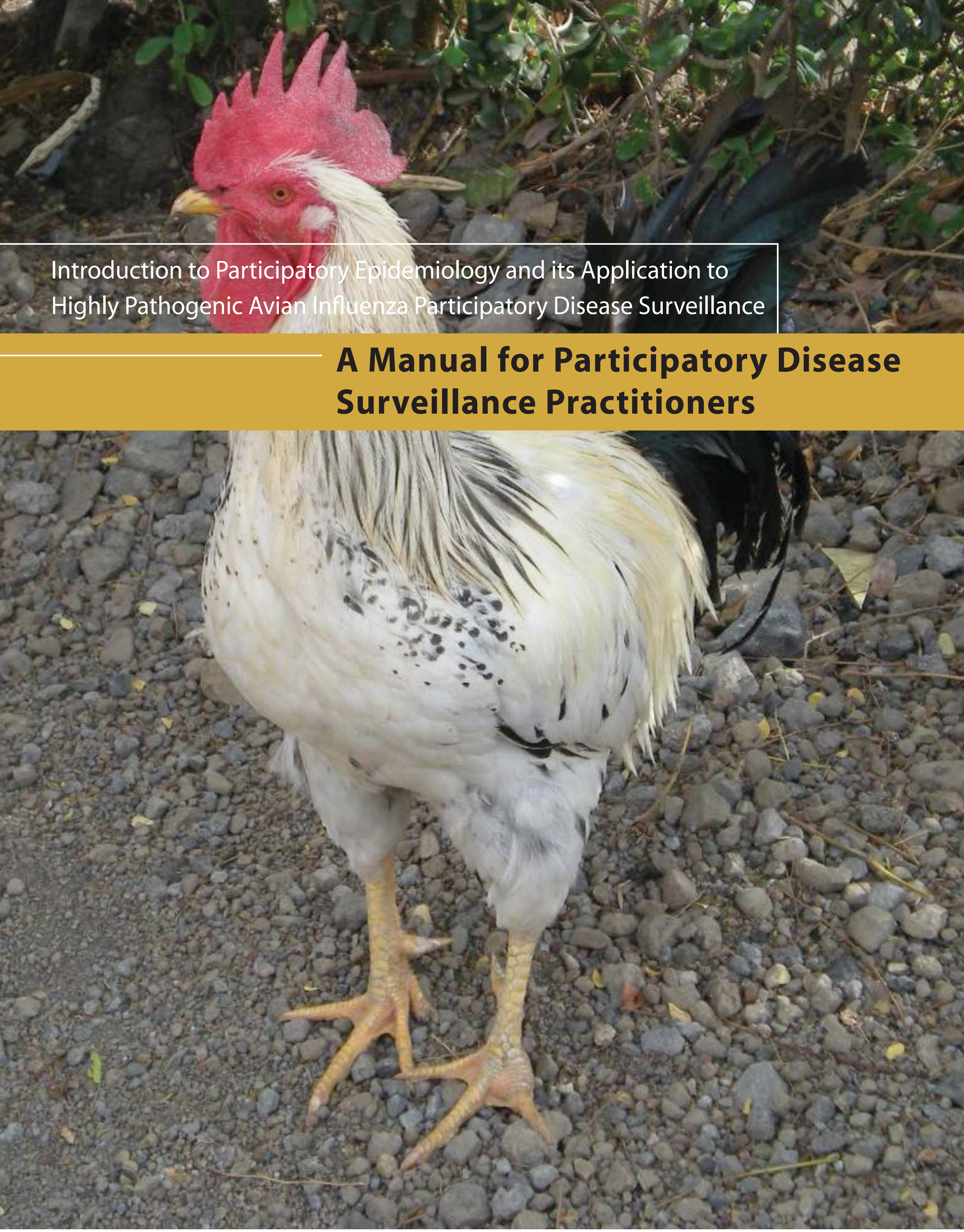

Introduction to Participatory Epidemiology and its Application to Highly Pathogenic Avian Influenza Participatory Disease Surveillance

A Manual for Participatory Disease Surveillance Practitioners

September 2009

DIERENARTSEN ZONDER GRENZEN | VETERINAIRES SANS FRONTIERES BELGIUM

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Contents

Acronyms and abbreviations

AU-IBAR	African Union – Interafrican Bureau for Animal Resources
CBPP	Contagious Bovine Pleuropneumonia
ECF	East Coast fever
FAO	Food and Agriculture Organization of the United Nations
FMD	Foot and Mouth Disease
GPS	Global Positioning System
HPAI	Highly Pathogenic Avian Influenza
HS	haemorrhagic septicaemia
ILRI	International Livestock Research Institute
LPAI	Low Pathogenic Avian Influenza
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
SOP	Standard Operating Procedure
USAID	United States Agency for International Development
VSF-B	Vétérinaires Sans Frontières-Belgium
WHO	World Health Organization

Preface

As part of the Early Detection, Reporting and Surveillance for Avian Influenza in Africa project 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) have been conducted in western and eastern Africa in 2008 and 2009. The purpose of this manual is to provide a reference for veterinarians and animal health workers during and after PDS training. The main focus of the manual is on HPAI PDS but the methods can be easily adapted and applied to address other livestock diseases.

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.

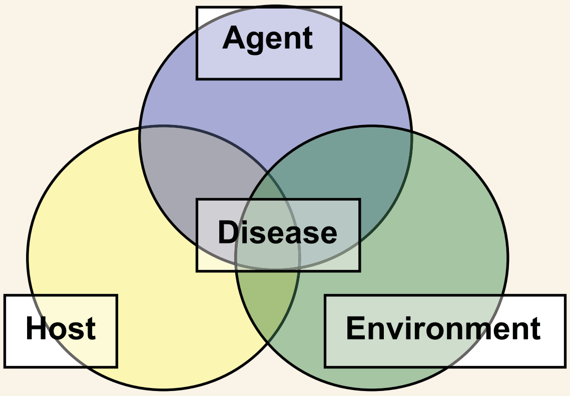

Figure 1: Interaction of host, agent and environment in the occurrence of disease.

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	Genotype	Location
Pathogenicity	Age	Climate
	Sex	Husbandry
	Species and breed	
	Immune status	
	Stress	

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.

Data are crosschecked by probing, triangulation and laboratory diagnostics.

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 involving 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 risk-based depending on its objective.
- **Epidemiological studies** to develop a deeper understanding of the manifestation of a disease in a population.

Participatory Disease Surveillance (PDS) is 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 PDS, the method of sampling is usually risk-based 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.

Figure 2: Local chicken Togo

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

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.

Figure 3: Semi-structured interview in Burkina Faso

"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." (Pretty *et al.,* 1995)

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 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 pastoral societies, dawn and dusk are often the best times to find cattle owners at their camps, but may not be the best times to interview them. For sedentary smallholder farmers, they may be busy tending to their crops in the mornings so it may be better to carry out interviews in the afternoon. Always ask if it is a convenient time and if not, when you could meet. The interview should be planned to last about an hour; if it

Figure 4: Semi-structured interview in Togo

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 Introductions

The first step in any interview is introductions. The members of the study team should introduce themselves and ask the participants to introduce themselves. 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 poultry or Contagious Bovine Pleuropneumonia (CBPP) 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. 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 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

Figure 5: Semi-structured interview in Tanzania

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 sheep pox 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.

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 appraisal team may have a special interest in unravelling the local epidemiology of CBPP and wish to ask in every interview about the last occurrence of CBPP. 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 CBPP and the appraisal team can safely ask their standard question. If the participants do not introduce the subject of CBPP, the CBPP 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 CBPP is not a local priority.

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

2.1.5 Probing

In PA, 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 describe a disease that causes sudden death in livestock without rigor mortis. The appraisal team could enquire if the disease can affect man and if so what does the disease look like in man. A positive response with a characteristic description of anthrax abscesses will confirm this description as anthrax.

Verifying internal consistency of information is an important means of data quality control in PA. 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 PRA 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:

Livestock species by population

1. chickens
2. goats
3. cattle
4. sheep
5. donkeys

Livestock species by importance to household livelihood

1. cattle
2. goats
3. sheep
4. chickens
5. donkeys

The species could also be ranked based on importance to household income, which might give a slightly different ranking. For example:

Common livestock diseases based on importance to household income e.g. cattle diseases

1. CBPP
2. Haemorrhagic septicaemia (HS)
3. Foot and mouth disease (FMD)
4. Trypanosomiasis
5. Anthrax

Diseases could also be ranked based on mortality, or frequency of occurrence.

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 cattle 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 your cattle?'*
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 livestock 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 CBPP first, followed by FMD, then HS, then trypanosomiasis. Is this correct?'*
8. Probe the results. For example: *Why did they put this disease first, why this one last, why is this one above this one?* etc.
9. Record the ranking question, the results and notes of any discussion during the ranking or during probing.

Example of simple ranking

Informants are asked to name common poultry diseases. The diseases are written on cards. Then the informants are asked to organize the cards in order of importance.

1. Newcastle disease (ND)
2. Fowl typhoid
3. Coccidiosis
4. Fowl cholera
5. Fowl pox
6. Gumboro

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 disease 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 6: Simple ranking exercise in Tanzania

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 pairwise 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 2) 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 2: 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, stones 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 diseases according to how commonly they occur.

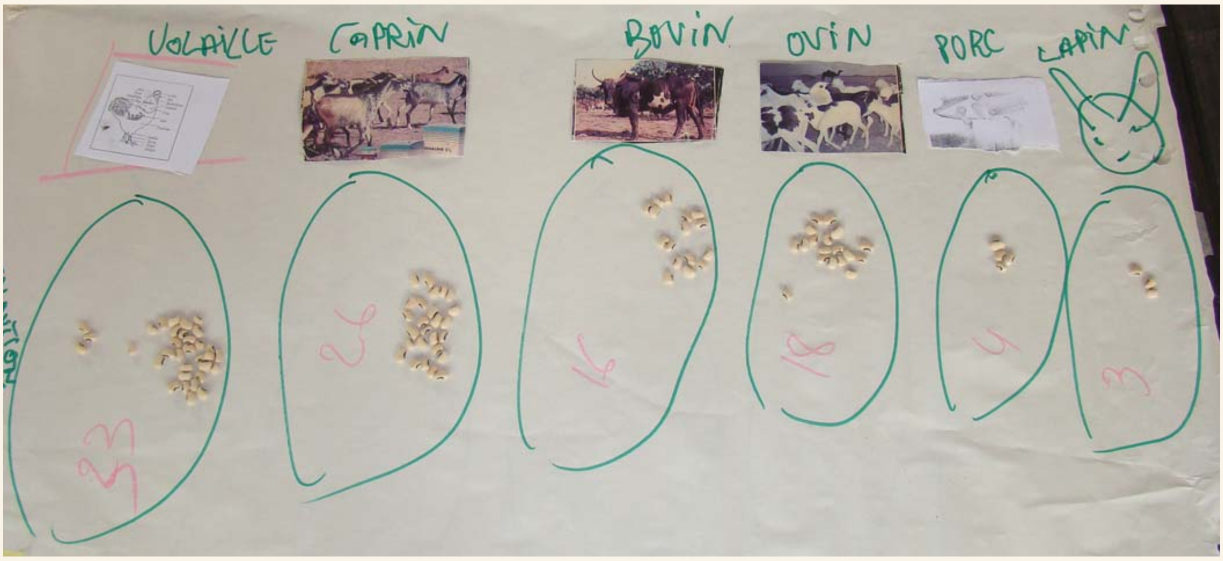

Figure 7: Results of proportional piling by number of species kept in Benin

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 disease problems affecting your cattle?'*
3. Probe the responses; ask for descriptions and clarifications.
4. Explain that you want to carry out an exercise to better understand what you are learning about their livestock disease problems. Draw circles on the ground, one circle for each disease mentioned, and place a drawing or card next to each circle that illustrates the disease.

5. Place one hundred counters in a pile and 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 impact each disease has on their livelihood.
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 disease 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?

Example of proportional piling

1. Our objective is to know which fruits are most liked by children aged 5 to 15 years in community X.
2. What are the common fruits in this area? Banana, lemon, orange and mango.
3. Use the beans to show which fruit the children prefer. The result of the exercise is shown below.

Fruits	Score	Reason
Banana	66	sweet, easy and cheap to get
Lemon	0	bitter, only eat when the other fruits are not there
Orange	19	cheap and seasonal
Mango	15	seasonal, sweet and expensive

It is usually best 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.

The results of proportional piling exercises from several groups can be averaged to derive an **aggregate** score for the community. You should

Figure 8: Proportional piling exercise in Kenya

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.

Figure 9: Proportional piling exercise in Nigeria

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

Figure 10: Proportional piling for morbidity and mortality in Uganda

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

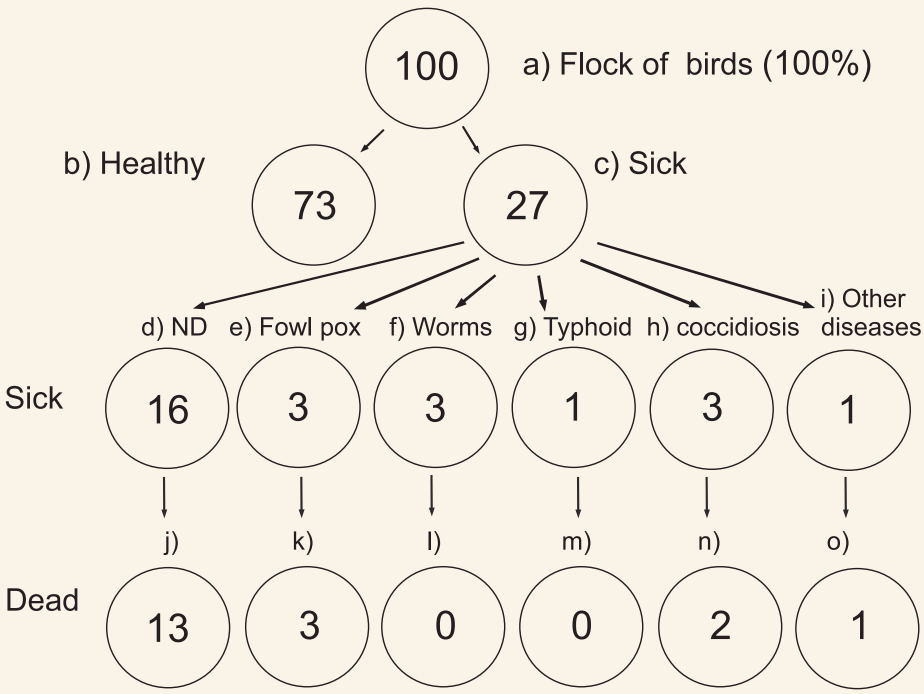

Figure 11: Example of proportional piling for morbidity and mortality for a poultry flock.

Overall flock morbidity is c = 27%
Overall flock mortality is j + k + l + m + o = 19%
Overall case fatality is (j + k + l + m + 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.

Figure 12: Matrix scoring exercise in Tanzania

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.

7. 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 3: Example of matrix scoring of clinical signs and causes of common diseases of chickens, Uganda

	***Kalusu* (ND)**	***Nsense* (Coccidiosis)**	***Ebiwuka* (Worms)**	***Kawali* (Fowl pox)**	***Senyiga* (Respiratory disease)**
High mortality	14	5	2	1	8
Diarrhoea	8	11	9	1	1
Weight loss	4	11	12	1	2
Fever	15	8	0	3	4
Lesions on wattle	0	0	0	30	0
Cough	16	0	5	0	9
Nasal discharge	15	0	4	0	11
Airborne infection	14	0	0	0	16
New bird introduction	15	0	1	3	11

Figure 13: Matrix scoring exercise in Kenya

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 30 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.

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. Human activities such as festivals, holidays 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.

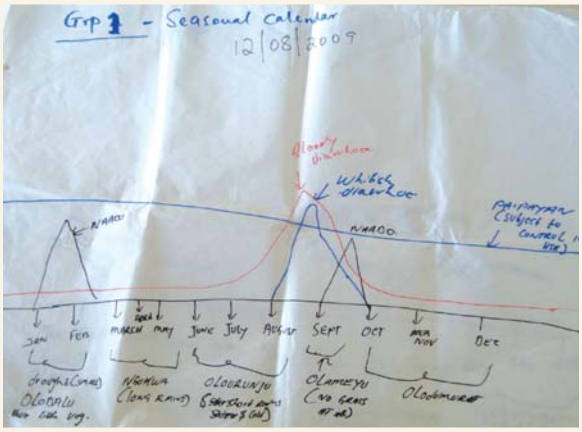

Figure 14: Seasonal calendar Kenya

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 rainfall 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 rainfall. The higher the rainfall in a season, the more counters should be allocated to that season. If there is no rain 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 4). 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?*

Table 4: Example of a seasonal calendar for cattle diseases in Maasai community, Tanzania (translated into English)

	DRY SEASON	HEAVY RAIN SEASON	COLD AND DRY SEASON	SHORT RAIN SEASON
East Coast fever	■■■■	■■■■■■■■	■■■■■■	■■
Rift Valley fever	■■	■■■■■■■	■■■■■■■	■■■■
Lumpy skin disease		■■■■■■■■ ■■■■■■■■	■■■	■
Peste des petits ruminants	■■■■■■■■■■			■■■■■■■■■■
Anaplasmosis	■■	■■■■■■■	■■■■■■■	■■■■
Contagious bovine pleuropneumonia	■■■■■■	■■■■■■	■■■■■	■■■
Foot and mouth disease	■	■■■■■■■■■	■	■■■■■■■■■
Malign catarrhal fever		■■■■■■■■ ■■■■■■■■	■■■■	
Trypanosomiasis	■■	■■■■■	■■■■■■■■■■	■■■
Tsetse flies	■	■■■■	■■■■■■■■■	■■■■■■
Ticks	■■	■■■■■■■■	■■■■■■■	■■■

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 5: Example of a seasonal calendar 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.

Once a map has been drawn it can be used to show the location of disease outbreaks, the spread of disease through an area over time and risk factors for disease occurrence or spread.

Figure 15: Participatory mapping in Uganda

Figure 16: Participatory mapping in Togo

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 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 17: Map of Ngorongoro district, Tanzania

Figure 18: Map of Butagaya sub-county, Uganda

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).

- 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 or more for diseases with long epidemic cycles such as RVF or rinderpest, three to five years for a disease which occurs more frequently such as ND, 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?*

Table 6: Example of a timeline prepared for the period 1999-2008 indicating key events in Uganda and key national or local livestock events

Year	General events	Livestock events
1999	Kabaka's wedding Congo war	Recruitment of vet graduates started CBPP influx from Congo
2000	Kanungu massacres Kisangani I and II Besigye declares political intentions	CBPP
2001	Presidential elections Signing of EA pact Ebola outbreak in North Uganda	PACE starts CBPP
2002	Bill Clinton visits Uganda Congo war ends	Uganda declared provisionally free of rinderpest
2003	Death of Amin (ex-president)	Decentralization of veterinary services
2004	Ebola outbreak in North Uganda Uganda withdraws from Congo Constitutional amendments	FMD
2005	Death of Obote (ex-president) Discovery of oil in Uganda Amendment of constitution Ebola	FMD, anthrax in QENP
2006	Presidential elections under multi-party system Floods in East and North Uganda	FMD spread reaches record levels, Anthrax in QENP (hippos died)
2007	Ebola in Bundibugyo Marburg outbreak in Western Uganda Uganda hosts CHOGM (Queen) Floods in Teso region Peace in Northern Uganda Balaio saga	FMD in E. Uganda, Uganda declared RP free by OIE Peste des petits ruminants (PPR) confirmed outbreak in Karamoja
2008	Budo inferno Obama elected US president Minister of State MAAIF Sebunya dies Kyabazinga dies	FMD, livestock census, Uganda declared free of rinderpest infection PACE ends

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.

Figure 19: Transect walk in Tanzania

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.

3

Highly Pathogenic Avian Influenza (HPAI)

3. Highly Pathogenic Avian Influenza (HPAI)

3.1 Background

Avian influenza is a common poultry disease. The disease is caused by a virus from the Orthomyxoviridae family and varies in severity depending on the strain of the virus. Thus, we distinguish between low pathogenic avian influenza (LPAI) and HPAI. In poultry, HPAI is characterized by a sudden onset, severe illness of a short duration and a mortality approaching virtually 100% in vulnerable 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 avian influenza A H5N1 which has infected more than 400 humans since 2003 leading to the death of more than half of them. It is thought that the current 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 see references from OIE (**http://www.oie.int/eng/ressources/AI-EN-dc.pdf**) and the World Health Organization (WHO).

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:

- 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

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. For poultry, the incubation period for HPAI 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

Individual countries have Standard Operating Procedures (SOPs) for sample collection and submission which are based on guidelines from OIE and/or FAO. Below we give a brief overview of the suggested steps to take upon finding a suspected case of HPAI. However, please make sure you use the SOP applicable in your country. For information on more detailed sampling for HPAI and dealing with suspicious events please see 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 would be: apron, pair of gloves, goggles, mask and boots.

Sample collection

Before you start, you will need the following equipment:

- 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 that fit the established clinical case definition for HPAI (recently dead birds are those that have died in the previous 12 hours). 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 from recently dead birds
Trachea with mucus, lungs, kidneys, ovaries (whole organs) ––> keep cool (2-8°C) and only freeze if transport to laboratory will take more than two days ––> take to laboratory

Whole recently dead birds
These may also be analyzed so long as they are kept cool (2-8°C) and transported to the laboratory within 12 hours.

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.

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 11).

- The test is usually negative with ducks and geese and gives false positive in pigeons so should only be used in chickens and quails (Thacker et al., 1998).

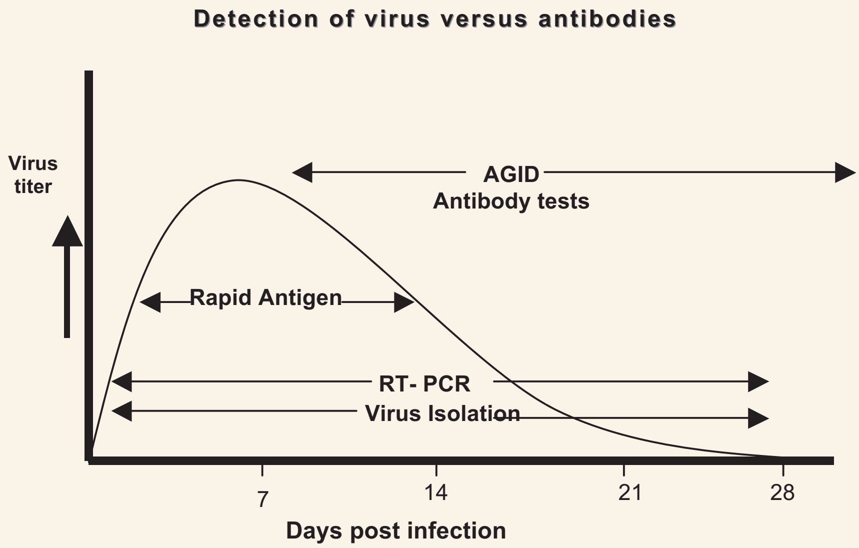

Figure 20: Detection of virus versus antibodies.

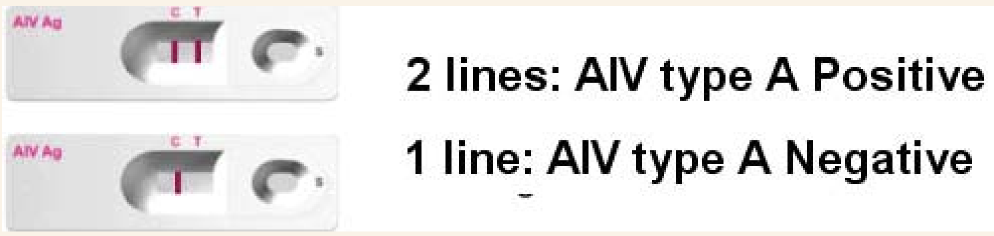

Figure 21: Positive and negative test results for avian influenza.

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.

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 or burning and burial.

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. Booties

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

Different countries have their own national disease reporting systems but all must inform OIE about the occurrence of outbreaks of notifiable disease such as avian influenza A H5N1. It goes beyond the scope of this manual to discuss the possible reporting systems, but all PDS practitioners should be aware of the established system in their country. Thus, all PDS practitioners should know who to inform when abnormal mortality possibly due to HPAI is detected.

Below are some suggested steps:

- Inform the District Veterinary Officer (or equivalent). Agree on who should take the samples and who will inform the laboratory.
- Inform the local government authority.
- Once confirmed by the national laboratory, the Chief Veterinary Officer (or equivalent) should inform the African Union – Interafrican Bureau for Animal Resources (AU-IBAR) and OIE.

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 farm
- Public awareness about the disease and measures for its prevention and control.

4

Participatory Disease Surveillance for HPAI

4. Participatory Disease Surveillance for HPAI

PDS is the application of PE to disease surveillance. PDS uses PE for active surveillance of HPAI, a form of active clinical surveillance supported by laboratory diagnostics.

4.1 Why use PDS for HPAI surveillance?

- A lot of valuable information can be collected in a short time.
- PDS can be used to target poultry populations that might be harbouring HPAI.
- PDS allows for a better understanding of the poultry diseases in an area.
- PDS 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.
- PDS has been effective in detection of other animal diseases, e.g. rinderpest outbreak in northern Kenya and outbreaks of *peste des petits ruminants* in new areas in Kenya.
- PDS 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.
- Creation of awareness on HPAI preparedness and control can be carried out as part of the exercise.

4.2 When and where to conduct PDS for HPAI

PDS is used to carry out risk-based 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 such as widespread household poultry keeping, small-scale commercial poultry and/or larger commercial farms.
- 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 disease.

4.3 Planning for PDS for HPAI

When planning to carry out PDS, one needs to decide on the following:

Objective

Examples of objectives for HPAI PDS are:

- To detect the presence of HPAI H5N1 in the target area
- To determine previous history of HPAI-compatible events in the target area

Methods

- *Checklist:* Develop an appropriate checklist that will contribute to achieving the objective. See Box 2 for an example of a checklist for HPAI PDS.
- *PE tools:* Decide what tools should be used during interviews to promote participation and dialogue, and enrich the information gathered.
- *Case definition:* Develop a clear and simple case definition for HPAI-compatible cases. If a disease event is found that fits the case definition, decide what action will be taken.
- *Sampling method:* Decide, among other issues, what the geographical focus will be, the likely key informants, the number of farms or villages to visit and the 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 PDS.
- *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.

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

PDS team: The size of the team may vary depending on the objective of the activity and available resources. Ideally, a PDS team should be composed of at least two persons: either two PDS veterinarians or one PDS veterinarian assisted by a local veterinarian or animal health worker.

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

Box 2: Checklist for HPAI PDS used in Benin and Togo

- Introductions
- Reason for visit: from the veterinary department, looking at challenges for poultry production
- Agricultural practices
- Livestock production: Species kept
- Type of poultry and management (source of animals and feeds: marketing)
- Challenges faced
- Poultry diseases (special attention to high mortality and ± respiratory symptoms)
  - Outbreaks (in the last year)
  - Current diseases
  - Describe diseases → Clinical signs
- Questions from farmers
- Advice
  - General awareness on HPAI
  - Vaccination: ND + others
  - Action taken if birds get sick: Who to contact

Transect walk and farm/household visit to triangulate and check for current disease problems

4.4 Secondary information

Before actually conducting the HPAI PDS, the PDS 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 you will be conducting. 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 PDS planning and implementation. Key informants are a source 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 meetings with commercial and free-range farmers, and organize group meetings with poultry keepers. Involving key informants in PDS 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.

4.6 Interviews

Once you have identified the study area, you must determine:

- The number of villages to be covered so as to adequately represent the area.
- 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 PDS.
  - Group interviews with household and small-scale commercial poultry keepers. 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 enough representative information while for others you 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 backyard poultry keepers for direct observation of poultry management and poultry disease problems. Again, the number of visits will depend on the size of the village and whether a significant disease problem exists.
  - Direct observation: Transect walk, visits to key livestock features such as markets, slaughter points etc.
- Whether to adapt the time of your visit to meet these poultry keepers.
- Whether it will be possible to interview groups with both men and women or if there is need to interview men and women separately; the latter option has time implications.

4.7 HPAI PDS tools

Semi-structured Interview

The semi-structured interview is the basis of PDS. 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, 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 PDS 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. Seasonal calendars can be used to understand local perceptions of seasonal variations in disease incidence in poultry. In Africa, some diseases such as worms occur all year round while others such as ND tend to be seasonal.

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 PDS, 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.

4.8 Use of HPAI risk maps

In recent years, more and more sophisticated risk maps are being generated to identify areas where there is a higher likelihood for either introduction or spread of a disease based on a set of risk factors. In the *Early Detection Response and Surveillance of Avian Influenza in Africa* project, maps are being generated for the African continent to identify areas with an increased likelihood for introduction or spread of HPAI. For more information about these risk-mapping products see the ILRI website: *http://www.ilri.org/research/Content.asp?SID=295&CCID=41*

Risk maps are useful decision-support tools if used in combination with risk assessment and local knowledge. Computer-generated risk maps are neither needed nor appropriate in all situations. PDS practitioners can easily generate their own risk maps by mapping their study area and considering risk factors for the introduction or spread of HPAI such as:

Introduction

Poultry trade

- Airports
- Ports
- Cross-border roads

Migratory birds

- Flyways
- Water bodies and wetlands

Spread

Poultry trade

- Roads
- Navigable rivers
- Markets/cities
- Poultry density

Wild birds/free-range

- Irrigated areas
- Water bodies and wetlands

5

Data Recording and Analysis

5. Data Recording and Analysis

5.1 Data recording

PDS 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
- Personal Digital Assistant (handheld computer)
- Digital pen technology
- 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

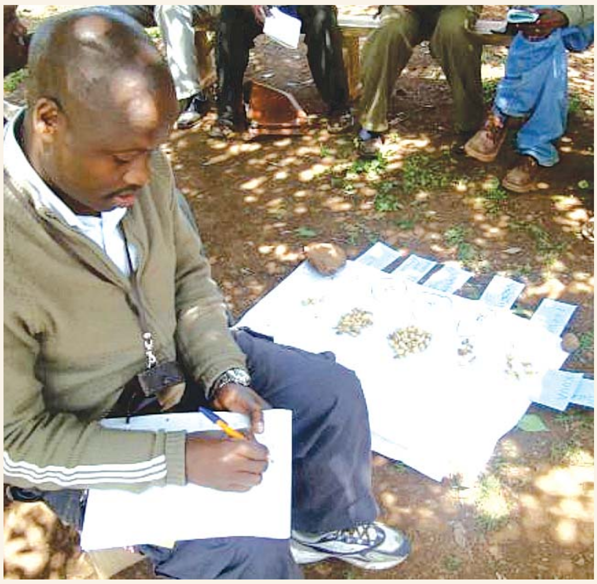

Figure 22: Note taking during semi-structured interview in Kenya

Recording of PE/PDS data differs from recording questionnaire of data because PDS collects a lot of qualitative and quantitative data in a variable order. PDS data therefore need to be organized and summarized before analysis.

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 PDS practitioners have submitted their reports, further data analysis may be carried out centrally, e.g. at the central veterinary services laboratory.

Descriptive statistics

Descriptive analysis is most commonly used to analyze PDS 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.

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