

Livestock Diseases Surveillance & Early Warning Systems Guidelines Handbook

A Reference Manual for Animal Health Workers in South Sudan



July 2018



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Tobias Odhiambo Ounga

PREFACE

The level of resources spent on control of livestock diseases increases when occurrence is unpredictable. A lot of time, human resources, financial and physical materials are spent to institute actions for treatment of affected animals, to reduce presence of disease and to prevent further spread to other animals and locations. Notwithstanding are repercussions and other losses that result from occurrence of disease such as death of animal(s), loss in milk production, reduced growth rates, reduced conceptions, reduced calving rates and reduced market value. Livestock diseases may involve a single animal, may involve household, cattle camp, village or may be spread over wide areas. The World Organization for Animal Health (OIE) report that 75% of emerging diseases are zoonotic and nearly all emerging (new) human diseases originate from animal reservoirs. The consequences of livestock disease on human can be devastating or even degenerate to crisis/emergency levels. Hunger, famine, deaths, sustained poverty and inter-clan conflicts are likely to result from outbreaks of livestock diseases.

Early detection and effective prevention are crucial in saving lives and use of massive resources. Surveillance and early warning systems monitor possibilities of occurrence as well as actual occurrence of diseases so that preventive measures can be instituted before diseases cause adverse damages. Such prevention require use of appropriate early warning signs/indicators, appropriate coordination, proper planning, good skills, reliable approaches, and relevant information and communication materials.

This handbook is intended for use by animal health workers in South Sudan as a guide towards understanding of livestock disease surveillance and early warning systems in terms of how to plan, how to monitor implementation, tracking of diseases and effects, how to coordinate, how

to mobilize resources, scenario modeling, and how to undertake other preventive measures.

Development of the handbook followed comprehensive consultations with livestock keepers, other members of cattle camps, livestock professionals from aid agencies and from government departments in South Sudan, complemented with review of written and other media information from animal health institutions.

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ABBREVIATIONS AND ACRONYMS

AHA	Animal Health Auxiliary
AHW	Animal Health Worker
ASF	African swine fever
AU-IBAR	African Union Inter-African Bureau for Animal Resources
BSE	Bovine Spongiform Encephalitis
CAHWs	Community Animal Health Workers
CBPP	Contagious bovine pleuro-pneumonia
CD	Community Dialogue
CDC	Centers for Disease Control and prevention
DRR	Disaster risk reduction
EHF	Ebola Hemorrhagic fever
FAO	Food and Agriculture Organization of the United Nations
FAO/EMPRES	FAO Emergency Prevention Systems for trans-boundary diseases of animals and diseases and pests of plants
FMD	Foot and Mouth Disease
GIS	Geographic information systems
HAT	Human African Trypanosomiasis
IGAD	Intergovernmental Authority on Development
IPC	Integrated Food Security Phase Classification
OIE	World Organization for Animal Health
OFDA	Office of the U.S Foreign Disaster Assistance
PDS/PE	Participatory disease search/Participatory Epidemiology
PPR	Peste des Petits Ruminants
PRA	Participatory rapid appraisal

PRRS	Porcine reproductive and respiratory syndrome
RVF	Rift Valley Fever
SAS	Statistical Analysis System
SPSS	Statistical Package for the Social Sciences
TADs	Trans-boundary Animal Diseases
TB	Tuberculosis
UNDP	United Nations Development Programme
UNMISS	United Nations Mission in South Sudan
UNICEF	United Nations United Nations Children's Fund
USAID	United States Agency for International Development
VSF	Vétérinaires sans Frontières
WFP	World Food Program
WHO	World Health Organization
<i>Goll</i>	In cattle camps, cattle that belong to a clan are grouped together into units called “ <i>golls</i> ”.

INTRODUCTION

In South Sudan, high prevalence of livestock diseases is a major constraint to food security, livelihoods and proper health of communities. The livestock sector has been faced with emerging and increased livestock disease outbreaks, mortalities, among others posing grave threats to the livelihoods and food security of the dependent populations across the country.

FAO/WHO/OIE electronic conference on Veterinary Public Health and Control of Zoonoses in developing countries noted that public health authorities in most developing countries were interested in zoonotic disease only when the incidence/prevalence was high or during epidemics.

VSF Suisse in partnership with VSF Germany implemented the Livestock Emergency Response Project in the Greater Upper Nile, Phase Three (LERP-III) from 1st of August 2017 to 31st of July 2018 through funding from USAID/OFDA. The goal of the project was to contribute to improved food and nutrition security of vulnerable conflict-affected, displaced, and returnee populations in South Sudan. The objective of the project was to improve access to animal source foods and income for vulnerable conflict-affected, displaced, and returnee populations in Greater Upper Nile Region, South Sudan.

The expected achievement of the project activities depended mainly on instituting and strengthening local capacities of various stakeholders in livestock disease surveillance and early warning systems. This was important in ensuring improved local capacities in prediction of outbreaks, spread of livestock diseases to new locations – the essential pre-requisites for effective containment and control of outbreaks including zoonoses. Frontline Animal Health Workers in collaboration with line ministry officials and traditional knowledge of the community are key in facilitating livestock disease surveillance and early warning systems.

This handbook provides set of guidelines that define the basic steps, skills, approaches, techniques and requirements necessary to plan and execute an effective surveillance and early warning system for livestock keepers and stakeholders.

CHAPTER 1

UNDERSTANDING CONCEPTS IN LIVESTOCK DISEASE SURVEILLANCE AND EARLY WARNING SYSTEMS

1.1. Specific terminologies in Livestock Disease Surveillance and Early Warning Systems

Surveillance

Surveillance has been applied in health to refer to tracking, follow ups and monitoring of occurrence of diseases. Surveillance also includes monitoring to detect changes in patterns of occurrence of diseases.

Early warning

These are signs that indicate likelihood of disease or other humanitarian emergency situation. They comprise of risk factors, clinical signs as well as manifestations in terms of resulting consequences. They include usual and unusual changes in weather conditions, clinical signs on livestock, clinical signs on humans, ecological changes (such as increase in certain insect species or vectors), shortage of milk, none peculiar loss of livestock, none peculiar loss in human lives and others.

Disease detection

These refer to processes, indicators and signs that lead to confirmation of presence of disease.

Zoonosis

Zoonosis is a disease that affects animals as well as human beings and is transmittable between animals and human beings. List of zoonotic diseases is given on annex II. When zoonotic disease is suspected during surveillance, human involvement should also be investigated and also considered during planning and response.

Contingency planning

These are plans that are laid down to take care of circumstances in which normal state does not proceed as usually expected. They are plans to be resorted to when things are going out of control, threatening human life.

Trigger/Trigger factor

These are factors that set off particular humanitarian situation. When these factors are detected, it is definite that they will result into particular humanitarian situation. Trigger factors in animal health crises include,

- Sudden unprecedented livestock migrations such as during displacements of people as a result of insecurity, severe draught
- Unusual flooding
- Unusual migration of birds due to severe draught
- Unusual migration of wildlife due to severe draught
- Insecurity.



Figure 1: Flooding may trigger humanitarian emergencies associated with livestock

Risk factors

These are conditions that provide favorable conditions for disease to occur.

Humanitarian emergency

This refers to a situation that is of great threat to human life. In humanitarian emergency, if relevant actions are not undertaken, the situation will be overwhelming and there is high risk of loss of human life in large numbers.

Crisis in livestock health is likely to lead to humanitarian emergency when large numbers of livestock are lost to diseases, when there is drought and livestock conditions become too bad, when livestock are not giving birth and other conditions that diminish productivity of livestock in supporting human survival.



Figure 2: Disease outbreak may be accompanied with high mortalities

Disaster

A disaster is a serious damaging disruption of the functioning of a community or a society involving widespread human, material, economic or environmental loss and impacts, which exceeds the ability of the affected community or society to cope using its own resources.

It is commonly considered that disasters strike when risks overwhelm, or are not managed.

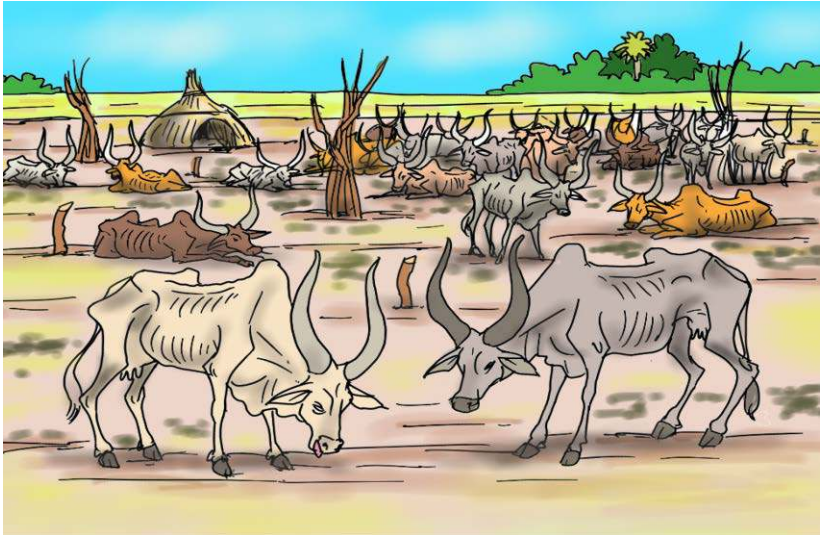


Figure 3: Disasters cause serious devastation among communities and societies

Humanitarian phase classification

These refer to stages of state of humanitarian emergency ranging from normal state, alarm, alert and eventually crisis/emergency/disaster (Further details under 7.4).

Crisis

In a crisis, the regular control measures are overwhelmed and loss of human life is/are certain.

Notifiable diseases

Notifiable diseases are disease conditions that must be reported to specific authority/ies – National, regional and international.

Newly emerging diseases

These are disease conditions that have previously not been seen to be present in population. Either, although present, they have never been identified before or they are completely new conditions.

Epidemiology

Epidemiology describes the patterns of distribution of disease conditions in a population (See more in Chapter 6).

1.2. Possible consequences during animal health humanitarian emergency

- i). Widespread death of livestock, loss of large herds, loss of flocks, low conceptions, less calves, less kids, less chicks. Anthrax, HS and CBPP cause high mortality among cattle.
- ii). Shortage of milk hence hunger, malnutrition of children, death of children, and lack of household income. Outbreak of Foot and mouth disease (FMD), Pestes des Petits Ruminants (PPR) can lead to drastic reduction in milk production and growth rates.
- iii). Zoonotic diseases result into sickness among people, death, low manpower, loss of household head. Diseases such as Anthrax, RVF, Ebola Hemorrhagic Fever (EHF), can lead to loss of life among humans.
- iv). Prohibited movement of livestock. Imposed by veterinary departments in collaboration with local authority and police.
- v). Shut down of livestock auctions.
- vi). Ban from use of watering points and grazing areas. Clans deny other clans from using their watering points and grazing areas.

- vii). Interfered with payment of dowry and of other social functions such as livestock gifts.
- viii). Disagreements and conflicts between clans, between communities over grazing areas and watering points.
- ix). Crowding of some grazing areas hence risk of spread of other diseases.
- x). Reduced economic power.
- xi). Ban on export of livestock and livestock products.

1.3. Significance and purpose of livestock diseases surveillance

- i). To detect onset early so that further effects, on herds or flocks, on food security, on economy and on human life, are prevented.
- ii). To prevent consequences on herds or flocks, on food security, on economy and on human life.
- iii). To identify affected locations and affected communities so that they can be saved from suffering.
- iv). To identify affected animals so that further spread is prevented.
- v). To identify specific causing bacteria, virus or other micro-agents so that relevant vaccination and treatments are undertaken.

CHAPTER 2

FRAMEWORK FOR LIVESTOCK DISEASE SURVEILLANCE AND EARLY WARNING SYSTEMS

2.1 Events and resources in livestock diseases surveillance and early warning system

Livestock disease surveillance and early warning system is an interaction of events and resources - plans, stakeholders, equipment, materials and other resources that are integrated together towards achievement of the goals and objectives for effective prevention, containment and control of outbreaks in livestock diseases that interfere or greatly threaten with humanity. An effective disease surveillance and early warning system is a continuous flow of the events and resources. Table 1 gives some events and resources involved in livestock disease surveillance and early warning systems.

In an effective disease surveillance and early warning system, the structure remains active throughout the year. However, some sections become more active depending on humanitarian state at particular time. For instance, state of disease occurrence may only be monitored from information from CAHWs and Animal Health Workers based in the field but when an alarming occurrence is noted at a location, a special team is sent to the field location to go and assess the situation; talk to livestock keepers, collect clinical samples, make observations on affected livestock, talk to members of households, talk to hospital workers and such others. Figure 4 presents interactions and set of events and resources in livestock disease surveillance and early warning systems.

For monitoring, disease surveillance requires continuous reflection of effectiveness of activities and implementation of the processes to check sections that are going out of plan as well as those plans that may not be good and need to be modified. Monitoring should be included early in plan to ensure the process is checked throughout. An effective monitoring includes key stakeholders.

Table 1: Lists of some events and resources involved in Livestock disease surveillance and early warning systems

Resources	Events
<ul style="list-style-type: none"> • Laboratory • Disease report files/Data • Means of transport - 4-wheel drive vehicles, motorcycles, bicycle, boats, • CAHWs, Veterinary doctors, laboratory workers, other personnel • Sampling kits • Vaccines, medicines and equipment • Write up of plans • Money/funds • Accommodation • Survey reports • Community, livestock keepers, cattle camps • Training materials • Awareness and sensitization materials. 	<ul style="list-style-type: none"> • Disease reporting • Field survey/field assessment • Development of plans • Meetings – Staff meetings to plan field surveillance, meetings to discuss emergency, community dialogues • Sample collection, sample analysis • Data analysis • Vaccination campaign, disease treatment and de-worming. • Re-stocking to re-establish herd or flocks • De-stocking to prevent massive losses in herds or flocks • Water trucking to save livestock during severe drought • Quarantine • Prohibition of livestock auction • Prohibition of livestock movement • Staff training, training of livestock owners • Awareness and sensitization.

Livestock disease surveillance and early warning system comprise of components that operates while feeding into a continuously flowing program. When one component becomes ineffective, the whole system becomes is weakened.

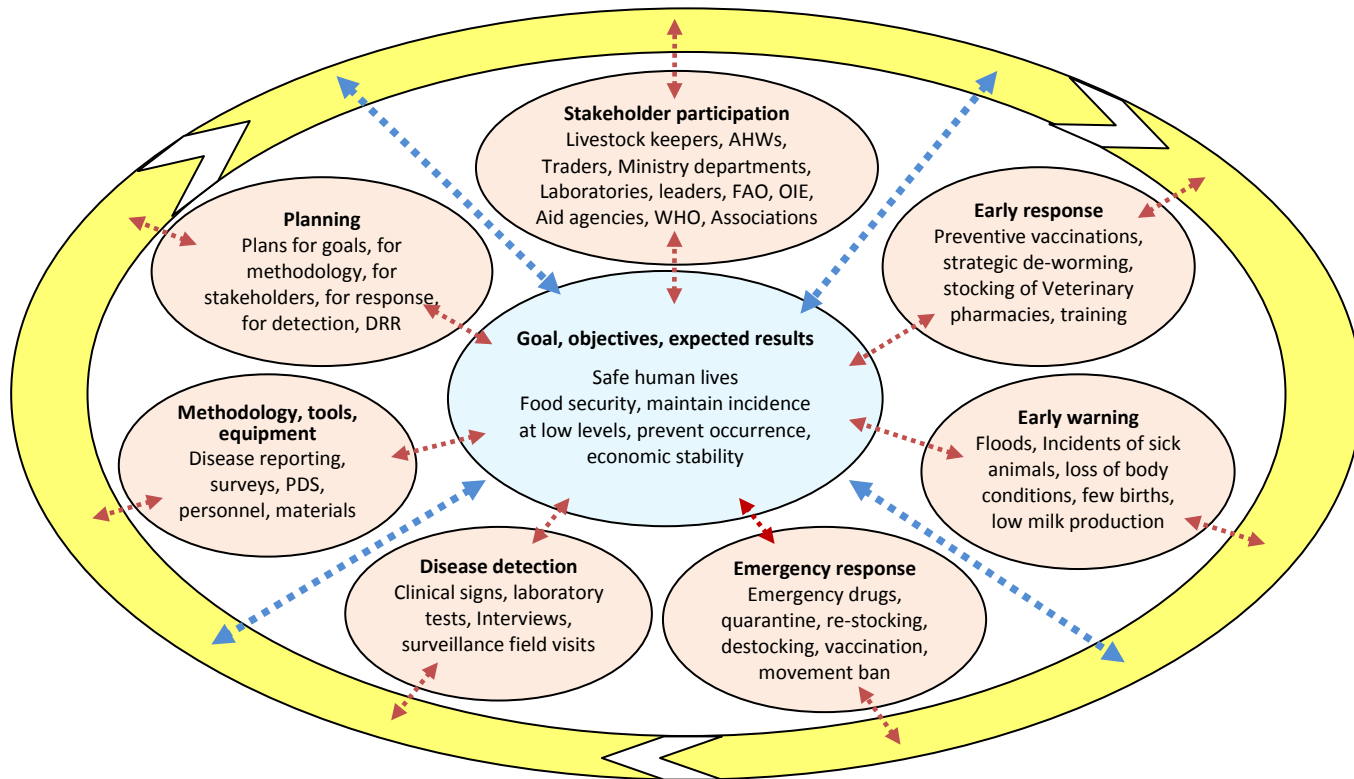


Figure 4: Interactions of events and resources in livestock disease surveillance and early warning systems

2.2 Key principles for the events and resources

- All events and resources lead to common overall goal, objectives and results.
- The goals, objectives and required results are the core of the system.
- Functionality of each component supports the others.
- The components are interlinked and also inter-relate at various levels.
- Relationships between the components are bi-directional.
- The form taken by the components depend on the goals, objectives and required results.
- The overall surveillance system is a continuous system.
- The components need to be monitored and evaluated.

During emergencies or depending on humanitarian state (explained in chapter 7), some components may become more active than during “normal times”.

2.3 Risk based and Syndromic surveillance systems

The unique characteristic of risk based and syndromic surveillance systems is that both do not include consideration of presence of pathogens. In both, the likelihood of occurrence of disease is considered in terms of risk factors and disease syndromes.

‘Risk surveillance’ focuses on detecting risk factors for disease transmission without estimating the prevalence of pathogens, or identifying clinical features. ‘Syndromic surveillance’ focuses on disease trends by analyzing data on a set of clinical symptoms that are potentially associated with a disease without necessarily considering identification of pathogen.

These approaches enable commencement of early response actions even before pathogens are confirmed by laboratory tests. For instance when cattle show signs of ulcerations in the mouth and between the hooves, movement control, quarantine and closer monitoring at auctions yards may be initiated before other confirmations. These would reduce further serious spread and possibility of advancing into outbreak levels, in the case of FMD.

CHAPTER 3

SURVEY APPROACHES AND DESIGN

3.1. Rationale for surveys in livestock disease surveillance and early warning

Survey approaches aim at explaining the situation of disease. These include presence and patterns of occurrence (affected locations, numbers affected, consequences, seasonality, trends of incidence and others). Specific objectives for a particular survey exercise vary depending on suspected disease, level of involvement (i.e the phase of emergency) and circumstances on ground. The aim and objectives of a survey determines the methodology applied. The following factors should be considered while planning the methodology and approach: -

- i). What problems does the survey seek to solve?
- ii). What questions does the survey seek to answer?
- iii). What information will the survey gather?
- iv). What information is already available?
- v). What are the expected sources of information? These could be livestock keepers, animal health organizations, government ministries, field data and similar others.

3.2. How to enhance accuracy and reliability of results of a survey

- i). Use of combination of several methods and tools - In case of errors in some tools, other tools helps in verifying. When more than one method yields similar information, it implies the information is more accurate.
- ii). Adequate coverage – Survey should cover adequate area, number of animals, locations, cattle camps, in order to obtain a clear picture of the situation. This is usually considered in terms of sample size. The

bigger the sample size, the more accurate the information. However, too large sample size consumes resources for no purpose.

- iii). Relevant source – The source should be part of affected or very closely associated with those affected. Wrong source leads to wrong conclusions hence wrong response in mitigation actions.
- iv). Several sets of data (Replication) – For instance when obtaining information by interview, they should be from several affected villages. The same type of interview/inquiry is repeated in a number of villages. In case in which the data is clinical sample, this is collected from a number of herds, cattle camps, “golls” or homesteads.

3.3. Methodology and tools for surveys in livestock disease surveillance and early warning

The following approaches and methods are used: -

i. Literature search/review

Sources of literature are reports from Veterinary department, Ministry of Health, Aid agencies, University papers, Assessment missions and similar others.

They give information on percent of livestock affected, locations affected, time, mortalities, rate of spread, species of livestock affected and clinical signs.

They may be in form of hard copy papers in files or online in the internet.

Review of existing literature/literature search commonly involve desk study in which the investigator sits on a desk and studies reports on the hard copy papers, books, journals, University papers, monthly reports, annual reports, project reports, reports of previous surveillance and such others.



Figure 5: Sources of existing literature include information from the internet

ii. Field visits

Field visits are usually important for collecting particular types of information and data such as household interviews, clinical and pathological samples, interview of key informants, community dialoguing, transect, physical triangulation and others. Direct observations are made during field visits.

Important field visits during disease investigations include visits to cattle camps, homesteads, grazing areas, watering points, migration routes, livestock auctions, slaughter places and butcheries.



Figure 6: Survey team during field visits

iii. Key informant interviewing (KII)

Key informant interviews are necessary for obtaining information from key people involved in livestock keeping. Such key informants comprise of owners of livestock, herders, milking women and girls, cattle camp leaders, the chief, community animal health workers, livestock traders, slaughter site workers, butchers, traders of hides and skins, milk vendors, milk transporters, staff of ministry of animal resources, medical staff, staff of aid agencies, staff of inter-governmental organizations such as FAO, AU-IBAR, IGAD, laboratory staff, milk consumers, milk processors consumers of meat and consumers of eggs.

iv. Household interviews

Household interviewing provide information and data specific to individual households. Questionnaires are often applied to conduct

household interviewing and administered by enumerators. It is important that respondent household member clearly understands the question posed to them, otherwise the information and data obtained will not be accurate and not reliable. This requires that the enumerator also clearly understands the questions well and is able to convey it to the respondent accurately.

A major limitation of questionnaires is that they are pre-designed; making it difficult to obtain information and data that only emerges during the interviewing.

Questionnaires are also considered to be more extractive, only obtaining information from respondent while not giving feedback possibilities.

v. Community dialogues

Various sectors of the community are knowledgeable about information on diseases. The men, elders, leaders, women, youths are useful in providing information on disease situation. Community dialogues (CDs) are meetings with community members during which interactive discussions are conducted.

Various types of participatory tools are applied during community dialogues, such as simple listing, proportional ranking, pair-wise matrices, spatial mapping, transect walk, livelihood resource mapping, historical time lines, seasonal calendars, institutional analysis and gender daily activity calendars.



Figure 7: Proportional piling exercise during community dialogue

vi. Collection of clinical and pathological samples

These include blood samples, swabs of mucus membranes, fecal samples, skin scrapping, pus, intestinal contents, samples of feeds, samples of herbs in the pasture, tissue parts such as the head of dead dog in cases of Rabies.

Critical precautions during sample collection

- Be careful to know circumstances under which blood, discharges, meat and tissues should never be touched. These include Suspected Anthrax, RVF and Ebola viral hemorrhagic fever (EHF).



Figure 8: A surveillance team collecting blood sample from a cow

- Blood samples are carried chilled, clotted or non-clotted.
- Special permits may be required to transport specific samples across particular borders.

vii. Participatory Disease Search (PDS) and Participatory Epidemiology (PE)

Involving wider category of stakeholders increases the accuracy, validity and reliability of information and data. This implies that various stakeholders are involved in providing relevant information and other data. Stakeholders should be involved throughout from planning, implementation of survey activities and in the responses.

Effective disease surveillance comprise application of comprehensive methodology using diverse tools and approaches such as literature review, field visits, participatory rapid appraisal (PRA), clinical and pathological samples, key informant interviews, household interviews, statistical analysis, laboratory analysis, and Geographic information systems (GIS).

By using diverse array of methods, approaches, tools and stakeholders, the information obtained can be compared to enhance reliability and accuracy.

In whereas PDS refer to the entire processes in disease study/search, PE tends to refer to epidemiology study.

viii. Laboratory analysis

Laboratory analysis include examinations using microscope, tests using chemical reagents and with various other machines that determine concentrations, counts and anti-bodies or antigen of disease particles. Laboratory analysis also includes statistical tests applied on figures obtained from observations on clinical samples.

Basic veterinary laboratories may be operated by government departments at Counties or by public or private veterinary clinics. More specialized laboratories may be regional, national or specially operated by intergovernmental agencies.



Figure 9: Laboratory analysis in progress

ix. Data analysis

Data analysis include statistical tests applied on figures collected from household questionnaires, figures obtained from observations of clinical samples, from laboratory results and on figures obtained from participatory tools.

Statistical parameters/summaries include mean, expectation, average, mode/most frequent, standard deviations, quartiles, highest, lowest, variance and others.

Depending on type of statistical summaries needed, various statistical software programs can be used including Ms Excel, SPSS, Genstat, SAS, and Harvey.

Description of outcome of data analysis are presentable as reports, tables, graphs, videos, slides, discussions, talks, press statements, policy briefs and others. Figure 10 gives example of graphical summary from data analysis.

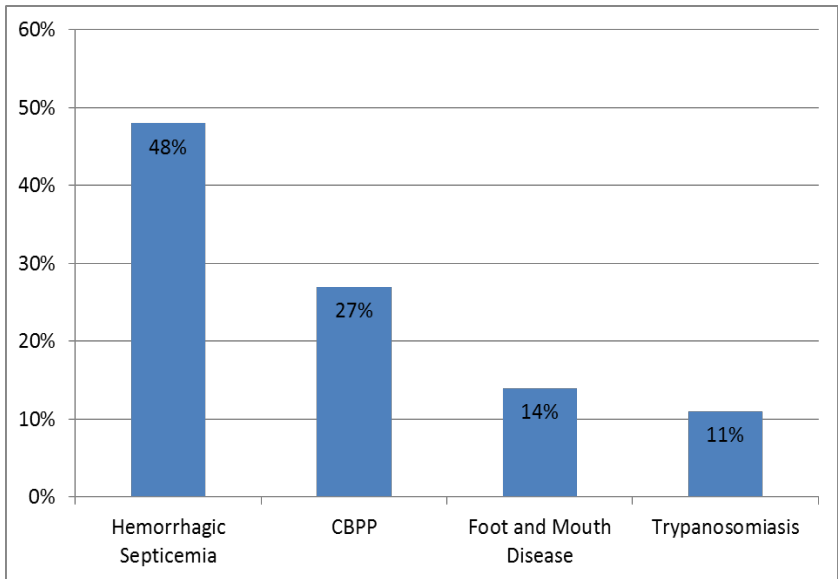


Figure 10: Graphical presentation of outcome of data analysis

CHAPTER 4

STAKEHOLDERS IN DISEASE SURVEILLANCE AND EARLY WARNING

A functional livestock disease surveillance and early warning system involves relevant stakeholders in livestock keeping, livestock trade and disease control and prevention. Each play important roles to ensure monitoring of diseases, detection, planning processes, resource mobilization, control, prevention and other mitigation activities.

Involvement of particular stakeholder depends on type specific mitigation and methods employed in those processes.

4.1 Livestock keepers and handlers

These include,

- 1) Livestock owner
- 2) Cattle camp leaders
- 3) Herders of livestock
- 4) Milking girls, boys and women.

These stakeholders are interchangeably referred to as livestock keepers or as livestock keepers and handlers.

Forms of information provided by livestock handlers

- Proportions of livestock affected
- Clinical signs
- Proportions of livestock that die
- Locations affected by disease
- Type of husbandry and management of livestock
- Patterns of livestock movement
- Past history

- Human involvement
- Ethno-veterinary information.



Figure 11: Livestock keepers and handlers are important stakeholders in livestock disease surveillance and early warning systems

Other roles and significance of livestock handlers

- By continuously being together with their livestock, they are part of routine monitoring on diseases
- Guide surveillance team to affected locations
- Guide surveillance team to affected livestock
- Implement control and preventive interventions
- Provide local resources
- Participate in planning.

4.2 Service providers, (aid agencies), OIE, UN agencies, AU-IBAR

They provide extension services, animal health services, input provision and aid support. They include,

- 1) Animal health workers
- 2) Extension workers
- 3) Aid agencies involved in livestock
- 4) Private veterinary pharmacies
- 5) Traditional healers
- 6) The United Nations agencies – FAO, UNICEF, UNDP, WFP, UNMISS
- 7) Other inter-governmental agencies – such as AU-IBAR.

Forms of information provided by service providers

- Routine reports on animal health
- Locations of affected areas
- Alarms on outbreaks
- Locations of services
- Status of services such as functional veterinary pharmacies, availability of veterinary drugs and equipment
- Survey, assessment, surveillance reports.

Other roles and significance of service providers in livestock disease surveillance and early warning system

- Coordinate implementation of control and prevention activities
- Organize other stakeholders
- Support mobilization of resources
- Support in synthesis of information
- Support facilitation of meetings
- Comprise technical personnel

- Organize, facilitate and support resources for training
- They face professional hazards while handling sick or carrier livestock and samples
- They need to be well skilled in handling risky materials
- During zoonotic disease emergencies such as EHF and RVF, they need to be specifically further sensitized on safety against professional hazards.

4.3 Traders of livestock, and in products of livestock

These include,

- 1) Livestock auction traders
- 2) Butchers
- 3) Meat transporters
- 4) Slaughter site workers
- 5) Hides and skins traders
- 6) Hides and skins processors
- 7) Hides and skins transporters
- 8) Milk vendors/sellers
- 9) Milk processors
- 10) Milk transporters
- 11) Traders of poultry products
- 12) Restaurants handling foods of livestock origin
- 13) Traders and processors of blood, bones, hair, horns, fur and feathers.

Forms of information provided by traders

- Changes and trends in quality of livestock, meat, milk, hides and skins
- Livestock movement
- Trends in availability of livestock, meat, milk, hides and skins

- Trends in price
- Catchment areas
- Sale rates.

Other roles and significance of traders

- Implement movement controls
- Implement handling controls
- Practice safety measures for handling of livestock, meat, milk, hides and skins
- Monitor changes and trends in quality of livestock, meat, milk, hides and skins
- Participate in planning
- Since they handle products, they are at risk of infection by zoonotic diseases.

4.4 Consumers of livestock products

These mainly comprise the general population that consumes meat, milk, blood and other products from livestock.

Forms of information provided by consumers

- Changes and trends in quality of livestock, meat, milk, hides and skins
- Rates of consumption
- Sources of products consumed
- Forms in which the products are consumed
- Locations of consumption.

Other roles and significance of consumers

- Responsible for safety measures while handling livestock, meat, milk, hides and skins, and related products.
- Since they handle and consume the products, they are at risk of infection by zoonotic diseases.

4.5 Regulators of the livestock industry

Regulators comprise government departments, institutions and regional bodies that are responsible for laws, policies and enforcements in the livestock industry. Regulators in livestock sector include,

- 1) Ministry departments – of veterinary services, wildlife, health, public health and medical staff. They regulate and control use of drugs and equipment, live animal trade, hides and skins trading, meat, milk, eggs, livestock feeds, feed ingredients, bones, horns, hair, fur, feathers, tools, service provision, trade and other products.
- 2) Local government – Regulate trade premises and levies on products.
- 3) Police – Are law enforcers.
- 4) River chief.
- 5) Immigration and emigration departments – Regulate and control import and export of drugs and equipment, live animal trade, hides and skins trading, meat, milk, eggs, livestock feeds, feed ingredients, bones, horns, hair, fur, feathers, tools, and other products.

Forms of information provided by regulators

- Routine reports on animal health
- Survey, assessment, surveillance reports
- Policies, laws and regulations that concern livestock keeping and trading
- Trends in trading
- Quantities of products traded
- Routes of trading
- Number of people and businesses involved in trading
- Incomes from trading
- Revenues from trading.
- Sources and destiny of traded products.

Other roles and significance of regulators

- Coordinate formulation of policies, laws and regulations
- Enforce laws and regulations
- Monitor implementation of laws and regulations
- Support mobilization of resources
- Have good contact with livestock keepers
- Wide areas of jurisdiction
- Have important networks for awareness and sensitization of livestock keepers, traders and service providers.

CHAPTER 5

EPIDEMIOLOGY OF DISEASES

Epidemiology refers to descriptions of patterns of disease occurrence in a population. It describes the patterns of distribution of disease conditions in a population in terms of season of occurrence, demographic distribution of occurrence (such as age of animals that get affected), physiologic status of animals that get affected, number of livestock affected, mortality rates and other similar factors. For instance, the following was used to describe the epidemiology of Hemorrhagic septicemia (HS), in Jonglei in 2013: -

- Occurred as outbreaks in certain Payams (such as Lith Payam)
- Mainly adult cattle and older calves were affected
- Affects about 21 % of the herd
- 95.5 % of affected cattle died.

Epidemiology describes the characteristics of disease in terms of herd/flock involvement, size of area involved and seasons of occurrence, therefore refers to both time and space of occurrence.

5.1. Special terms used to describe epidemiology of disease

Endemic

This refers to patterns that are same from year to year. For instance Rabies in Northern Bahr el Ghazal is always present at constant rate, every year.

Endemic occurrence can further be described as: -

- Hyper-endemic - an endemic disease that affects a moderate proportion of the population.
- Meso-endemic - an endemic disease that affects a moderate proportion of the population.

- Hypo-endemic - an endemic disease that affects a small proportion of the population.

Sporadic

This is when disease condition occurs suddenly in an area where it has not been present. The disease condition can occur without any prediction, such as the occurrences of Ebola Hemorrhagic fever (EHF) in West Africa have been sporadic.

Epidemic

Epidemic is an occurrence that involves many countries of the world. Most of epidemics occur in regular cyclic patterns over long periods of time. This is because when they occur, the susceptible affected animals die or some survive and become immune. Therefore, the disease seems to disappear from the population for some period. As new susceptible individuals are born or gradually brought into the population, they are affected and the next epidemic is experienced.

Outbreak

The occurrence of a disease is described as outbreak when the incidence (or frequency) of the particular disease has increased to levels that raise unusual attention. The disease condition may have been absent in the population or may have been endemic.

Determinants of disease

These are factors that increase the occurrence of disease. They can be intrinsic or extrinsic.

Intrinsic determinants of disease are those that are part of the animal. They comprise of the ***living disease agents, non-living disease agents*** and ***host determinants***.

Living disease agents include viruses, bacteria, protozoa, fungi, worms and external parasites. Non-living disease agents include cold, heat, water and toxins. Host determinants are host factors that can influence the extent of occurrence of disease include breed of animal, species, age, sex and physiologic status.

Extrinsic determinants of disease are those that are not part of the animal such as climate, soil types and human management.

5.2. Livestock disease seasonal calendars

Some diseases are associated with specific seasons of the year. Seasonal disease calendars are important for prediction of future occurrence of diseases as well as for identification (diagnosis) of disease in a population. Seasonality of occurrence may be due to higher presence of insect vectors, environmental temperatures, swampy conditions and other ecological conditions. It should, however, be noted that not all diseases have seasonal patterns of occurrence.

Application of disease seasonal calendars for prediction

Seasonal disease calendars can be applied to predict risks of occurrence of disease by matching seasons of previous occurrences with similar seasons in coming periods.

Application of disease seasonal calendars for identification (diagnosis) of disease

When the seasonal pattern of occurrence of a disease is known, the information can be applied to rule out or include a particular disease among a list of those suspected during diagnosis.

Disease calendars can be developed from existing data bases of diseases, routine reports, prepared through consultations with stakeholders in livestock health or from data obtained by household interviews. Various

methods can be used to obtain information which are then compared and triangulated for higher precision and reliability.

Generally, good understanding of the overall epidemiology of a particular disease requires comprehensive information gathered through various approaches and tools. Thus epidemiology, disease surveillance, disease diagnosis and disease monitoring are inter-related processes for which similar methods are applied. The methods and tools comprise of review of existing literature, interview of key informants (including owner of animal, handlers, community leaders, animal health workers), field visits, collection of clinical samples, household interviews, community dialogues, laboratory analysis, statistical data analysis and others.

CHAPTER 6

TRAINING OF FIELD WORKERS

Availability of skilled workers is vital for routine activities of planning and implementation of disease surveillance and early warning systems. This is achieved through relevant courses in form of routine training, refresher training and other added capacity building courses.

6.1. Routine training

Routine training, mainly undertaken in form of the regular government education programs for production of personnel are important for continuous production of skilled technical workers. After nursery, primary and secondary education, courses in animal health, laboratory technology, social work, meat hygiene, milk handling and processing and others are professional specializations in the livestock sector. They are mainly the core professional courses with certificate, diploma, bachelors', masters and doctorate qualifications aimed to produce planners, veterinary surgeons, laboratory workers, livestock researchers, statisticians, cold chain technicians, social workers are significant for planning and implementation of disease surveillance and early warning systems. Routine training courses may be subsidized by scholarship grants or availed through special loans.

After core professional qualification, other further courses may be undertaken including those that complement the skills obtained at Certificate, diploma, bachelors, masters and doctorate qualifications.

6.2. Refresher training

Refresher training are conducted to update workers on new trends or to adapt to specific technical issues to be tackled. In South Sudan, CAHWs are usually taken through refresher training to update them on actual vaccination of specific diseases, handling of specific groups of veterinary

drugs to be used, livestock disease reporting, veterinary public health, animal welfare, cross border diseases and newly emerging diseases. During the outbreak of avian influenza in Egypt in 2011/12, refresher courses were organized and conducted for CAHWs in some at-risk Counties. Effective training should apply participatory approaches that take into account adult learning principles, active learning, protection of vulnerable groups and gender sensitivity.



Figure 12: CAHWs undergoing refresher training

6.3. Training for emergency response

Emergency humanitarian response is in time of crisis. Approach to interventions during such times is different from operations in “normal” times. Field workers need to be taken through training to handle actions that are not routine and to focus on specific disease, its effects and required mitigation.

Types of courses suitable in the event of emergency

i). General

- Basic mapping and geography
- Interviewing skills
- Sensitivity to local cultural practices
- Safety measures during field visits
- Contingency planning
- Disaster risk reduction (DRR).

ii). Livestock related

- Sampling techniques
- Handling of clinical samples (specifically on the disease at hand)
- Training on household interviewing
- Professional hazards and safety measures for specific disease outbreak/occurrence
- Prevention and control
- Vaccination
- Cold chain management and maintenance.

6.4. Characteristics of the adult learner

While planning for training of field workers, it should be noted that they are adults hence require special skills on adult handling during training events. The adult learner tends to have past experiences, personal interests and engagements that may affect their learning process. The following are significant characteristics to be taken into account: -

- When they decide to attend a training event, they expect to benefit on the purpose of the event. If that purpose is not supported, they will switch off.
- Adults absorb best when it is clear to them that the context of the event is relates to their daily engagements.

- Adults have experience of being independent; they weigh out situations and make decisions on what options are best for them. The freedom of independence should be respected. Directives, commands, and other instructions that limit independence should be avoided during training.
- Adults absorb best under active involvement and interactions. To keep on track on the proceedings, they check back on unsolved questions, they test by the mind until it is accepted by their conscience.
- Adults are voluntary learners. They perform best when they have decided to attend the event for purposes that benefit them.
- Adults have important experiences which will be beneficial to others in the event. Methodology of the event should encourage sharing of ideas and information.
- Adults have domestic household responsibilities that they need to attend to from time to time. These include needs for daily meals for the household, need to earn income, care for livestock, so, the timing, duration and venue of training events should be properly organized.

6.5. Other short courses for capacity building

Other courses that are important in livestock diseases surveillance and early warning include short training courses in PDS/PE, CD, Monitoring and evaluation, facilitation skills, project planning, finance and accounting, participatory training and monitoring, team building, project cycle management, GIS, participatory resource mapping and other.

They mainly comprise of skills that although are not part of curriculum/syllabus of core professional courses, they are of importance in interacting with communities, planning, managing field teams, organizing training events, evaluation, resource mobilization and project management.

Short capacity building courses may be undertaken for a particular organization or individuals may apply to attend on their own accord.

Various short capacity building courses are regularly planned by various institutions and originations. They include courses tailor-made to suite requirements of organizations or other curriculum. A number of relevant courses are advertised on-line.

CHAPTER 7

EARLY WARNING AND EARLY RESPONSE PLANS AND MODELING

7.1. Early warning in livestock emergencies

Humanitarian emergencies often lead to devastating consequences if appropriate mitigating actions are not taken on time. Emergencies may occur abruptly and suddenly without early indicators. Indicators that help in identifying possibilities of emergencies at early stages are important in preventing serious consequences.

Early warning signs include weather patterns, clinical signs, changes in husbandry management, unusual patterns in livestock trading and other factors that co-relate to emergency situations. They comprise of determinants and risk factors in livestock health.

During past outbreak of Avian Influenza, high mortalities of wild birds have indicated impending outbreak. Teams were sent to affected locations who conducted assessments, including laboratory sampling.

7.2. Early response

Early response minimizes severe devastation that would otherwise result if timely actions are not instituted. Early response relies on early detection. The aims of early response are to minimize loss of human lives, loss of livestock through high mortalities, food shortages and economic losses.

7.3. Livestock interventions in humanitarian emergencies

i). Emergency vaccination

Emergency vaccination may be conducted to save livestock facing risk of outbreak. Such vaccination are organized and conducted only when an outbreak is suspected. Emergency vaccinations are not part of routine vaccinations based on specific periodic regimes. Some diseases for which

vaccination are carried out to prevent and control outbreaks are HS, CBPP, PPR, FMD, Anthrax, Rabies and others. Emergency vaccination can be conducted on migration routes, at cattle camps or at households depending on type of disease, targeted animal species, logistics and other factors.

ii). Treatment and de-worming

Particular humanitarian emergency conditions may interfere, or severely threaten to interfere with livestock husbandry services. Such include interference with free trade on veterinary inputs, interference with livestock movement for grazing or interference with animal health services in the county. When the interference leads to increase in disease incidences to emergency levels, treatment and de-worming exercises are useful in saving large losses of herds and flocks or their productivity. De-worming may be conducted when there are risks of worm overload associated with humanitarian emergency. Severe flooding, war/other conflicts, tensions due to insecurity may interfere with service provision in livestock husbandry.

iii). Re-stocking

Livestock are source of food, income and other socio-economic sustenance for households. In emergencies in which large numbers of livestock are lost, the communities may face hunger, starvation and famine. During the 1983 – 2005 conflicts in South Sudan, over 97% of an estimated 2 million deaths were due to diseases and malnutrition. Large numbers of livestock died of diseases and food became scarce. Re-stocking avails livestock back to affected communities thereby improving availability of food and incomes. Re-stocking, especially for communities that highly depend on animals for their livelihoods, are important in restoration, recovery and rehabilitation of food security and livelihoods. Re-stocking may be through goats, sheep, cattle and camels.

Re-stocking can involve purchase of livestock from the more able households within the community for distribution to most affected households. When livestock are purchased from within the villages, re-stockings also aids in cash transfer to vulnerable communities.



Figure 13: A group of community members re-stocked with goats

iv). Water tracking

Water tracking is an intervention undertaken in emergency cases where drought is part of factors leading to the emergency or is a factor that worsen the emergency. It is an intervention that may be relevant in arid and semi-arid locations.

v). De-stocking

De-stocking aims at reducing livestock populations when high mortalities are anticipated. It is an action of salvaging livestock that are likely to die

for instance due to severe drought, or high displacements of human settlements during wars. Commonly de-stocking is done alongside slaughter and the meat issued to vulnerable members of the community facing humanitarian emergency.

Other activities undertaken alongside those mentioned in this section from i) to v) are refresher training, awareness and sensitizations of various stakeholders, rehabilitation of veterinary drug stores, capacity building of animal health workers and resource mobilization.

7.4. Contingency planning and scenario modeling

Generally, routine preventive and control measures should ensure that emergency states are avoided. However, humanitarian emergency may occur when the normal measures are overcome. Contingency plans are resorted to when the usual “normal” state changes towards bad.

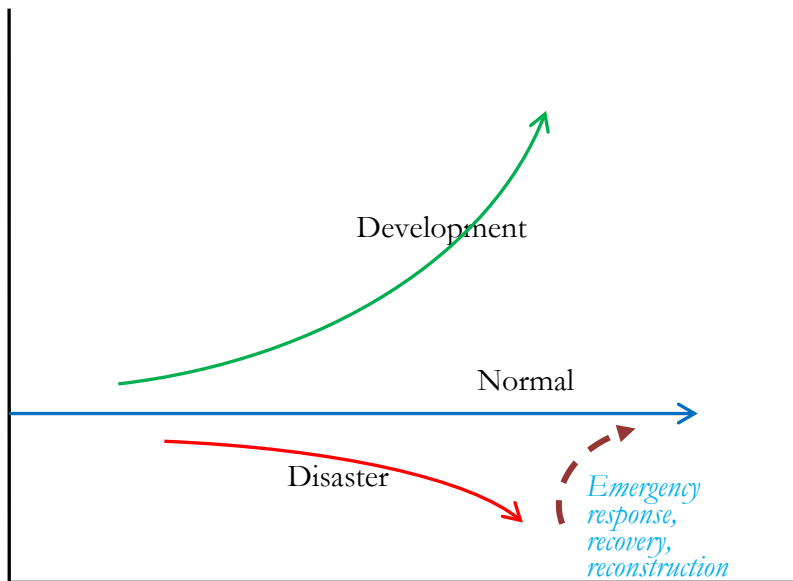


Figure 14: Paths under normalcy, development and during humanitarian state

Since contingency plans are intended to take care of circumstances out of the “normal”, they are designed to be activated in the event of, or in case of impending humanitarian emergency. They are therefore modeled on various scenario possibilities. Should any of these unexpected possibilities occur, then the contingency plan is activated (otherwise, the other normal plan continues to be applied).

An effective contingency plan exploits all possibilities and sets out actions to be instituted in the event of these possibilities. Contingency planning therefore requires proper risk analysis to identify possible risks so that relevant solutions are formulated. Figure 14 gives paths under normalcy and during humanitarian state.

Phases of humanitarian emergencies


Humanitarian emergencies progress in stages changing from normal and, eventually if no mitigation action is taken, end up into crisis and disaster.

At the crisis/disaster stage, the local community is overwhelmed, and coping strategies lead to destruction of community support structures and more lives of human being are lost. Table 2 gives the core characteristics of humanitarian emergency phases.

Table 2: Core characteristics of humanitarian emergency phases

Phase	Characteristics
Alarm	At least 20% of community are affected but can cope without irreversible actions.
Alert	At least 20% of community are affected, can cope, but with irreversible actions.
Emergency	Loss of life occurs or is definite.

Table 3: Contingency plan and scenario modeling

	Phase (Scenario)			
	Normal	Alarm	Alert	Crisis
	Phase I	Phase II	Phase III	Phase IV
				
Signs, indicators	Livestock are healthy – Normal milk production, normal growth rates, normal birth rates, or Endemic state of disease	Abnormal patterns detected Warning signs detected e.g from endemic to sporadic, pandemic	Loss of life among human is eminent	Loss of life among humans being experienced
Actions				
Livestock keepers	Routine reporting	Report to AHWs, chief, MP	Heed control measures	Stop livestock movements
Aid agency	Support development	Inform national institutions, awareness and	Relief e.g emergency treatments and de-	Intensified relief

		sensitizations, assessments, surveillance team	worming, emergency vaccinations, refresher training, coordination meetings	
Animal health worker	Routine reporting	Inform national institutions, chief, Payam administrator, County Commissioner	Support relief	Support relief
Ministry	Routine reporting, policy and regulations	Sensitization and awareness creation, policy and regulations	Sensitization and awareness creation Restrict movement, policy and regulations	Quarantine of locations
FAO	Technical support	Technical support Vaccines procurement and movement	Mobilize resources, Vaccines procurement and movement	Technical support, Vaccines procurement and movement
OIE	Technical support	Technical support	Technical support	Technical support

The phases towards emergency crisis can be described to change from normal, alarm, alert then to emergency/crisis/disaster. The stages have been assigned colors of green, yellow, orange then red to denote normal, alarm, alert, and eventually disaster. In food security, the stages have been described by the Integrated Food Security Phase classification (IPC) as given on annex IV.

Contingency planning consideration of various possibilities and for each, mitigation actions are planned, specific to particular location, country or disaster threat. For instance, contingency plans can be prepared for livestock health for a County or plans for such as Avian Influenza for the whole country. Table 3 presents contingency plan for livestock.

Since circumstances are dynamic and keep developing differently with time, contingency plans should cover specific period of time after which updating, review and re-planning is necessary.

Although contingency planning may be considered to be Disaster Risk Reduction (DRR), basically the latter term refer to the entire processes of prevention, control and reduction of occurrence of disasters. Thus, livestock disease surveillance and early warning system is a DRR on the part livestock husbandry and health.

CHAPTER 8

CIRCUMSTANCES AND LEVELS FOR REPORTING OF LIVESTOCK DISEASES

The World Organization for Animal Health (OIE) classifies animal diseases into two “lists” – List A and List B in order to characterize their level of significance in terms of international trade and public health consequences.

i). List A diseases

These are "Transmissible diseases which have the potential for very serious and rapid spread, irrespective of national borders, which are of serious socio-economic or public health consequence and which are of major importance in the international trade of animals and animal products." List A diseases are: -

- Foot and mouth disease
- Vesicular stomatitis
- Swine vesicular disease
- Rinderpest
- Peste des petits ruminants
- Contagious bovine pleuro-pneumonia.

ii). List B diseases

They are "Transmissible diseases which are considered to be of socio-economic and/or public health importance **within countries** and which are significance in the international trade of animals and animal products."

This group includes diseases such as:

- Rabies

- Heartwater
- Tuberculosis
- New and Old World Screw worm
- Brucellosis and many others.

iii). Trans-boundary animal diseases (TADs)

During the BSE epidemic in Europe and the outbreaks of Nipah virus in Malaysia, it was noted that even “**unclassified**” diseases can have severe economic or trading implications, especially when there is a link to public health. Thus a new emphasis was developed by FAO since January 1994. This placed more emphasis on promotion of the goal of enhanced world food security and the fight against trans-boundary animal diseases (and plant pests). This was because outbreaks of such diseases or pests can result in food shortages, destabilize markets and trigger trade measures. The FAO EMPRES - Emergency Prevention Systems for trans-boundary diseases of animals and diseases and pests of plants was established to address this. The program put set of significant livestock diseases in specific group: “trans-boundary diseases (TADs)”. The TADs are defined as: -

"Those diseases that are of significant economic, trade and/or food security importance for a considerable number of countries; which can easily spread to other countries and reach epidemic proportions; and where control/management, including exclusion, requires cooperation between several countries."

EMPRES further classifies TADs into three ‘flexible’ categories: -

a) Epidemic diseases of strategic importance

These are foot-and-mouth disease and contagious bovine pleuro-pneumonia (CBPP) - these are accorded top priority by EMPRES at the global level. However, regions or countries can have a country-/region-specific set of strategic diseases, as well.

b) Diseases requiring tactical attention at the international/regional level

These are such as Rift valley fever, lumpy skin disease, Peste des Petits Ruminants (PPR), Newcastle disease, African swine fever (ASF) and classical swine fever.

c) Emerging or evolving diseases

These include BSE, porcine reproductive and respiratory syndrome (PRRS).

The diseases in the first two groups (diseases of strategic and tactical significance) can evolve into epidemics which may threaten populations in a region, and have dire potential consequences in terms of international trade and are of particular danger.

Various international organizations have been established that report and respond to zoonoses of significance, including emerging zoonoses (listed in Annex I). These organizations, including the WHO, the World Organization for Animal Health (OIE), and the Food and Agricultural Organization of the United Nations (FAO) have several different roles, including monitoring, notifications regarding cases/and outbreaks, and technical support.

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Annexes

Annex I: Newly emergent diseases

- Hemorrhagic fevers
- Ebola hemorrhagic fever
- Malta fever
- Rift valley fever
- Marburg
- Lassa Fever
- BSE
- Avian influenza

Annex II: Zoonotic diseases

- Anthrax
- Brucellosis
- Botulism
- Ebola hemorrhagic fever
- Malta fever
- Rift valley fever
- Marburg
- Hydatid disease (Echinococcosis/Dog tapeworm)
- Cattle tapeworm (*Taenia saginata*/*Cysticercosis spp*)
- Pig tapeworm (*Taenia solium*)
- Avian influenza
- Tuberculosis
- Trypanosomiasis
- Rabies
- Toxoplasmosis

Annex III: International outbreak and response systems

Other than the country-specific surveillance systems, certain global, region-specific, and non-governmental organizations which provide information related to zoonoses in general are: -

1. Morbidity and Mortality Weekly Report (MMWR) of CDC.
2. Global Public Health Information Network (GPHIN) of Health Canada.
3. UK public health network for zoonoses.
4. European Centre for Disease Prevention and Control (ECDCMedVetNet and PACNET in the Pacific region).
5. Sentiweb in France.
6. Mekong Basin Disease Surveillance Network (MBDS) – China, Cambodia, Vietnam, Thailand, Myanmar, and Lao PDR.
7. Middle East Consortium on Infectious Disease Surveillance (MECIDS) – Israel, Jordan, and the Palestinian Territory.
8. South-eastern European Health Network (SEEHN) – Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Montenegro, the Republic of Moldova, Romania, Serbia, and the former Yugoslav Republic of Macedonia (FYROM).
9. Asian Partnership on Emerging Infectious Disease Research (APIER) – Cambodia, China, Lao PDR, Indonesia, Thailand, and Vietnam
10. South African Centre for Infectious Disease Surveillance (SACIDS) – DR Congo, Mozambique, South Africa, Zambia, and Tanzania.
11. East African Integrated Disease Surveillance Network (EAIDSNet) – Kenya, Tanzania, and Uganda.
12. Non-governmental organizations, including the Red Cross, Red Crescent.

Annex IV: Characteristics of the Integrated Phase Classification (IPC) of food security status

Phase	Classification
Generally food secure	80% or more of population can meet basic food needs without atypical coping strategies
Borderline food insecure	For 20% or more of population, food consumption is reduced but minimally adequate without having to engage in irreversible coping strategies. These households cannot fully meet livelihoods protection needs.
Acute food insecurity	For 20% or more of population, there are significant food consumption gaps OR are <u>marginally</u> able to meet minimum food needs only with irreversible coping strategies such as liquidating livelihood assets. Levels of <u>acute malnutrition</u> are high and above normal.
Emergency	At least 20 percent of households face <u>extreme</u> food consumption gaps, resulting in very high levels of acute malnutrition and excess mortality; OR households face an extreme loss of livelihood assets that will likely lead to food consumption gaps. Extreme loss of livelihood assets that will likely lead to food consumption gaps.
Humanitarian catastrophe, Famine	At least 20 percent of households face a complete lack of food and/or other basic needs and starvation, death, and destitution are evident; and acute malnutrition prevalence exceeds 30%; and mortality rates exceed 2/10,000 per day.

