and clarify details.
4. Explain that you want to carry out an exercise to better understand what you are learning about their poultry disease problems. Have pictures, symbols or objects to represent each disease or write the name of each disease on a card. Place the pictures, symbols, objects or cards on a flat surface or on the ground where everyone can see them and remind the participants what each represents.

5. Ask the group to rank the diseases based on your defined criteria. For example, ask them to rank the diseases in order of the level of impact they have on household livelihood.
6. Give them time to discuss and rank the cards by consensus. Encourage them to make adjustments if they want to. When they appear to have finished, ask them if they all agree on the result.
7. Leave the cards in place. Summarize and crosscheck their ranking. For example: *'You have put cyanosis first, followed by torticollis, and then bloody diarrhoea Is this correct?'*
8. Probe the results. For example: Why did they put this disease first (or last), what are the species affected by this disease, are there any other signs accompany this disease? When did these diseases occur? etc.
9. Record the ranking question, the results and notes of any discussion during the ranking or during probing.

Once the informants have ranked the cards, the interviewer asks if they all agree and then asks probing questions to find out why they have put a certain diseases first, why another one last etc.

Simple ranking is a quick way of gathering data to help the researcher to understand issues from the respondents' point of view. It is usually best to conduct this exercise with small groups, although it can be done with individuals or quite large groups. They should discuss the ranking and arrive at their decision by consensus. Listening to the discussion and probing the results of the ranking provides as much or more information than the final ranking.

Figure 4: Simple ranking exercise in Al Menia Governorate, Egypt

2.2.2. Pairwise ranking

Pairwise ranking or comparison is a slightly more complex method of ranking where each item is compared individually with all the other items one-by-one. Pairwise ranking can be used to understand the relative importance of different species or diseases and through probing, to understand the benefits of different species or the impact of different diseases.

Method for pair wise ranking

1. Have your pairwise ranking question clear in your own mind and write it down in your notebook. For example: *'Compare the importance of different poultry disease problems'*.
2. To develop the list of items for ranking, begin with an open-ended question: For example: *'What are some common disease problems that affect your poultry?'*
3. Probe the responses. Ask for descriptions of the diseases and clarify details.
4. Explain that you want to carry out an exercise to better understand what you are learning about their poultry disease problems. Have pictures, symbols or objects to represent each disease or write the name of each disease on a card. Place the pictures, symbols, objects or cards on a flat surface or on the ground where everyone can see them and remind the participants what each represents.
5. Select one disease card and a second one. Ask: *'Which disease is more important? This one or this one?'* Once they have chosen, crosscheck the answer and then probe: *'Do you all agree? Why is this disease more important than this one?'*

6. Repeat the question comparing the same disease with each of the other diseases one-by-one, crosscheck and probe. Then select the second disease and compare it with all the remaining diseases one-by-one, and so on until all the diseases have been compared with all the other diseases.
7. The result of each comparison is recorded (see example in Table 5) as well as the details of any discussions generated by crosschecking and probing.
8. Count the number of times each disease was selected. The disease that was selected the most times is ranked highest.

Table 5: Example of pairwise ranking on importance of common poultry diseases

	Fowl typhoid	**Coccidiosis**	**Fowl cholera**	**Newcastle disease**	**Fowl pox**	**Gumboro**
Fowl typhoid		Fowl typhoid	Fowl typhoid	Newcastle disease	Fowl typhoid	Fowl typhoid
Coccidiosis			Coccidiosis	Newcastle disease	Coccidiosis	Coccidiosis
Fowl cholera				Newcastle disease	Fowl Cholera	Gumboro
Newcastle disease					Newcastle disease	Newcastle Disease
Fowl pox						Gumboro
Gumboro						
Number of times selected	**4**	**3**	**1**	**5**	**0**	**2**

Result

In this example, ND ranks first with a score of 5, fowl typhoid second with 4, coccidiosis third with 3, Gumboro fourth with 2, fowl cholera fifth with 1 and fowl pox last with 0.

Probing questions during the exercise help to understand the ranking:

- why ND is most important
- why fowl pox is least important
- what aspects of diseases and poultry are more important to the community

2.2.3. Proportional piling

Proportional piling is a technique that allows farmers to give relative scores to a number of different items or categories according to one criterion. The scoring is done by asking the farmers to divide 100 counters (beans, buttons or similar items that are familiar to the community and locally available) into different piles that represent the categories. For example, the farmers could give scores to a set of disease problems (the categories) according to how important the diseases were to their livelihood (the parameter). Alternately, the farmers could be asked to score the disease according to how commonly they occur.

Method of proportional piling

1. Have your proportional piling question clear in your own mind and write it down in your notebook.
2. To develop the list of items or categories for scoring, begin with an open-ended question. For example: *'What are the most common sources of poultry reared in the village?'*
3. Probe the responses; ask for reasons and clarifications.
4. Explain that you want to carry out an exercise to better understand what are the most popular sources and the reasons of its preference on other sources. Draw circles on flip chart paper or the ground, one circle for each species mentioned, and place a drawing or card next to each circle that illustrates the sources of poultry.
5. Place one hundred counters in a pile and tell the respondents what this pile represents. For example, the piles represent the new poultry stocks per year in the village, and then ask the respondents to divide them according to a particular characteristic or parameter. Record the question now if you haven't already. For example: Ask them to divide the counters to represent the proportions of poultry bought from each sources in the village.
6. Make sure that they recognize each category by its drawing or card.
7. Give them time to discuss and divide the piles by consensus. When they appear to be finished, summarize and crosscheck the result. For example: *'You have scored this source highest, followed by this one, then this one and this one is scored lowest. Do you all agree with these results?'*
8. Count the counters, but leave them in place so that the result can be discussed.
9. Probe the results. Why did they make the choices they did?

Fig 5a: Proportional pilling in Al Menia governorate, Egypt

Example of proportional piling

1. The objective of using this activity is to find out what are the common sources of poultry reared in the study area, and the relative proportions of each type that are provided.
2. What are the common sources of poultry in this village? Peddlers, live bird markets, hatcheries, farms and home brooding.
3. Provide the farmers with 100 counters and clarify that these counters represent the new poultry stock bought per year in the village, ask them to distribute them relatively to their sources. The farmers agree on the following proportions:

Possible additional questions: Why do people in this village prefer peddlers and markets more than other sources of poultry?

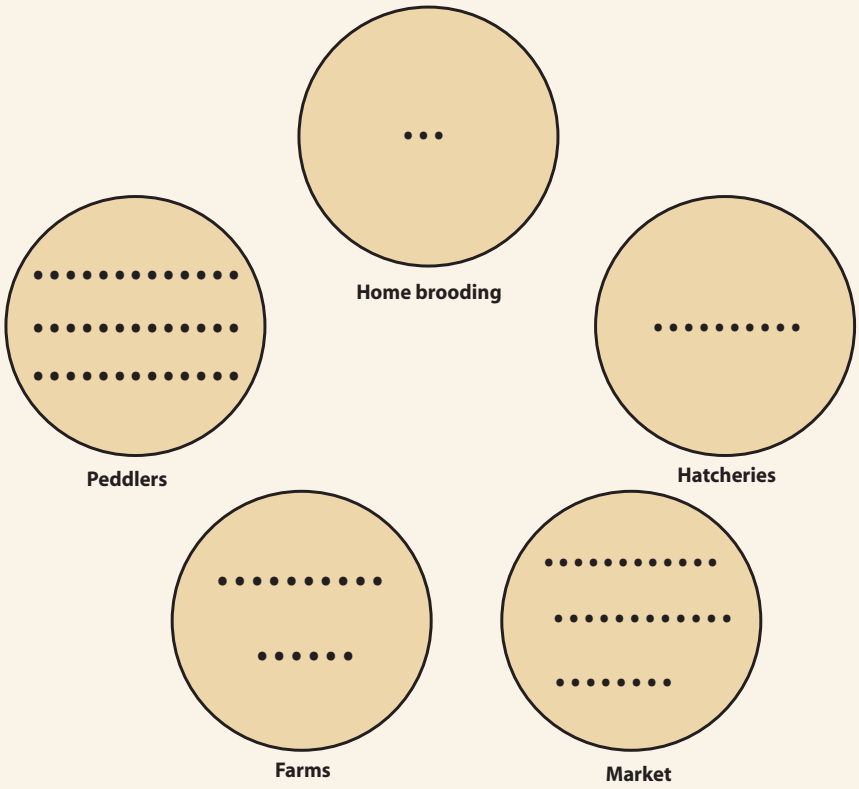

Figure 5b: Example of proportional piling

The results of proportional piling exercises from several groups can be averaged to derive an **aggregate** score for the community. You should pay close attention to the types of stakeholders or informants who participate in the interviews. Often, different stakeholders or informant groups will provide very different scores, and probing differences provides a lot of insight into the different perceptions and priorities of the groups.

Probing differences and calculating average scores for different segments of the community is known as analyzing the **disaggregated** results. For example, women often score diseases very differently from men because their needs and concerns differ from men.

It is usually better to conduct this exercise with small groups, although it can be used with larger groups or with individuals. They should discuss the division of the counters and arrive at their decision by consensus. Listening to the discussion and probing the results of the piling provides as much or more information than the final score. This information tells you why the respondents gave the scores that they did and tells a lot about how they view the problems.

2.2.4. Proportional piling to show relative morbidity and mortality

Proportional piling can be used to demonstrate the impact of diseases on the herd or flock, by demonstrating the relative morbidity, herd or flock mortality and case fatality of different diseases. The advantages of this method are (1) it does not require the actual number of animals in the herd to be known and (2) It compares the morbidity and mortality of different diseases; this can reduce bias towards an individual disease problem.

Method of proportional piling for morbidity and mortality

1. Use a pile of 100 counters to represent the flock of birds or herd of animals belonging to an individual farmer.
2. Ask the farmer to show what proportion of the flock or herd was healthy and what proportion became sick in the last one year (no need to count the beans at this point).
3. Using the list of common diseases already given during the interview, write the names of the diseases on cards or use pictures or objects to represent the diseases. Use no more than four or five diseases, grouping all other mentioned diseases under a category called 'other diseases'.
4. Using the counters allocated to sick birds or animals, ask the farmer to divide the counters to show the proportion that suffered from each of the common diseases in the last one year.
5. Taking one disease at a time, ask the farmer to use the counters allocated to each disease to show what proportion of birds/animals died out of the birds or animals that suffered from the disease and what proportion recovered.
6. Count the counters at the end, when the farmer has finished scoring each disease.
7. Summarize and crosscheck the results with the farmer.

Example of proportional piling for morbidity and mortality

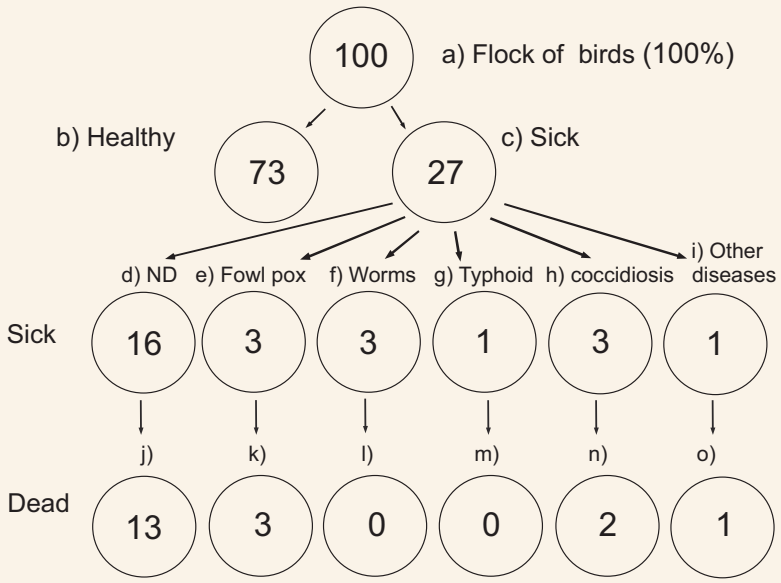

Figure 6: Example of proportional piling for morbidity and mortality for a poultry flock.

Overall flock morbidity is c = 27%
Overall flock mortality is j + k + l + m + n + o = 19%
Overall case fatality is (j + k + l + m +n + o)/c = 19/27 = 70%

Morbidity due to individual diseases = d, e, f, g, h, i

Disease specific flock mortality is j/a, k/a, l/a, m/a, n/a, o/a
E.g. flock mortality due to ND is j/a = 13%

Disease specific case fatality is the number died over the number sick from each disease: *j/d, k/e, l/f, m/g, n/h, o/i*
E.g. case fatality due to ND is j/d = 13/16 = 81%

2.2.5. Matrix scoring

This method can be used to better understand the local characterization of livestock diseases and the meanings of local names for diseases. It is essentially a series of proportional piling exercises where a list of items, such as diseases, is scored against a number of indicators, such as clinical signs, sources of infection, etc. to create a matrix. Catley et al. (2001) describe some examples of this tool.

Method for matrix scoring of disease syndromes and clinical signs

1. Have a list of five to six common diseases or disease syndromes that the participants have mentioned. Use the same disease names as used by the participants.
2. For each disease, obtain the main clinical signs (indicators) that characterize it.
3. Use pictures, objects or cards to represent the diseases and place these across the top of the matrix.
4. Write the first clinical sign (indicator) on a card or use a picture/object to represent it. Place this to one side of the first row of the matrix.
5. Place a pile of 30 counters next to the indicator and ask the participants to use the 30 counters to show how commonly the clinical sign occurs with each disease. Summarize and crosscheck for agreement on how they have scored.
6. Repeat for each clinical sign one by one, gradually building up the matrix. Leave the matrix in place so that everyone can view the results and discuss as a group.
7. During the exercise and after the matrix is complete, it is essential that the investigator carefully probe the informants as to why they are scoring the way they are. After the matrix is complete, summarize the results and give the informants the opportunity to make changes if they wish.
8. Record the results in a matrix in your notebook.

If possible, leave the counters in the different rows until the end of the exercise so that you create a real matrix that shows the patterns of scoring and the participants can get an idea of the different signs related to which disease.

Table 6: Example of matrix scoring of clinical signs and diseases causing sudden death and /or high mortality of chickens, Dakahlia governorate, Egypt

Clinical signs	Fowl cholera	AI	ND	IBD (Gumboro)	Caecal coccidiosis
Mass mortality	6	7	6	3	3
Partial mortality	2	2	2	7	12
Cyanotic comb	8	17	0	0	0
Dyspnea	0	0	25	0	0
Greenish diarrheal	6	7	12	0	0
Deformed Egg	4	12	9	0	0
Yellowish diarrheal	7	5	0	13	0
Bloody diarrheal	0	4	0	0	21
Haemorrhagic shank	0	25	0	0	0

This tool can take some time, so it is usually carried out with particularly knowledgeable farmers who are willing to spend a bit longer talking about diseases in detail.

Approximately five counters are used per item across the top of the matrix. In the example above, there are five diseases so 25 beans were used. If there were only four diseases, then 20 counters could be used. It is best not to have more than six items across the top and up to 10-12 indicators. If more are used, the exercise becomes more complex and lengthy and respondents will lose interest.

Figure 7: Matrix scoring exercise in Sharkia governorate, Egypt

Uses of Matrix scoring:

- General disease survey for example: To identify the impact of common diseases of a specified species on animals and livelihood of the owners.
- To collect detailed information about the clinical differentiation between the disease of interest and other similar diseases running among the animals in the same village (eg. HPAI, ND, FC).
- Study criteria affecting community behavior towards certain practices like keeping specific species or breeds as well as tendency towards specific husbandry systems.

2.3. Visualization tools

2.3.1. Seasonal calendar

Many animal health problems and issues show seasonal variation. A seasonal calendar can be used to visualize and analyze local perceptions of the seasonality of key farming practices, diseases, risk factors etc. The seasonal occurrence of diseases is interesting to understand in relation to the seasonality of factors that affect the occurrence of different diseases such as climate, management practices, vectors etc. New or unusual factors may emerge that are important in the particular area. The information can be useful for improving disease mitigation strategies such as timing of prophylactic vaccination or treatment.

In order to be able to construct a seasonal calendar, it is first necessary to be familiar with local terminology and descriptions of seasons and how these relate to the months of the year. This information can be gathered from key informants. The seasonality of different events or activities of interest is then demonstrated by indicating the timing of occurrence or scoring occurrence in relation to the seasons.

In many countries it is interesting to first obtain the seasonality of rainfall, whilst in other countries it may be relevant to obtain the seasonality of temperature or humidity. Other seasonal factors such as availability of

grazing pasture, access to water, presence of wild animals or birds, or presence of vectors may be of interest depending on the farming system, species and diseases of interest. Livestock management and marketing practices may be seasonal such as movement of livestock, calving seasons, housing, buying in stock or off-take. In Egypt, farmer's occasions or activities such as festivals, holidays, harvest seasons for particular crop (e.g wheat) or times when cash is needed can affect numbers of livestock, marketing and slaughter. The seasonal occurrence of the main diseases of interest and their vectors (if any) are shown.

Having developed the seasonal calendar, the results are then discussed and probed with the participants to find out why things happen at certain times and how they may or may not be related to other factors.

Scoring method

Based on information already gathered earlier in the interview, you should already be familiar with local farming practices, common disease problems and have some idea of the factors that may affect disease occurrence. From this information you can develop a list of items for which you want to explore seasonality, both individually and in relation to each other.

1. Draw a line on the ground or at the top of a piece of flip chart paper and indicate that this represents one year.
2. Write the seasons of the year along the line in the order in which they occur, crosschecking with the participants that these are the local seasons. Either write the names on cards or on the paper, or use local objects or pictures to represent the seasons.
3. If the months of the year are commonly used, then write these along the line next to the relevant seasons.
4. Ask the participants to think about sudden death and high mortality events among poultry and how it varies with the seasons. Give them a pile of 30 counters and ask them to divide the counters between the seasons to show the seasonal pattern of such outbreaks. The higher the outbreaks in a season, the more counters should be allocated to that season. If there is no outbreaks in a season, no counters should be allocated. All the counters should be used. Draw a line to create the first row of the calendar.
5. Repeat this with each indicator (activity, event, disease) on a new line, using 30 counters each time, so that gradually a matrix is built up (see example in Table 6). The name of the indicator may be written on the flip chart or on a card and placed at the side of the matrix. For illiterate participants, a picture or object may represent the indicator. The indicators used will be linked to the species or disease(s) of interest. They may be determined before the PE interview but are likely to be added to or modified as a result of discussions during the interview.
6. Once the calendar has been completed, the results should be discussed with the participants using open and probing questions, for example: *Why is this disease more common in this season? Do you know what causes this disease? So this disease seems to occur when there is a lot of rain, is that correct?*

Fig 8: Seasonal calendar exercise in Dakahlya governorate, Egypt

Table 7: Example of a seasonal calendar for events compatible with the HPAI clinical case definition linked to some seasonal practices of the community

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
	Winter		Spring		Summer				Autumn		Winter	
Availability of green food (barseem)	■■■■ ■■■■■■		■■ ■■						■■■ ■■■		■■■■ ■■ ■■■	
Purchase of new ducks	■■■■■ ■■■■■				■■■■■				■■ ■■■		■■■■■■ ■■■■	
Purchase of new chickens			■■■■■■■ ■■■■■■■■						■■■■■■■ ■■■■■■■■			
Sudden death & high mortality with or without distinctive signs	■■■ ■■■■		■■■ ■■■■ ■■■		■■				■■■ ■■		■■■ ■■■	

Alternative method: Timing of occurrence

This method simply indicates the presence or absence of an indicator by season rather than scoring, and therefore gives useful but less detailed information.

1. Draw a line on the ground or at the top of a piece of flip chart paper and indicate that this represents one year.
2. Write the seasons of the year along the line in the order in which they occur, crosschecking with the participants that these are the local seasons. Either write the names on cards or on the paper, or for illiterate groups use local objects to represent the seasons.
3. If the months of the year are commonly used, then write these along the line next to the relevant seasons.
4. Ask the participants to think about rainfall and how it varies with the seasons. Ask them to mark on the matrix when rainfall occurs; draw on ground with a stick or on flip chart paper with a marker pen.
5. Repeat this with each indicator (activity, event, disease). The name of the indicator may be written on a card or on the flip chart and placed at the side of the matrix. For illiterate participants, a picture or object may represent the indicator. The indicators used will be linked to the species or disease(s) of interest. They may be determined before the PE interview but are likely to be added to or modified as a result of discussions during the interview.
6. Once the calendar has been completed, the results should be discussed with the participants using open and probing questions, for example: Why is this disease more common in this season? *Do you know what causes this disease? So this disease seems to occur when there is a lot of rain, is that correct?*

Table 8 : Example of a seasonal calendar for timing of occurrence of diseases (Tororo/Butaleja HPAI PDS, Uganda)

	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Dry season												
Wet season												
Kawoya (ND)												
Amabwa (Fowl pox)												
Ehidukhano sio musayi (Coccidiosis)												
Ekusa/nafuya (Fleas/mites)												
Senyiga (Respiratory signs)												

During calendar construction, participants will often mention key risk factors such as humidity, vector populations, grazing conditions, water scarcity etc. Thus, not only do calendars provide information on seasonality, they are also useful tools for identifying predisposing factors.

2.3.2. Participatory mapping

Mapping is one of the most useful tools of participatory epidemiology.

- It provides spatial information on livestock distribution, movement, interactions, diseases and disease vectors which is extremely useful in epidemiology.
- Some information is easier to describe and analyze visually than in written form. It is easier to draw a map than to describe a map in words.
- Mapping is useful at the beginning of an enquiry to define the spatial boundary of the system under investigation. It also acts as a good ice-breaker because many people can be involved.
- Maps produced on the ground using locally-available materials are easy to adjust until informants are happy that the map is correct.
- Maps do not need written words or labels, and therefore non-literate people can participate.
- Mapping can be useful in planning for the field work in the village as the number of days of village visits and number of interviews to be conducted can be determined according to the size of the village, maps also

illustrate the distribution of risk factors, key informants & farms, livestock population distribution, maps also illustrate the at risk villages or areas.

- In outbreak investigation, mapping illustrates how the disease spread over time and place among the households in the village.

As with other activities, it is useful to prepare a mental or written checklist of items to be probed during the mapping exercise. Respondents should not only be asked to illustrate locations on the map, but to provide underlying reasons for movements and resource use.

Method for participatory mapping

1. Request the group to draw key features of their village or area on a map, e.g. the place of the meeting, main roads, rivers, lakes, important public places etc. Depending on the location of the meeting and the type of participants, the map may be drawn on the ground and features represented by objects, or it can be drawn on flip chart paper with coloured marker pens. It is important that the map is large so that everyone can see it and contribute to its development.
2. Request the group to draw key livestock features, e.g. grazing areas, watering points, markets where animals are sold, slaughtering points, veterinary services, locations of farms, disposal sites, seasonal movements, trade routes , resting points of migratory birds , hatcheries , feed shops etc.
3. Once the map is completed, ask probing questions, e.g. How are animals marketed? *Where do new animals come from? Where did a disease outbreak occur?*
4. To finalize the map, find out the direction of North and mark it on the map. Also try to obtain an idea of scale by asking the distance between two key points and then add an approximate scale. If symbols are used to represent features, add a key to the map.

Maps can be drawn on different scales depending on the objective of the study being carried out. The map could be of a farm and its surrounding area, a village and its surrounding area, a district or even a country.

Figure 9: Map of a village

When to draw a map?

Mapping can be done at both the beginning or the end of an interview:

- At the beginning of the interview it can stimulate much more discussion and can be used as a probing tool for example: if the informant determined the location of live bird markets more detailed questions can be asked as *which species or breeds and what ages are present in the market? What is source of these animals or where vendors come from? Are there other sources rather than the market?* etc.
- At the end of the interview, mapping can be a tool of triangulation of the collected data during SSI.

Who to draw a map?

Key informants or any person from the study area or know the study area either literate or illiterate person as the illiterate person can illustrate the items using symbols.

How many times to draw a map in the same village?

One map can be used in all interviews and this map can be shown for informants and participants to add or comment or to start a discussion.

Fig 10: Participatory mapping exercise with village key informants in Al Menia governorate, Egypt.

2.3.3. Timeline

A timeline is a useful tool for exploring the frequency of key disease events and patterns over time. Besides providing information in itself, the timeline will provide a useful reference for triangulating the year of reports made by the community with information collected by the surveillance system. Information on other major events, such as droughts and famines or political events should be collected. Try to use the local names as much as possible.

Usefulness of timelines in PE:

- Help to clarify the details of disease events mentioned by respondents because they prompt respondents to remember things that happened before or during the disease event.
- Timelines may also prompt them to remember additional information e.g. other disease outbreaks not already mentioned.
- Estimate the duration of events, e.g. disease outbreaks and how frequently they occur.
- Can show the cause-and-effect relationship between events, e.g. timing of heavy rainfall and occurrence of Rift Valley fever (RVF), timing of religious or social occasions and occurrence of sudden deaths and high mortality in poultry.
- Enable the surveillance team to involve communities in evaluating targets, e.g. how soon after a disease report should implementation of disease control interventions start.

The timeline scale may vary depending on the issue of interest. For example, it could be 50 years of more for diseases with a long epidemic cycles such as RVF or rinderpest, three to five years for a disease which occurs more frequently such as HPAI, or just a few months or weeks if you are exploring events around a specific disease outbreak e.g. the new introduction of a disease into an area.

Method

1. Decide on the timeline scale based on the issue of interest (50 years, 10 years, 3 years etc.).
2. Ask the participants to indicate key events during the timeframe (events affecting the community, major livestock events and livestock disease events).
3. Probe the timeline, e.g. *Has this disease ever occurred in this area before that year? Did anything different or significant happen in the few months or weeks before that outbreak?*

2.3.4. Transect walk

A transect walk is a tool that involves use of direct observation, informal interview and visualization to describe and show the location and distribution of resources, features, landscape and main land uses along a given cross-section of a village or area.

Transect walks can be used to:

- Identify and explain the cause-and-effect relationships among topography, natural vegetation, animal husbandry systems and other production activities and human settlement patterns.
- Identify major problems and possibilities perceived by different groups of participants in relation to features or areas along the transect.
- Learn about local technology and practices.
- Triangulate data collected through other tools such as mapping; and
- Probe the information that has already been mentioned by the community.

Transects refer to the process of obtaining a representative cross-section of the area of interest by walking in a straight line (or as straight as possible) right across the area. The transect walk should not coincide with the main road, but should start on one side of the area, crossing the main road and continuing to the other side.

Method

1. Find a key informant or livestock keeper to accompany you on the transect walk.
2. During the transect walk, directly observe and note production systems and community life, not just on the main street.
3. Informally interview the key informant or livestock keeper as you walk. The questions can be prompted by what is seen on the way.
4. If you come across community members on the way, you may stop and conduct short informal interviews as appropriate.
5. From the transect walk notes, you can construct a diagram of the cross-section showing land use, livestock etc. and triangulate this with maps already prepared.

Fig 11: Transect walk in Al Menia governorate, Egypt

3

Highly Pathogenic Avian Influenza (HPAI)

3. Highly Pathogenic Avian Influenza (HPAI)

3.1. Background

Avian influenza is a disease common caused by a virus of the Orthomyxoviridae family and varies in severity depending on the strain of the virus, thus, two forms are distinguished and referred to as low pathogenic avian influenza (LPAI) and high pathogenic avian influenza (HPAI). In poultry, HPAI is characterized by a sudden onset, severe illness of a short duration and a mortality approaching virtually 100% in susceptible species. HPAI is commonly caused by sub-types H5 and H7 and its occurrence should be notified to the World Organization for Animal Health (OIE). Currently, the most commonly known HPAI strain is A/H5N1 which in Egypt since 2006 has infected more than 122 persons and killing 40 of them. Globally the virus has infected 520 persons with 307 deaths as of 9th of February 2011. It is thought that the current A/H5N1 strain may mutate into a strain that is easily transmissible from human to human and cause a worldwide influenza outbreak, an influenza pandemic. For more information on the viral characteristics and potential impact on public health of the HPAI virus strain, please refer to OIE (http://www.oie.int/eng/ressources/AI-EN-dc.pdf) and the World Health Organization (WHO) websites (www.who.int).

3.2. Clinical signs and differential diagnosis

LPAI strains cause mild illness, without mortality. Other signs include ruffled feathers and reduced egg production.

HPAI strains are extremely contagious and rapidly fatal (within hours) with mortality approaching 100%. Signs and symptoms include:

- gastrointestinal, respiratory and/or nervous signs
- swollen eyes and blue comb
- difficulty in breathing, severe weakness, loss of appetite
- blood spots on legs
- nasal discharge
- reduced egg production and feed intake

Some diseases have similar clinical signs with high mortality and must be considered in the differential diagnosis of HPAI. These includes:

- Newcastle disease (ND): This is the most important differential diagnosis for HPAI. The two diseases cannot be clinically distinguished so laboratory diagnostic confirmation is always needed.
- infectious bursal disease or Gumboro
- chronic respiratory disease
- infectious bronchitis
- fowl cholera
- duck plague
- poisoning

Fig. 12: Photos showing the cases of HPAI in chickens and ducks

3.3. Incubation period and transmission

The incubation period for a disease is the time between the initial infection of an animal to the appearance of clinical signs. The incubation period for A/H5N1 HPAI in poultry is between one and seven days.

Avian influenza can be transmitted through direct contact between birds in a flock or through contact with infected wild birds. The causal agent (virus) can be found in nasal discharges, blood, faeces or manure. In addition, the virus can survive in contaminated feed and water. Transmission can also occur indirectly by persons or materials via contaminated shoes, clothes or equipment (e.g. vehicles, cages and egg trays). Highly pathogenic viruses can survive for long periods in the environment, especially when temperatures are low.

3.4. Action to be taken upon finding a suspected case of HPAI

A brief overview of suggested steps to be take upon finding a suspected HPAI case are presented below. However, it is essential that standard operating procedures (SOPs) are applicable in the country in point. Based on guidelines of OIE and/or FAO, Egypt has developed SOPs for sample collection and submission. For more detailed information on sampling for HPAI and dealing with suspicious events please refer to http://www.fao.org/docrep/010/a0960e/a0960e00.htm.

3.4.1. General outline for sample collection and submission

Ensure that all equipment for sample collection, transport media and storage facilities are in place before starting any sampling activity.

Personal protective equipment (PPE): Always wear appropriate PPE when collecting samples from a suspected case of HPAI. The suggested minimum PPE includes an apron, a pair of gloves, goggles, a mask and a pair of boots.

Sample collection

Equipment to be prepared prior to any sampling process include:

- screw-top bottle/universal bottle containing transport medium
- swabs
- pair of scissors
- cold box and ice blocks or liquid nitrogen container to store the transport medium and swabs
- lab marker/sample labels
- data form on which to collect bird data
- packing tape and courier forms

Collect as many samples as possible from sick or recently dead birds (12 hours) that fit the established clinical case definition for HPAI. Do not sample the birds in the chicken house but take them outside to reduce the time spent in a possibly infected environment.

Samples from sick birds

Tracheal and cloacal swabs ➔ transport medium ➔ keep it cool (2-8°C) ➔ take to laboratory

Samples should be kept in the viral transport medium at 4°C and transported to the laboratory as soon as possible. If the samples are taken to the laboratory within two days, they may be kept at 4°C in a cooler or using cold packs. If it will take longer than two days to send the samples to a laboratory, you should freeze them at or below minus 70°C until they can be delivered to the laboratory. It is important to avoid repeated freezing and thawing as this might destroy any virus present in the sample.

Clean-up equipment

Proper cleaning and disinfection will prevent the spread of the disease agent to other animals or humans via environmental contamination. Ensure that you have water, a wash bucket, nail brush, soap, paper towels and spray disinfectant with you.

Conservation, packaging and transport

It is important to contact the nearest laboratory to obtain specific instructions on packaging and shipping of diagnostic samples. This will ensure that quality of the specimen is not compromised by poor packaging.

For proper sample packaging and dispatch:

- prevent cross-contamination between specimens
- prevent decomposition of the specimen
- prevent leakage of fluids
- preserve individual sample identity
- label the package properly

3.4.2. Use of rapid antigen test

There are several rapid antigen tests available for influenza A. For all tests, samples should be taken from sick or recently dead birds. We do not have a specific preference for any of the tests available. Always read the instructions provided with the kit before use. As an example, we will discuss the use of the Anigen rapid antigen test for common A.

Method

1. Take a cloacal swab.
2. Put the swab in the extraction buffer tube, mix, squeeze the swab against the side of the tube to extract all the fluid and then remove the swab. Wait for at least five minutes.
3. Aspirate the buffer using the dropper provided.
4. Holding the dropper vertically over the sample hole of the test device, place five drops onto the sample hole.

Beware of common mistakes

- heavy faecal matter on the swab
- not holding the dropper in a vertical position (this results in a smaller drop)
- little faecal matter
- not waiting for five minutes before applying the buffer to the test device (the time is needed for the extraction buffer to work on any virus in the faecal matter)

Advantage

Rapid diagnosis within 15 minutes enables appropriate action to be taken quickly.

Disadvantages

- Low sensitivity: If a test is positive it is highly likely this is a true positive, but if a test is negative there is an approximately 30-40% chance that this is a false negative i.e. the bird is excreting virus but at a level that is below the ability of the test to detect (see Figure 13).
- Based on field experience from the past year in Egypt, the test usually shows negative results with ducks which are later confirmed by PCR , however, in sick turkey and Sudani ducks RFT gave faint (but visible) positive reactions which are later confirmed by PCR. It is therefore recommended to only use RFT in sick chickens, quails, turkey and Sudani ducks matching the HPAI clinical case definition.

Interpreting the test

A coloured band will appear in the left section of the result window to show that the test is working properly; this is the control band (C). If another coloured band appears in the right section of the result window, this is the test band (T).

Negative result

Only one band (C) in the result window indicates a negative result.

Positive result

Two coloured bands (T and C) in the result window, no matter which band appears first, indicates a positive result.

Invalid result

If the control band (C) is not visible in the result window after performing the test, the result is invalid. An invalid test may be as a result of not following the procedure correctly or the deterioration of the kit. If an invalid result is obtained, the sample should be tested again.

Observations on the use of RFT by CAHO teams in Egypt:

- Faecal samples collected from brown sasso-balady hybrid breeds give very quick and strong positive reaction even when the clinical signs are not so clear, and those samples have been confirmed to be HPAI H5N1 by RT-PCR test.
- RFT gave faint positive reaction with infected sudani ducks and turkey which has been confirmed to be HPAI H5N1 by RT- PCR test).

Storage and stability

The kit should be stored at room temperature (2-30°C) or refrigerated. Do not freeze and do **not** store in direct sunlight.

Note: When collecting samples and using rapid antigen test kits in the field, there is need to limit the spread of infection by properly disposing of infected specimens either by burning and burial.

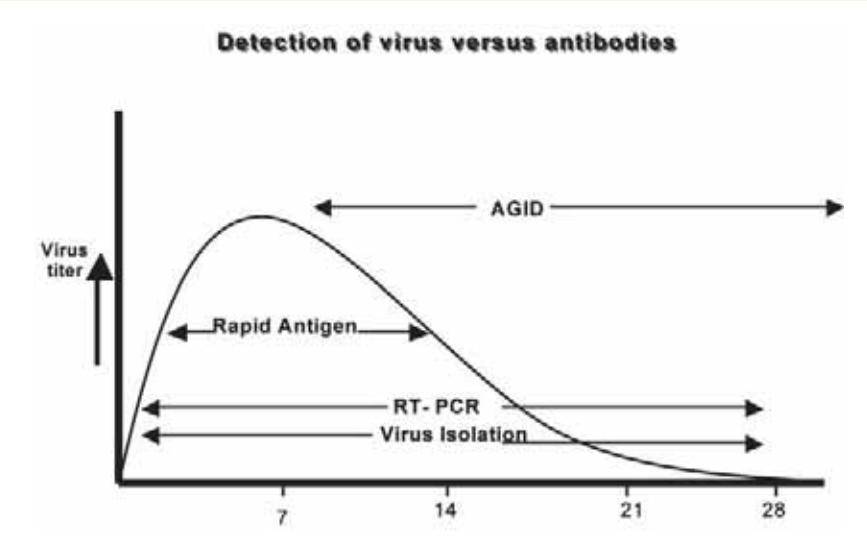

Figure 13: Detection of virus versus antibodies.

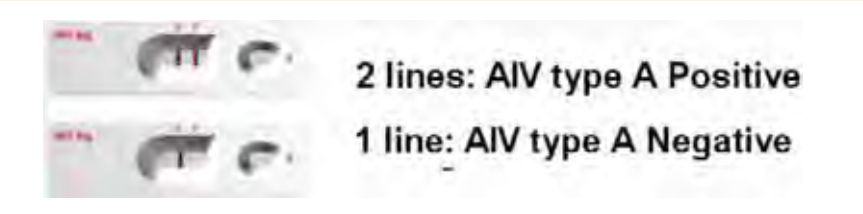

Figure 14: Positive and negative test results for avian influenza.

3.4.3. Use of PPE

The use of PPE protects all those in contact with poultry that are potentially infected with avian influenza A H5N1. It is especially important when taking samples and during disposal/culling of sick and dead poultry infected with the H5N1 virus. Below are some suggestions on when to use the different types of PPE available. Please note that there may be specific guidelines in your country.

No active cases (green level)

1. Disinfect shoes, especially soles, when leaving the village.
2. Wash hands with soap and water:
    a. immediately after handling ANY poultry
    b. whenever leaving the village

Active or suspect cases (yellow level)

1. When performing rapid tests on poultry the following PPE should be worn:
    a. booties
    b. mask
    c. gloves
    d. apron
2. Healthy chickens should not be handled by anyone who has already touched sick or dead chickens.
3. When testing is complete, collect used PPE and other items to be disposed of and burn them immediately.
4. Wash hands with soap and water and disinfect shoes before leaving the village.

High-risk activity (red level)

1. During direct handling of more than one infected bird (such as during a culling operation), the following PPE should be worn:
    a. suit
    b. boots
    c. gloves
    d. mask
    e. goggles
2. Remove used PPE and dispose of it immediately by burning before leaving the infected area.

3.4.4. Considerations regarding reporting

Governorates may have a little variation in their disease reporting mechanisms according to the presence or absence of laboratory facilities. All, however, must inform GOVS and NLQP about the occurrence of outbreaks of a notifiable disease such as avian influenza A H5N1. All CAHO practitioners should be aware of the compliance with the reporting system in their governorates. Thus, when abnormal mortality possibly due to HPAI is detected, all CAHO practitioners should know who to inform.

The following are the basic steps:

- Inform the District Veterinary Officer (or equivalent). Agree on who should take the samples and who will inform the laboratory.
- Inform the local veterinary directorate.
- Local veterinary directorate will notify GOVS and NLQP.

3.5. Control of HPAI

Since the appearance of avian influenza A/H5N1 in different parts of the world, veterinary services have been working on preparedness and outbreak response plans. These are often combined with plans developed by the human health sector so that the influenza pandemic preparedness plans have an intersectoral approach to the threat.

Action plans addressing the notification and response to an HPAI outbreak may vary across countries but will generally follow guidelines by FAO and WHO. Some suggested points to consider include:

- Coordination with all stakeholders (e.g. local authorities, district veterinary office, national veterinary services, FAO, WHO, OIE, non-governmental organizations, poultry traders and donors).
- Guidelines on surveillance and investigation of possible HPAI outbreaks.
- Guidelines for the control of HPAI when an outbreak is confirmed. This should include, among others:
    - culling and disposal of all sick and dead birds, and disposal of feed and manure from the reported farm or area
    - cleaning and disinfection of the infected premises
    - control of movement on and around the reported outbreak (farm or village)
- Public awareness about the disease and measures for its prevention and control.

4 Community-based Animal Health Outreach for HPAI

4. Community-based Animal Health Outreach for HPAI

CAHO is the application of PE to disease surveillance as well as activities for risk communication and outbreak investigation. In principle, CAHO uses PE for active search on rumours about suspected HPAI outbreaks, a form of syndromic surveillance supported by laboratory diagnostics.

4.1. Why use CAHO for HPAI surveillance?

- A lot of valuable information can be collected in a short period of time.
- It can be used to target poultry populations that might be harbouring HPAI.
- It allows for a better understanding of the poultry diseases in an area.
- It is a very sensitive surveillance method, which means it can detect possible HPAI reports that can then be investigated further to find out whether they are caused by HPAI or not.
- It has other potential benefits in the wider context of animal health services because it provides information about livestock priorities and needs. It can aid in fostering good relationships between livestock owners and providers of animal health services.
- It can be used to collect relevant epidemiological information that can support the decision makers in planning the HPAI control programs.
- It can be used for the creation of public awareness on HPAI preparedness and control.

4.2. When and where to conduct CAHO program for HPAI

CAHO is used to carry out purposive or targeted HPAI surveillance in areas that are thought to be at high risk of having the disease. These include:

- Areas with a high poultry population including household, small-scale and/or larger commercial poultry production sectors.
- Areas with live bird markets, trade routes and slaughtering points.
- Areas where large numbers of wild migratory and residents birds converge and are in contact with domestic poultry e.g. lakes, wetlands and rice fields.
- Areas with reports or rumours of outbreaks of HPAI or HPAI-like diseases.

4.3. Planning for CAHO program for HPAI

When planning to carry out CAHO, one needs to decide on the objectives, methods to employ, data recording and analysis, the team, and other logistic issues.

Objective

The objectives of CAHO program for HPAI are to:

- Detect the presence of HPAI H5N1 in the target areas.
- Determine previous history of HPAI-compatible events in the target area.
- Contribute in disease investigation efforts.
- Provide grassroots level communication and community awareness.

Methods

- *Checklist*: Develop an appropriate checklist that will contribute to achieving the stated objectives (see Box 2 for an example of a checklist for HPAI CAHO).
- *PE tools*: Decide what tools should be used during interviews to promote participation and dialogue, and enrichment of the information gathered.
- *Case definition*: Develop a clear and simple case definition for HPAI. If a disease event is found that fits the case definition, decide what action to be taken.
- *Sampling method*: Decide, among other issues, on geographical focus, likely key informants, number of farms or villages to visit and number of groups and individuals to be interviewed.
- *Global Positioning System (GPS)*: Decide whether to use GPS to obtain spatial coordinates of the sites visited during the CAHO.
- *Rapid tests and laboratory confirmation*: Determine if rapid antigen tests will be available for use in the village and what additional samples need to be collected for confirmatory laboratory testing.

Box 2: Checklist for CAHO program in Egypt (2010/11)

- **Introduction**
- **Meeting/visit objective**
- **Most common poultry species in the village**
- **Percentage of households in the village that keep poultry**
- **Sources of birds (name and location of sources)**
- **Season of buying in new poultry flock (per species), and preferred age of new flocks**
- **Most common husbandry systems in the village**
- **Current disease problems**
- **History of any disease outbreaks** matched with the HPAI clinical case definition in last 4 years – in the village
- **Risk factors (map)**
- **If HPAI has not yet been mentioned**, ask if they have ever heard of HPAI, have they ever experienced the disease in their own flocks or heard of an outbreak in the village or neighbouring villages
- **Advice (using BCC approach)**
- **Direct observation** of village and household poultry
- **Outbreak investigation** (description of the outbreak, source of infection …etc)

Recording and analyzing data: Determine how to record the interview data and how the data will be collated, analyzed and reported.

CAHO team: The size of the team may vary depending on the objective of the activity and available resources. Ideally, a CAHO team should be composed of at least two veterinarians.

Other logistical issues: These must be planned for and sourced, e.g. supplies and equipment, transport etc.

4.4. Secondary information

Before actually conducting the field work, the CAHO practitioners should collect secondary or background information about the village and surrounding area. This might include a map of the area; human and livestock population data; location of poultry farms, hatcheries and markets; data on poultry disease outbreaks and common poultry diseases; and the names and contacts of key informants.

4.5. Key informants

The local government and veterinary authorities should be informed about the work that CAHO team is planning to conduct. They can assist by providing secondary information and introducing you to key informants, such as the local veterinary staff and extension officers, who can play an important role in CAHO planning and implementation. Key informants are community residents who are in a position to know the community as a whole. Key informants are sources of secondary information and may help to organize meetings with other key informants such as local leaders and heads of farmers associations. They may also help to facilitate understanding of the community culture and customs and local language. They also facilitate meetings with commercial and free-range farmers, and organize group meetings with poultry keepers. Key informants can be any person who has specific information to fulfill the goal of the study and may include persons with no official positions.

Involving key informants in CAHO program may help to strengthen the relationship between livestock services and the community, which may encourage reporting of disease outbreaks and improved uptake of disease control measures.

Generally involving key informants reduces time and effort for the appraisal team to organize meetings with poultry keepers. Sometimes the key informants try to show ideal and not the real situation in a village. The decision of whom to interview and where to be directed should be by appraisal team not by the key informant.

Key informants could be:

- veterinarians (officials – private)
- veterinary assistants
- communication staff of health ministry (Raedat refeat)
- agriculture officers
- head of the village (Omda)
- municipality staff
- religious man
- community development associations (CDAs)
- peddler
- hatchery owner
- feed trader

4.6. Interviews

Once the study area is identified, it's necessary to determine:

- The number of villages to be covered so as to adequately represent the area at risk.
- How to effectively cover a village in order to get a good idea of its disease status.
    - Interviews with key informants such as veterinary workers, extension officers, local officials to obtain secondary information and plan the CAHO.
    - Group interviews with household and small-scale commercial poultry producers. The number of group interviews will depend on the size of the village and how the people are organized. For some villages, one large group interview will provide representative information while for others one may need to conduct three to four group interviews in different parts of the village or among different types of poultry keepers.
    - Farm visits and visits to household poultry keepers for direct observation of poultry management practices and disease problems. Again, the number of visits depends up on the size of the village and whether there exists a significant disease problem.
    - Direct observation: Transect walk, visits to key livestock features such as markets, slaughter points, etc.
- Whether to adjust the timing of visit to suit into the schedules of the poultry keepers.
- Whether it is possible to interview groups with both men and women or separately (time implications).

Group interviews can be organized in/with:

- schools (teachers, administrative staff and workers)
- women health units and hospitals (nurseries, and workers)
- veterinary units (veterinarians – assistants– administrative staff - poultry owners)
- agriculture cooperatives (Agriculture engineers – administrative staff – assistants)
- municipality units (employees)
- youth clubs (employees – members)
- NGOs
- street (with household neighbours)

Fig 15: Semi Structured interview

4.7. HPAI CAHO tools

Semi-structured Interview

The semi-structured interview is the basis of CAHO. Other PE tools are used as appropriate during the interview. Simple tools such as simple ranking, proportional piling and mapping may be used in most interviews whilst more complex tools such as matrix scoring and proportional piling for morbidity and mortality are used with groups and individuals who show greater knowledge and interest and are willing to spend more time.

Mapping

Can be used to obtain the following information:

- The location of farms, settlements, water bodies (canals, drainage canals), service and social areas.
- The possible spread of the disease in case of an outbreak between farms and/or villages.
- An overview of the critical points for disease spread.

Mapping can also assist in planning of subsequent CAHO activities such as where to conduct further interviews, farm or household visits and transect walk.

Seasonal calendar

Temporal variations in disease occurrence are a common aspect of epidemiological investigation. In addition, purchasing and selling of animals is also a seasonal activity. Seasonal calendars can be used to understand local perceptions of seasonal variations in disease incidence in poultry and may be related to some of the purchase or selling of the animals.

Timeline

A timeline shows the major disease/animal health events in a defined period of time (from several weeks to 50 years) in a particular area. For HPAI CAHO, a timeline of one to three years may be used to show the pattern of recent outbreaks of high mortality poultry diseases.

Simple ranking and proportional piling

Simple ranking and proportional piling can provide information on livestock species kept or common diseases in a village.

Proportional piling for morbidity and mortality

This exercise should be done with individual poultry keepers since it reflects the disease incidence and mortality in their flocks based on their own perceptions.

Matrix scoring

Matrix scoring is used to understand the local characterization of poultry diseases or disease syndromes and the meanings of local names for diseases.

5

Data Recording and Analysis

5. Data Recording and Analysis

5.1. Data recording

CAHO practitioners can record the data collected in different ways:

- notebook
- interview record forms
- disease report forms
    - zero report form: filled when there is no outbreak
    - laboratory forms
    - reporting form for notifiable diseases
- flip charts
- GPS: save readings
- camera
- mobile phone
- laptop

Advantages of notebooks

- flexible
- easily available and cheap
- simple to use; no training or pre-testing needed

Advantages of using forms

- easy to file
- allows standardization of records
- can be easily linked to a database
- easier to trace recorded information in a form compared to a notebook

What are the steps leading to data analysis?

- defining the questions that need to be addressed e.g. developing hypotheses
- identifying the right statistical tests to use
- doing a quality check on the data (distributions, frequencies, levels)

5.2. Data analysis

Data analysis is a continuous process that occurs during and after the interview. There is continuous crosschecking of data and updating of the checklist and tools to follow new leads and be open to new discovery.

Triangulation is used to verify the collected data and is carried out:

- between questions and tools used with the same informants
- between questions and tools repeated with multiple informants
- between information collected from interviews and tools with laboratory diagnostics
- between PE findings and secondary information

After the CAHO practitioners have submitted their reports, further data analysis is carried out centrally, e.g. at the central veterinary services.

Descriptive statistics

Descriptive analysis is most commonly used to analyze CAHO data. It involves describing the distribution (pattern of the data), central tendency (average) and dispersion (how the data are spread out).

Analysis of simple ranking data

Example: You have conducted three interviews with different groups of livestock keepers. In each interview, you have asked them what species of livestock they keep in their villages. Using the list of livestock species they have provided, ask them to rank the species in order of size of population in the village.

Interview 1 result	Interview 2 result	Interview 3 result
cow	chickens	chickens
sheep	cow	cow
goat	sheep	sheep
chickens	goat	ducks
ducks	ducks	goat

The data can then be summarized in a table format

Species	Interview				
	1	2	3	Total	Rank
Cow	1	2	2	5	1
Sheep	2	3	3	8	3
Goat	3	4	5	12	4
Chickens	4	1	1	6	2
Ducks	5	5	4	14	5

The species with the lowest total score is the one that is most commonly kept (often ranked first).

However, if there was a fourth group that gave the following result

Interview 4 result
chickens
donkey
cow
ducks

then the data are less easy to analyze.

	Interview					
Species	1	2	3	4	Total	Rank?
Cow	1	2	2	3	8	3
Sheep	2	3	3	-	8	3
Goat	3	4	5	-	12	5
Chicken	4	1	1	1	7	2
Ducks	5	5	4	4	18	6
Donkey	-	-	-	2	2	1

The final ranking is obviously incorrect!

In this case, the original ranks should be converted to scores. Because the number of species is six, the lowest score would be 1 and the highest 6. For each interview, the species ranked 1 is given a score of 6, the species ranked 2 is given a score of 5, rank 3 a score of 4, rank 4 a score of 3, rank 5 a score of 2 and rank 6 a score of 1. Thus, using the data in the table above, we end up with the following converted scores:

	Interview					
Species	1	2	3	4	Total	Rank
Cow	6	5	5	4	20	2
Sheep	5	4	4	0	13	3
Goat	4	3	2	0	9	5
Chicken	3	6	6	6	21	1
Ducks	2	2	3	3	10	4
Donkey	-	-	-	-	5	6

Analysis of proportional piling data

Example: You have conducted four interviews with four groups of livestock keepers. In each interview, you asked them to indicate the relative population of different livestock species in the village by dividing a pile of 100 beans. The results have been tabulated as below.

Species	Interview					
	1	2	3	Total	Average	Range
Cow	50	40	45	135	45	40-50
Sheep	20	25	20	65	22	20-25
Goat	15	20	20	55	18	15-20
Chicken	10	10	5	25	8	5-10
Ducks	5	5	10	20	7	5-10
	100	**100**	**100**			

The scores for each species are added up and divided by the number of interviews to obtain the average score. The variation in scoring is also captured by recording the range, which is the difference between the highest and lowest scores.

Given the qualitative and semi-quantitative nature of the data, recording of PE/CAHO data differs from recording data from questionnaires. It needs to need to be organized and summarized before analysis.

6

Outbreak Investigation

6. Outbreak investigation[1]

According to the Terrestrial Animal Health Code from the World Organization for Animal Health (OIE) an outbreak is the occurrence of one or more cases in an epidemiological unit. An epidemiological unit means a locality wherein a group of animals with a defined epidemiological relationship share approximately the same likelihood of exposure to a pathogen in a given time lapse.

Why do outbreaks occur?

- New infectious disease is introduced from an endemic area into a susceptible animal population in which the disease is not endemic.
- Contamination of food, water or other vehicles takes place by an agent not normally present.
- Pre-existing infection reaches susceptible individuals as a result of new or unusual behavioral practices.
- Host susceptibility and response are modified.
- Environmental changes.
- Infecting agent modifies itself to become more effective.

Sources of outbreaks

Point source

- Caused by exposure of a group of individuals to a common, noxious influence.
- Exposure is brief and essentially simultaneous.
- All cases are exposed within a single incubation period. e.g. food-poisoning outbreak.

Intermittent

- Persons or animals are exposed intermittently to a harmful source.
- Period of exposure may be brief or long.
- Intermittent exposure often results in a pattern where the number of cases rises and falls.

Continuous

- Persons or animals are continuously exposed to a harmful source.
- Period of exposure may be brief or long. Continuous exposure will often cause cases to rise gradually.

[1] Materials adapted from FAO rapid deployment course for HPAI (2007).

Propagated

- Results from direct or indirect transmission of an infectious agent from one susceptible host to another. Can be via direct transmission or via a vector to another host.
- If a source remains contaminated and susceptible individuals are exposed at different times then the outbreak peak will be less distinct and the outbreak will last longer.

What is outbreak investigation?

An outbreak investigation is a semi-structured participatory interview technique to obtain a standard set of data. By asking questions we try to get as close to the truth as possible about what happened and when.

The reason for conducting an outbreak investigation is that decision makers need reliable information on which to base their decisions. It is also done to comply with international reporting requirements.

The questions we want to answer by conducting an outbreak investigation are as follows:

- Is the disease present?
- Detailed description of the disease and how long it is likely to have been present.
- Detailed description of the affected unit and which animals are diseased and which are not.
- Where might the disease have come from and by what means? (source tracing).
- Where might the disease have spread to and by what means? (spread tracing).

Once we have answered all the questions above, we will be able to:

- Determine possible spread before suspicion and reporting.
- Determine trends to have idea of what may happen in the next week.
- Determine major routes of transmission (source data).
- Determine where active surveillance is most needed (spread data).
- Determine how many resources and of what type are going to be needed in the near future
  i.e. the output of outbreak investigation is decisions.

Decisions can only be as good as the quality of the data used to make them. Good quality data is essential for effective disease control planning. It is the field epidemiologist's job to get the data and analyze it ➔ i.e. convert data into information.

When reporting back, always describe the data by time, place, and species.

- Time ➔ Epidemic curve by date of onset
  A key parameter within an outbreak investigation is the date when first signs were observed
  This is important for establishing the potential source(s) and the possible spread. Verify this dates with different persons to get the most accurate date.
- Place ➔ Distribution of cases by geographical area (GPS coordinates).
- Species ➔ Distribution of cases by species, age group, etc.

To conclude, below are twelve steps for a systematic approach to a successful outbreak investigation:

1. confirm existence of outbreak
2. verify diagnosis
3. prepare for field work

4. make/use case definition to identify & count cases
5. tabulate data
6. perform descriptive epidemiology
7. develop hypotheses
8. evaluate hypotheses
9. refine hypotheses
10. implement control & prevention measures
11. maintain surveillance to evaluate control & prevention
12. communicate findings

And please remember when you go on an outbreak investigation:

- Remember you are in an infected site!
- FOLLOW BIOSECURITY RIGIDLY.
- Explain that you are doing this to stop you moving the virus, not necessarily to protect yourself.

7

Using Participatory Mapping in HPAI Outbreak Investigation

7. Using Participatory Mapping in HPAI Outbreak Investigation

Outbreaks of HPAI may spread among households in a village according to three different scenarios:

Cluster

Scattered

Massive

Cases in an outbreak may be classified as follows:

- Index case(s): first case(s) of the outbreak in the epidemiological unit (mostly village or hamlet).
- Primary case: the first case reported in the epidemiological unit. This is generally not the index case which can be very difficult to find in some occasions especially when you have a massive outbreak in a village.
- Secondary case(s): cases generated from the index case(s), mainly by propagated source.

In case of suspected outbreaks, the CAHO practitioner has to use the maps prepared during the participatory mapping exercise to illustrate how the disease spread over time and place.

Example in case of massive spread of cases:

- In any interview, when the interviewees gave information about facing syndrome in their poultry matching with HPAI clinical case definition, triangulate the information and try to record the complete date or at least week of occurrence on the same area in the map and probe the source of infection.
- After completing the work in the village, the practitioner will have a map showing the pattern of disease spread over time and place.
- In the area(s) where the disease started first, those are the index case(s) and the source of infection for those cases is the main source of introducing the virus in the village.
- For other cases, also probe the source of infection to understand how the disease was massively spread among the households in the village. In this case the practitioner may face on of the following scenario:
    - A different source(s) of infection other than that contributed in the occurrence of the index case.
    - The same source of the index case(s) is contributed in the occurrence of all cases (point source).
    - The secondary cases occurred as a result of spread of infection from house to house (propagated source).

8

Communication for Behavioural Change

8. Communication for Behavioural Change[2]

There are two approaches to Health Education: Information Education and Communication (IEC) and Behavioral Change Communication (BCC). Now that Egypt has dealt with HPAI for more than 4 years, it may be time to focus more on BCC. There is a need to move away from only giving information to working with communities to facilitate change. There is nothing wrong with IEC and it is sometimes necessary when people do not have any information about a topic.

However, once people know where the disease comes from and how they can prevent it giving them more information is not helping them. We need to start focusing on how to help them identify their problems in relation to the disease and assist them in finding solutions to those problems. We have to facilitate discussions that allow them to verbalize their barriers to eradication then work with them to identify solutions to those barriers.

What is Information and Education Communication (IEC)?

This is an approach to health education that gives people factual information about topics such as HPAI and TB. The target audience is informed about the disease and is told how to protect themselves. The practitioner will mostly give information. Examples of typical IEC messages are given below:

- "wash hands with soap"
- "separate new poultry for 14 days"
- "separate ducks from chickens"
- "build fences and keep poultry in enclosures"
- "clean yards"
- "Bury/Burn poultry waste"

What is Behavior Change Communication (BCC)?

This is an alternative health education approach that aims to help people change behaviors that lead to HPAI infection. In this case, the practitioner will be more a facilitator than an educator.

Please be aware that as CAHO practitioners you cannot control other people's behaviour because:

- Only the people themselves know how to change in their situation.
- Only the people themselves know about their previous experience with behaviour change.

[2] The course materials have been adapted from materials provided by Dr Steven Becknell, United States Centres for Disease Control and Prevention (US CDC).

- Only the people themselves know if their neighbors will accept their new behaviours.

> In a BCC project, we DO NOT make people change their behaviour ➔ we facilitate individuals' ability to change their own behaviour.

Stages of Change[3]

Change is a process, not an event. The change process can be grouped into distinct stages of readiness:

People in the earliest stage are not intending to make a change. They may not even be aware that their behavior is unhealthy or they may be demoralized from past failed attempts.

People in the final stage have made a change and are working to keep it up (Maintenance).

And people in the middle: there may be some who are just starting to think about changing their behavior (Contemplation=getting ready), others who have decided to make a behavior change (Preparation=ready), and still others who have just begun to take action to change their behavior (Action).

This whole process takes time easily up to a year with the pre-contemplation and contemplation phase each taking up to 6 months. We need to take this change process theory into account when we work with the communities. We can't expect villagers to change their behavior after talking to us for 15 minutes… However, we can work with those community members that are already doing things well (action stage) or those that realize that something should be changed (preparation stage)… CAHO practitioners should start work with communities in their own districts where they work/live. They will have more time to spend with the community to clarify issues and to follow up.

The change process takes long time, what can CAHO practitioners do?

- Help people start thinking about their situation & actions ("what do you think you could do to change your situation?").
- Encourage/assist those that are thinking of changing ("you can do it!").
- Encourage/assist those that have already changed ("keep it up!").
- You will be most successful in the villages where you live/work because you have time to repeatedly interact with the community.

[3] Materials adapted from www.prochange.com/ttm

Below we give an example often faced in the field by CAHO practitioners.

In order to advise a group of farmers to use separate footwear when entering the poultry shed, we try to avoid giving direct advice. Instead, take them through the different steps so that they are able to understand the rationale of changing footwear. The possible steps:

- Jointly identify the hazard and risks you need to draw the attention of farmers to.
- Think about what message can simply clarify these hazards and risks to the farmers.
- Then ask the farmers how they can avoid such hazard and risk?
- Manage the discussion among the group in a way that can make the farmers create practically applicable and socially acceptable measure to avoid those hazard and risks.

Tell the group of farmers that faecal matter and secretions from poultry may carry many pathogens including HPAI that can cause serious illness and death for their poultry. One of the most important transmitters of these Faecal matter from markets, streets or farms to the household poultry is the shoes; even a very scanty amount of faecal matter stacked to shoes can carry millions of pathogens capable of destroying the entire poultry flock.

Create a discussion among the farmers by asking them how they can avoid the transmission of faecal matter from outside to your poultry shed. Manage the discussion of the farmers until they reach applicable measures.

Best time to deliver advice successfully using BCC approach:

- When you find a suspected case.
- When farmers tell you about common or current diseases or when seeking a prescription.

9

Guide on Minimum Biosecurity Practices for Improved Poultry Production

9. Guide on Minimum Biosecurity Practices for Improved Poultry Production

The newly revised avian influenza control strategy clearly stipulates the need for the promotion and implementation of various risk reduction measures. Biosecurity stands on the forefront to combat HPAI and other poultry diseases. Poultry operations can only be sustained if it is profitable. Improving poultry production and profitability can only be achieved through proper biosecurity practices that prevent and control infectious/contagious diseases. Poultry producers therefore have both individual responsibility to protect their own farms from getting infected and collective responsibility to prevent the spread of infection between poultry farms.

There are ten(10) messages on minimum biosecurity practices and organized into three interlinked parts. The first part provides a simplified and self-explanatory description of the identified ten biosecurity messages that all actors should use in the year 2010/11. The second part summarizes the key points that were described earlier. The third part presents a simple self-assessment exercise checklist to be used ONLY by poultry producers to determine the existing biosecurity status of their own farms and identify key gaps for improvement.

The biosecurity measures described below are simple, attainable and cost-effective. The experience since 2006 unequivocally proved that the lack of significant impact on HPAI control is as a result of approaches adopted by various levels of veterinary services and other players. The implementation of the revised strategy calls for a robust and harmonized approach at all levels and guided by core principles for the adoption of a more cohesive and multidisciplinary approach to HPAI control. These include:

A. Transition from disease-centered to people-centered approach

This is a major shift in thinking. We need to realize that poultry producers are the ones who suffered most and need our assistance in their effort to make their business successful and improve their livelihood. The disease control interventions and policy measures adopted should be producer-friendly and be managed with this renewed spirit of cooperation instead of imposition and control mindset. The approaches adopted will determine the success or failure of the disease control measures. All stakeholders need to bear this vital aspect and must strive to win the hearts and minds of poultry producers by minimizing or avoiding intrusive measures that proved to bear no fruit in the past.

B. Implementation of biosecurity in the context of improved poultry production

It is now recognized that biosecurity is the first line of defence. However, this important intervention was previously communicated as only applicable to HPAI. The new approach demanded that biosecurity messages be coined as tools to improve poultry production irrespective of individual disease entities. In other words, there is a compelling need to underscore that sound biosecurity measures are useful for the control of all prevalent poultry diseases and are beneficial to the producers in terms of improving production/productivity of farming units.

The information should NOT be used for any biosecurity audit process and should NOT be linked to the ongoing poultry farm registration/licensing process in Egypt. It can ONLY be used as a tool to help poultry producers to improve the biosecurity status of their respective farms.

9.1. Simple Biosecurity Practices and Messages

The description given below mainly focuses on carefully identified ten biosecurity practices/messages. These messages were developed by GOVS together with FAO and are meant to be applied in commercial poultry farms principally in sectors 1, 2 and 3. The first five biosecurity practices will assist poultry producers to significantly prevent the introduction of disease causing agents into poultry facilities. The remaining five biosecurity practices will enable the producers to contain diseases situations and avoid further spread to other poultry farms.

Define/secure farm/shed entrance:

Under ideal conditions, poultry farms must be isolated from the surrounding environment by solid fences. This is needed to prevent free entrance of people and goods that may bring with them disease pathogens and infect the birds in the farm/shed. However, in some instances, poultry farms in Egypt may not have fences due mainly to economic reasons. In these instances, it is mandatory to have a designated entrance and exit wherein biosecurity measures could be practiced. Owners or operators of poultry farms must understand the relevance of having defined gate for a poultry facility and strive their level best to establish it. The presence of a defined gate for farm entrance/exit is a necessary prerequisite to prevent/control diseases and improve profitability of poultry production. This could be done, for instance, by putting signs at various parts of the facility guiding visitors to use the defined farm gate.

Restrict /discourage people/vehicle, motorcycles, bicycles, carts, etc access into the farm/shed

Personnel, vehicles and goods are the main source of introduction of infection into poultry facilities and need to be restricted to the minimum possible. Poultry farm operators need to set rules and implement hygienic measures at the main farm entrance on people and vehicles of all kinds coming in and leaving the facility. Ensure that cleaning and disinfection is done at the gate before entrance into and upon leaving the farm.

Provide separate protective clean cloth and footwear to visitors

If external visitors (including casual visitors, veterinarians, vaccinators, other service providers, etc) are allowed to enter into the farm/shed, they should adhere to the hygienic measures set by the farm. Farm operators must ensure that protective clothes and footwear is provided to the visitors at the entrance and used. These protective clothes must be removed and left upon leaving the farm. This practice is very important to minimize the risk of introduction of infection through people accessing the farms as they may have come from other farms or may own their own poultry at home. Provision of clean protective clothing and footwear does not mean that the poultry facility is open for any visitor. The guiding principle for reducing risk of disease introduction,remains to limiting the visits (people) to a poultry farm to the minimum number possible.

Clean and disinfect vehicles, motorcycles, bicycles, carts, etc,

As indicated in 2 above, vehicles, motorcycles, bicycles, carts, etc, are one of the major ways for the introduction of infections into poultry farms. However, if allowed to enter into the farm/shed, proper cleaning and disinfection is necessary in order to reduce the risk of introduction of infection. Proper cleaning of vehicles, motorcycles, bicycles, carts, etc will remove about 90% of the debris that contain the infective material. Chemical disinfection helps to address the remaining 10%. It has to be noted, however, that disinfection without proper cleaning do not serve the desired objective. Cleaning/ washing (if possible with high pressure sprayers) with water and soap should be done with thorough brushing of all the wheels, under-side of and the external parts. Disinfection must be applied to all parts or the car, etc must pass slowly through a dip to allow proper disinfection. The driver must remain inside their cars and must not be permitted to walk out into the farm/shed. If the drivers have to go out of car, for one or another reason, they have to adhere to the hygienic measures (provided with clean protective clothing, footwear and follow a thorough cleaning and disinfection procedure).

Farm stores established adjacent to external fence/boundary

It's always advisable to avoid unnecessary entry into the farm. Establishing farm stores (feed, egg, medicine, etc) adjacent to the external fence of the farm will undoubtedly reduce the risk of introduction of infection through cars and people. The stores should be placed near the gate or fence to be easily accessible and used without a need for external people and vehicles to enter the farms. The access to the stores should be from outside the farms through a door or a window, the storage for farm products such as eggs at a location away from poultry houses will allow an easy access from outside without any need to enter into the farm. Farm inputs (feeds, medicines, etc) should be received and stored at a location away from poultry houses. If farms operate in this manner, the time spent and costs incurred for cleaning and disinfection as well as for protective clothing and footwear will dramatically reduced, hence significantly contribute to farm profitability.

Remark: *The above five biosecurity guide items were meant to prevent the introduction on infection into poultry farms. The following items will deal with the feasible biosecurity measures that will prevent the transmission of disease between poultry houses within a farm and prevent the spread of infection to other farms from infected premises.*

Designate and limit workers for each poultry house

It is essential to identify the minimum number of workers for each poultry house. The workers should be informed that they are designated to work only in specified poultry houses and must be aware of the risks associated with free movement of people between farm houses. They should not be allowed to move to poultry houses that they are not working in. In this regard, there must be an in-built mechanism to monitor the behavior of workers. In addition to regular hygienic measures to be implemented at the entry of the house (cleaning and disinfection of footwear), workers should wash hands, change clothes and footwear when moving between poultry houses.

Remark: *Disease may occur in one or two of the poultry houses where as the birds in the other houses may still remain normal. During disease outbreak events, farm workers generally tend to panic and move around from one poultry house to another. This behaviour is an extremely dangerous behaviour in terms of introducing infection from an infected house to a normal one. Farm operators must be aware of this situation and inform their workers about the specific attitudes that they need to exhibit during outbreak events.*

Discourage exchange of tools/equipments between different farms

Occasionally, some poultry farmers borrow/rent certain tools or equipment to accomplish a given task and return them back to the lender/renter. This is a very risky behaviour that can easily facilitate the introduction of disease

from infected to healthy farms. Poultry producers are generally advised to be self-sufficient in terms of tools and equipments they need for normal farm operation. If borrowing/renting of tools and equipment is necessary (inevitable), it should be thoroughly cleaned with water and soap then disinfected before and after its use.

Remark: *All actions of cleaning and disinfection should be away from poultry house entrance.*

Avoid selling of birds from infected premises

From the experiences and lessons learned over the past four years, the major source of spread of HPAI in Egypt is the selling of apparently healthy birds from infected farms. It's understandable that poultry producers facing heavy mortalities attempt to salvage and minimize losses particularly in circumstances where effective compensation scheme is not implemented. However, this behaviour is self-defeating as it allows sustained circulation of disease causing pathogens and substantially increasing the threat to all producers. It's therefore a shared responsibility between individual producers and veterinary authorities to discourage the selling of birds from infected premises. Poultry producers must be encouraged to report disease outbreak situations and compensated for losses. This will bring a measurable difference in terms of reducing the risk for disease spread.

Proper disposal of dead birds

The main bio-containment concept is to prevent the spill over infection from infected farms to other healthier premises. That is why it is important to ensure the safe disposal of dead birds either by burial, incineration or compost. In as much as possible, carcasses of dead birds must be disposed within the affected farm. The infected premises must be properly cleaned, disinfected and rest for at least 1 month before any restocking process takes place. The local veterinary authorities are responsible to monitor that proper disposal is taking place and hygienic measures are fulfilled before a restocking scheme. Poultry producers must appreciate the values of the above-indicated producers as they will benefit from healthy poultry farming in the subsequent production cycles. In other words, failure to properly dispose dead birds and implementing sound hygienic practices before restocking procedures leads to sustained infection in the farm and much greater losses in the future.

Implement proper poultry litter management practices

Poultry litter is a valuable resource and should be managed properly to maximize the benefit from it. It can be used as organic fertilizer, animal and fish feed. Almost all commercial farms consider the litter as an important source of income to be generated at the end of certain production cycles (varies for broilers and layers/breeders). On the other hand, the poultry litter may contain infectious materials. Its proper handling and management is therefore an essential aspect of the efforts to prevent spread of diseases. Poultry farmers must have a system for proper poultry litter management (such as piling of the litter inside the poultry house for at least 3 to 4 days, before sold or compost, etc). Such practices will kill most of the microbes within the litter. It is also important to ensure that transportation of the litter is effected in safely closed truck. Workers dealing with poultry litter management should wear protective clothes and footwear, and use masks to cover their faces. Workers must adhere to strict hygienic measures (clothes should be changed, hands washed with soap and water, footwear cleaned and disinfected).

This exercise checklist could be used for the following purposes:

9.2. Summary Guide

No	Messages	Description	Production Sectors		
			1	2	3
I	Define/secure farm/shed entrance.	• Delineate entrance into the farm/shed to prevent random access of people and goods to the facility. • Ensure that all people, goods etc, come in and go out through this designated gate.	X	X	X
II	Restrict /discourage people/vehicle, motorcycles, bicycles, carts, etc, access into the farm/shed.	• Avoid unnecessary visits. • Restrict visitors, vehicles, motorcycles, bicycles, carts, etc, to a minimum possible. • Implement critical hygienic measures at the designated entrance including people, vehicles, goods and equipments etc, entering and leaving the poultry farm/shed.	X	X	X
III	If external visitors (including casual visitors, veterinarians, vaccinators, other service providers, etc) are allowed to enter into the farm/shed, provide separate protective clean cloth and footwear.	• In as much as possible discourage any entrances or limit access to the minimum level. • Provide the visitors with clean protective clothing and footwear. • Ensure proper cleaning and disinfecting of footwear is practiced while entering or leaving the farm/shed.	X	X	X
IV	Clean and disinfect vehicles, motorcycles, bicycles, carts, etc, if allowed to enter into the farm/shed.	• Thoroughly cleaning (inside and external) and disinfecting (when possible). • C&D be carried out away from the gate of the poultry house. • When chemicals are used, strict adhesion to the manufacturer's prescription and basic safety measures are mandatory.	X	X	X
V	Farm stores (feed, egg, etc) put adjacent to external fence/boundary of the farm/shed.	• Wherever possible, establish stores that are easily accessible and used without a need for external people to enter the farms. • Designate a site (place) away from poultry houses where eggs or other farm products are delivered to clients. • Receive farm inputs (feeds, medicines, etc) at a location away from poultry houses. *NB: These actions reduce/avoid unnecessary movement of people/ vehicles, goods and equipment within the farm.*	X	X	X
VI	Designate and limit workers for each poultry house.	• Limit the number of workers to each poultry house to a minimum possible. • Avoid movement of workers between poultry houses. • Workers must use separate set of clothing and footwear when entering into the poultry house. • Monitor workers behaviour before, during and after outbreak events.	X	X	
VII	Discourage the exchange of tools/ equipment between different farms/sheds.	• In as much as possible, don't borrow or rent tools/equipment used in other farm/shed. • If there is exchange of tools/equipment, ensure that these materials are properly cleaned and disinfected before and after their use. • Cleaning and disinfecting must be done away from the poultry house.	X	X	X
VIII	Avoid selling of birds from infected premises.	• Don't sell or buy birds from infected premises (farms). • Immediately report disease outbreak situations to the near by veterinary authority. • Solicit technical support and advice on how to manage the outbreaks.	X	X	X
IX	Implement proper/hygienic disposal of dead birds.	• Have a standardized system to dispose dead birds (burial , compost , burning, etc). • Solicit technical support and advice from local veterinary services. • Disposal should be handled in a safe responsible manner to avoid disease spread. • Disposal must be done within the farm premises in a secured site. • Don't recklessly dispose dead birds (throwing away in the open field, irrigation canals, etc). • Workers involved in dead bird disposal should strictly adhere to hygienic measures during and after these procedures. • The infected poultry houses are properly cleaned and disinfected. • Allow adequate resting time (at least 1 month) before any restocking procedure.	X	X	X
X	Implement proper poultry litter management practices.	• Adopt proper poultry litter management and practices (pilling it up for few days before transporting it out of the farm premises; compost as a valuable fertilizer, etc). • Poultry litter transported in safely closed truck. • Workers involved litter management should strictly adhere to hygienic measures during and after these procedures.	X	X	X

9.3. An Exercise Checklist for Producers

This is used for:

1. Rapid assessment of the status of farm biosecurity and identification of key gaps prior to carrying out tailor-made field level capacity strengthening activities.
2. As a self-assessment exercise for poultry producers to determine the operational biosecurity status of their respective farms and identify key areas that require their follow up actions.

Ref. No	Verification	Yes	No
I	• Farm/shed fenced. • Farm/shed with designated entrance. • People/goods/equipment/ vehicles/ motorbikes/ bicycles, etc enter the farm/shed with designated entrance.		
II	• Standing instruction present to avoid unnecessary visits. • Measures are in place to restrict visitors, vehicles, motorcycles, bicycles, carts, etc, to a minimum possible. • Critical hygienic measures are implemented at the designated entrance including on people, vehicles, goods and equipments etc, entering and leaving the poultry farm/shed.		
III	• Strict measures in place to discourage any entrances or minimum access to the farm by external visitors. • All visitors (casual visitors, veterinarians, vaccinators, other service providers, etc) provided with clean protective clothing and footwear. • Visitors always practice proper cleaning and disinfection of footwear while entering or leaving the farm/shed.		
IV	• Vehicles entering the farm/shed always thoroughly cleaned (inside and external). • Vehicles entering the farm/shed always disinfected. • Cleaning and disinfection carried out away from the gate of the poultry house. • During disinfection (when chemicals are used), the manufacturer's prescription and basic safety measures are strictly adhesion to.		
V	• Farm stores (feed, egg, etc) put adjacent to external fence/boundary of the farm/shed. • Farm stores that are easily accessible and used without a need for external people to enter the farms. • Farm products are delivered to clients from a designate a site (place) away from poultry houses. • Farm inputs (feeds, medicines, etc) are received at a location away from poultry houses.		
VI	• Only essential (one/few) workers operate in each poultry house. • Farm workers do not move between poultry houses. • Workers use separate set of clothing and footwear when entering into the poultry house. • Workers behaviour are monitored before, during and after outbreak events.		
VII	• Tools/equipment from other farm/shed are not used. • Tools/equipment brought from other farms are properly cleaned and disinfected before and after their use. • Cleaning and disinfection of tools/equipment carried in a place away from the poultry house.		
VIII	• Sick or apparently healthy birds are not sold during an outbreak event (birds from infected farms). • Technical support and advice on outbreak management are solicited for and received from local veterinary authorities. • All disease outbreaks are always reported to local veterinary authorities.		
IX	• The farm has a standardized system to dispose dead birds (burial , compost , burning, etc). • Solicit technical support and advice from local veterinary services on disposal of dead birds. • Disposal should be handled in a safe responsible manner to avoid disease spread. • Dead birds are always disposed within the farm premises at a secured site. • The farm doesn't recklessly dispose dead birds (throwing away in the open field, irrigation canals, etc). • Workers involved in dead bird disposal strictly adhere to hygienic measures during and after these procedures. • The infected poultry houses are properly cleaned and disinfected. • The infected poultry houses are allowed to have adequate resting time (1 month) before any restocking procedure.		
X	• The farm has an established system for proper poultry litter management and practice (pilling it up for few days before transporting it out of the farm premises; compost as a valuable fertilizer, etc). • The transportation of poultry litter out of the farm premises is always done in safely closed truck. • Workers involved in litter management strictly adhere to hygienic measures during and after these procedures.		

- After completing the above exercise, it is essential to analyse the outputs and strive to address all the weaknesses ("No") identified.
- The summarized output (table below) will provide concrete indications on whether the prevailing biosecurity gaps are on the 'bio-exclusion' or "bio-containment" or both.
- Keep this assessment output to compare it with similar future undertakings and assess the level of improvement over a period of time.

Ref. No	Number of "Yes" Responses	Number of "No" Responses
I - V		
VI - X		
Total		

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