Food and Agriculture Organization of the United Nations

Ghana
Evaluation for action

Assessing animal disease
surveillance capacities

March 2019

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Acronyms

AMR	Antimicrobial resistance
ANSES	French Agency for Food, Environmental and Occupational Health and Safety (Agence nationale de sécurité sanitaire de l'alimentation, de l'environnement et du travail)
ARIS	Animal Resources Information System
ASF	African swine fever
ATLASS	Assessment Tool for Laboratories and AMR Surveillance System
AU-IBAR	African Union - Interafrican Bureau for Animal Resources
BSL	Biosafety level
CAHW	Community animal health worker
CBPP	Contagious bovine pleuropneumonia
CDC	Centers for Disease Control and Prevention
CVL	Central veterinary laboratory
CVO	Chief veterinary officer
DOC	Day-old chicks
DVO	District veterinary officer
DVM	Doctor in Veterinary Medicine
ECOWAS	Economic Community of West African States
ELISA	Enzyme-linked immunosorbent assay
EMA-i	Event Mobile Application
EMT	Epidemiology Mapping Tool
EU	European Union
FAO	Food and Agriculture Organisation of the United Nations
FAO-ECTAD	FAO Emergency Centre for Transboundary Animal Diseases
FAT	Fluorescent antibody test
FDA	Food and Drug Authority
FETP	Field epidemiology training programme
FMD	Foot and mouth disease
GHS	Ghana Health Services
GHSA	Global Health Security Agenda
GIS	Geographic information systems
GPP	Ghana Poultry Project
HPAI	Highly pathogenic avian influenza
IATA	International Air Transport Association

IDSR	Integrated Disease Surveillance and Response
IHR	International Health Regulations
IOM	International Organization for Migration
ISAVET	In-Service Applied Veterinary Epidemiology Training
JEE	Joint External Evaluation
KCCR	Kumasi Centre for Collaborative Research in Tropical Medicine
KIA	Kotoka International Airport
LIMS	Laboratory Information Management Systems
LMT	Laboratory Mapping Tool
MESTI	Ministry of Environment, Science, Technology and Innovation
MoFA	Ministry of Food and Agriculture
MoU	Memorandum of understanding
MVO	Municipal Veterinary Officer
NGO	Non-governmental organisation
OASIS	Outil d'Analyse des Systèmes de Surveillance
OH	One Health
OHPZD	One Health Zoonotic Disease Prioritization
OIE	World Organisation for Animal Health
PACE	Pan African Programme for the Control of Epizootics
PCR	Polymerase chain reaction
PPR	Peste des petits ruminants
PVS	Performance of Veterinary Services
PZD	Priority Zoonotic Disease
RVL	Regional veterinary laboratory
RVO	Regional Veterinary Officer
SET	Surveillance Evaluation Tool
SMART	Specific, measurable, agreed-upon, and time-bound
SOP	Standard operating procedures
SWOT	Strengths weaknesses opportunities threats
ToR	Terms of reference
USAID	United States Agency for International Development
VF	Veterinary form
VSD	Veterinary Services Directorate
WHO	World Health Organisation

Background

General context

In 2014, The United States Agency for International Development (USAID), under the Global Health Security Agenda (GHSA), granted funding to the Food and Agriculture Organization of the United Nations (FAO) to address emerging and re-emerging high impact zoonotic diseases in Africa, Asia and the Near East.

A strong component of GHSA includes building capacity for the surveillance of priority zoonotic diseases in animals. In this context, FAO project countries in West, Central and East Africa requested a tool to:

1. Assess general epidemiological surveillance capacity for animal diseases in countries in Phase 1 of GHSA (GHSA, 2016) and,

2. Develop recommendations that are country-specific in the form of an action plan.

Development of the Surveillance Evaluation Tool

In response to the request of project countries, FAO developed the Surveillance Evaluation Tool (SET) to support prevention and control of animal disease threats, including zoonoses. The tool provides veterinary services and ministries with an objective, standardized, comprehensive and systematic evaluation of animal disease surveillance systems.

The basis for the development of SET was the surveillance network assessment tool "Outil d'Analyse des Systèmes de Surveillance" (OASIS) developed by the French "Agence Nationale de Sécurité Sanitaire de l'alimentation, de l'environnement et du travail" (ANSES) (Hendrikx, *et al.*, 2011). Additional assessment criteria from FAO's Epidemiology Mapping Tool (EMT) were also included for the following indicators: cross-sectoral collaborations, epidemiology workforce capacities, outbreak investigation, and risk assessment. Finally, the tool's structure, scoring system (1 to 4) and graphical outputs were harmonized with FAO's Laboratory Mapping Tool (LMT).

In past SET missions, Joint External Evaluation (JEE) indicators for "Real Time Surveillance", "Workforce Development" (D.4.1 and D.4.3) and "Zoonotic Diseases" (WHO, 2016) were incorporated into SET and assessed in order to further characterise these indicators from the perspective of animal health. Following the publication of the new JEE indicators and guidelines in 2018 by the World Health Organization (WHO) (WHO, 2018), this aspect of the SET assessment was discontinued.

Two piloting sessions were conducted in Tanzania (12-21 June 2017) and Liberia (4-13 September 2017) to test SET in real-time situations in the East and West African contexts. Following these missions, outcomes were compiled in final reports that were distributed to key-decision makers of the surveillance system in both countries. The toolkit and evaluation methodology were also updated to reflect feedback and lessons learned during each of those piloting missions. Lastly, the final version of SET was distributed in English and French for implementation in the rest of GHSA Phase 1 countries in Africa.

This report details the SET mission conducted in Ghana in March 2019, and highlights outcomes and recommendations for the improvement of the national animal disease surveillance system.

Objective of Surveillance Evaluation Tool missions

The main objective of the mission was to conduct an external evaluation of the animal health surveillance system in Ghana using the SET tool, with specific focus on:

- Institutional organization and legal framework at central, intermediary and field levels
- Timeliness and quality of laboratory analyses
- Surveillance activities and methodology
- Epidemiology workforce capacity and management, and epidemiological training
- Outbreak investigation mechanisms and resources
- Data management and analysis
- Communication and reporting of results to internal, local, multi-sectoral and international stakeholders
- Performance attributes of the surveillance system: sensitivity, specificity, representativeness, rapidity, simplicity, flexibility, acceptability, data quality, stability, and utility of the surveillance system

Examining each of these topics in the Ghanaian context allowed for the identification of strengths and areas of improvement for the surveillance system. Recommendations on tangible actions were then made in the form of an action plan to reach realistic goals for improvement.

Evaluation methodology

The Surveillance Evaluation Tool and expected outputs

SET was developed to provide a comprehensive evaluation of the animal health surveillance system of a country, using a scoring grid (MS Excel) composed of 90 indicators, grouped into 19 "categories" and seven "areas" (Table 1).

Table 1. Categories and areas evaluated by SET

Area	Category	Nº of indicators
Institutional organization	Central institutional organisation	7
	Field institutional organisation	8
	Intersectoral collaborations	4
Laboratory	Operational aspects	2
	Technical aspects	8
	Analytical aspects	3
Surveillance activities	Objectives and context of surveillance	4
	Surveillance data collection	14
	Surveillance procedures	9
	Animal health investigations	2
	Risk assessment	2
Epidemiology workforce	Workforce management	5
	Training	4
Data management	Information system	2
	Data processing and exploiting	5
Communications	Internal communication	4
	External communication	3
Evaluation	Internal evaluation	2
	External evaluation	2
Total		90

Using the information gathered during the mission, a score from 1 to 4 (or "N/A" if the indicator is not applicable) is assigned to each indicator. Following the scoring session, outputs are automatically generated to identify the strengths and the gaps of the evaluation system. Two types of outputs are produced:

- **Core-results** for the operation of the surveillance system, assigning a score for each category and area evaluated by SET

- **Performance attributes** of the surveillance system (sensitivity, specificity, representativeness, rapidity, flexibility, reliability, stability, acceptability, simplicity and utility). These performance indicators are calculated using weighted coefficients assigned to the scores obtained for each subcategory

Phases of evaluation missions

SET evaluation missions consist of four main phases:

1. **Preparation and document review.** Preparation of the mission starts at the latest one month prior to the arrival of the team into the country. During this phase, team members finalise the mission's program, stakeholders to interview and logistics in the field. The full SET packet is also shared with each evaluator so that they can familiarise themselves with the toolkit and its methodology. A number of documents to support the information provided during the interviews must be shared by the national focal points prior to the mission – these include standard operating procedures (SOPs), protocols, regulations and other written documents describing how the surveillance system functions.

2. **Data collection during stakeholder interviews.** Detailed information on the country's animal surveillance system is elicited through participatory interviews with various stakeholders at each level of the system (national, subnational and field) and in the field (livestock owners, traders, abattoirs, markets, public/private sector, etc.). A structured questionnaire was used to identify the information required for a complete evaluation. Nevertheless, a key element of the SET methodology is to embrace dialogue with stakeholders and therefore the questionnaire may only be utilized as a guideline during the interview process.

3. **Scoring session.** The evaluation team enters the information gathered during interviews into the SET scoring grid, by assigning a score (1-4) to each of the 90 indicators evaluated, along with a justification.

4. **Development of country-specific recommendations.** Based on the scores entered into the SET scoring grid, graphs highlighting the system's strengths and weaknesses are automatically generated. These outputs become the basis from which recommendations are identified. A final restitution meeting reports the evaluation's conclusions and recommendations to key decision-makers.

The evaluation mission in Ghana

Local situation and livestock production

In Ghana, agriculture is a major economic development tool with the two main sectors being livestock and crops. Crops by far dominates the agricultural sector and play a major contributor to gross domestic product, compared to livestock. There are five main agro-ecological zones in the country, defined based on their climate, natural vegetation and soils. These are: rain forest, deciduous forest, transitional zone, coastal savannah and northern savannah (Guinea and Sudan savannah) (Appiah, Osman, and Boafo, 2014).

The main livestock species of economic importance in the country are cattle, sheep, goats, pigs, and commercial and local poultry. These are distributed according to the environmental suitability of the agro-ecological zones. Ghana is noted to have 80.3 million poultry, 7.1 million goats, 4.9 million sheep, 1.8 million cattle, , and760 000 pigs, (VSD, 2017). Other livestock in Ghana include donkeys, horses (approximately 14 800), rabbits and grasscutters. There are approximately 570 000 dogs and 126 000 cats (VSD, 2017).

The poultry subsector is a key component of the livestock industry. Though, there are local hatcheries producing day-old chicks (DOC), large scale commercial poultry farmers still import DOC from abroad. Small-scale commercial poultry farmers buy imported DOC from veterinary drug companies that import veterinary drugs as well as chicks mainly from the European Union (EU) market.

Endemic diseases commonly detected in the country include anthrax, rabies, *peste des petits ruminants* (PPR), African swine fever (ASF), bovine tuberculosis and African trypanosomiasis.

Appropriate and relevant strategic policies, legislation and regulations are in place that govern the animal resources and professional activities in the livestock sector. The main legislation used in the governance of animal health in the country are Public Health Act, 2012 (Act 851), Diseases of Animals Act, 1961 (Act 83), and Veterinary Surgeons Act, 1992 (P.N.D.C.L. 305C). A recent policy document is the Ghana Livestock Development Policy and Strategy, which was approved by and launched in November, 2016.

Composition of the evaluation team

The evaluation team consisted of eight members from the Ghana Veterinary Services Directorate (VSD), FAO Emergency Centre for Transboundary Animal Diseases (FAO-ECTAD) office in Ghana and FAO Headquarters in Rome (Table 2).

Table 2. Members of the SET evaluation team in Ghana, March 2019

Team member	Title and organisation
Helena Acquah	Veterinary Epidemiologist, VSD, Ghana
Ryan Aguanno	Veterinary epidemiologist, FAO Rome
Garba Ahmed	FAO-ECTAD country team leader, Ghana
Anthony Akunzule	FAO-ECTAD Ghana national coordinator Ghana
Emmanuel Eshun	Veterinary Technologist, VSD, Ghana
Danso Fenteng	Veterinary Epidemiologist (Head of Epidemiology Unit), VSD, Ghana
William Adu Kumah	Deputy Director of Veterinary Service, VSD, Ghana
Gaël Lamielle	Surveillance expert (zoonoses), FAO Rome

Mission summary

Identification of the stakeholders and areas to visit reflected the need for a representative assessment of Ghana's animal disease surveillance system, balanced with logistical limitations of field work.

The mission started on 18 March 2019 where members of the evaluation team met at the FAO-ECTAD office in Accra to finalise the agenda and ensure adequate coverage of all identified stakeholders. The team then travelled to the Veterinary Services Directorate headquarters to conduct interviews with the Epidemiology Unit, Accra Veterinary Laboratory, Regulatory Unit, and Tsetse Unit. Due to prior engagements of various participants, the launching meeting for the mission was held on the following day at the FAO Regional Office for Africa together with key decision-makers of the animal disease surveillance system in Ghana, including the representatives from various departments in the Ministry of Food and Agriculture (MoFA). The Deputy Director of VSD, Dr. William Adu Kumah, officiated at the launch together with Anthony Akunzule (FAO Ghana National Project Coordinator). Thirty participants from different central and sub-national levels and partner organizations attended the meeting.

The launching presentation highlighted the development of the SET as well as goals for the mission. Interviews with animal disease surveillance actors at the central level immediately followed the launching meeting.

The first one and a half days of interviews allowed the evaluation team to gain a clearer understanding of the structure and function of the system at the central level, as well as the integration between human and animal surveillance systems in place in Ghana at the time of the mission. Interviews at the central level included the following: Ghana Veterinary Services, Wildlife Division of the Forestry Commission, Environmental Protection Agency, Ghana Health Services (GHS), PREDICT, One Health (OH) Platform coordinator, International Health Regulations (IHR) focal point, Veterinary Council of Ghana, Animal Research Institute of the Council for Scientific and Industrial Research.

The evaluation team was then divided into three groups during the field portion of the mission to cover more territories (Fig.1). Stakeholders selected for interviews originated from various regional and field veterinary offices, laboratories, a zoo, sea and land border points, a national park, livestock farmers and associations, abattoir workers and local non-governmental organisations (NGOs). Areas visited included:

- **Southern Zone (Team I):** Central, Greater Accra, Volta, and Western regions; Cape Coast, Takoradi, Tulaku, Denu – including Tema Port and Aflao border point.
- **Middle Zone (Team II):** Eastern, Ashanti, and Brong Ahafo regions; Ejisu, Kumasi, Dormaa Ahenkro, and Koforidua cities – including Gonnokrom border point.
- **Northern Zone (Team III):** Northern and Upper East regions; Tamale, Damongo, Mole national park, and Bolgatanga – including Paga border point.

A total of 134 interviews were conducted at all levels of the system to obtain a thorough understanding of the context of animal health surveillance in Ghana.

Following the data gathering phase, the team reconvened in Accra on 25 March 2019 to summarise the information from the interviews and begin scoring the system using SET. A strengths, weaknesses, opportunities, threats (SWOT) analysis was done to help identify specific recommendations to improve on the gaps identified. Recommendations were then incorporated into an action plan for improvement with input from the team members from the VSD.

A closing meeting occurred on 28 March 2019 where findings of the mission and recommendations were presented to key decision-makers, who were then provided an opportunity to provide comments on the preliminary findings. Following this meeting, the evaluation team met one last time to provide feedback on the mission itself.
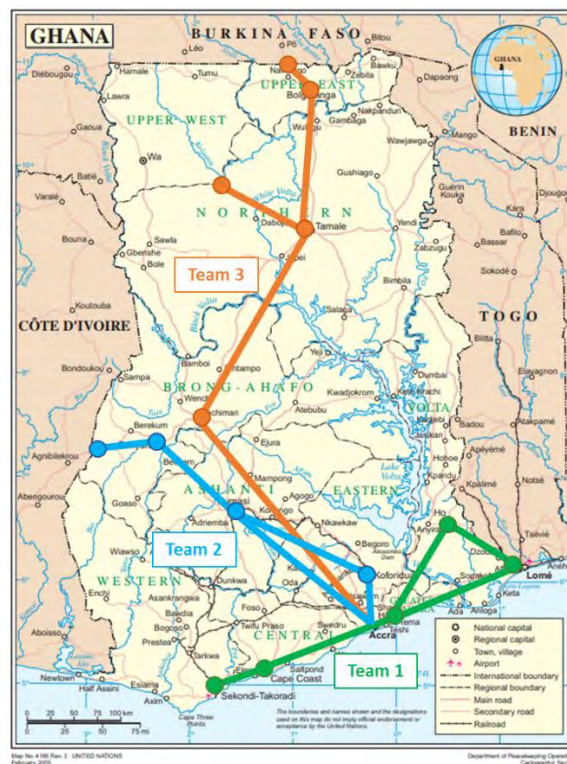
Figure 1. Areas visited during SET evaluation mission in Ghana, March 2019.
United Nations, 2019.

Evaluation results

Description of surveillance system

Legal context and external evaluations

Surveillance of animal diseases in Ghana is under the authority of the Ghana VSD, within the MoFA. The Diseases of Animal Act of 1961 (Act 83) describes the veterinary services' responsibilities related to disease notification, necropsies, inspections and isolation/quarantines of sick animals. In addition, a Public Health Act of 2012 (Act 851) regulates inspection of animals and animal products, including meat inspections at slaughterhouses. Act 851 jointly mandates the VSD and the Food and Drug Authority (FDA), under the Ministry of Health, to conduct slaughter inspections. In 2014, the VSD drafted a Veterinary Services and Animal Production Bill with the support of FAO, which is awaiting official signature by the Government. Implementation of this new bill will update the 1961 Animal Diseases Act and should clarify the roles and responsibilities of the VSD. A detailed assessment of the veterinary laws conducted by the World Organisation for Animal Health (OIE) in 2017 is available online for review (OIE, 2017).

Lastly, the country benefited from several external evaluations that address aspects of animal disease surveillance. These include the OIE Performance of Veterinary Services (PVS) in 2008, OIE Gap Analysis in 2011 (OIE, 2011), WHO JEE in 2017 (WHO, 2017) and several laboratory assessments using the FAO LMT and FAO Assessment Tool for Laboratories and Antimicrobial resistance (AMR) Surveillance System (ATLASS) in 2017-2018.

National level

The national Epidemiology Unit is located at the VSD's headquarters in Accra and is responsible for receiving and analysing the surveillance data sent from the sub-national level. It is staffed by three epidemiologists, and the local zonal epidemiologist can also provide support if needed. Other relevant divisions within the Directorate include the Tsetse Unit, which conducts active surveillance and geographic mapping of African trypanosomiasis in the country, Public Health and Food Safety Unit and the Regulatory Unit responsible for imports and exports of animals and animal products into and out of the country respectively. The mandate of the VSD is to ensure a healthy livestock population through animal health delivery services.

The VSD has identified a list of 28 notifiable schedule animal diseases in Ghana, in addition to six priority zoonotic diseases (PZDs) selected during a One Health Zoonotic Disease Prioritization (OHZDP) workshop led by the US Centers for Disease Control and Prevention (CDC) in March, 2018 (Table 3).

Table 3. Notifiable and priority animal diseases in Ghana

Notifiable animal diseases (VSD)
African horse sickness; African swine fever (ASF); Anthrax; Black quarters; Bovine spongiform encephalopathy; Brucellosis; Contagious bovine pleuropneumonia (CBPP); Contagious pustular dermatitis/Orf; Dermatophilosis; Epizootic lymphangitis; Foot and mouth disease (FMD); Fowl pox; Fowl typhoid; Glanders; Gumboro; Haemorrhagic septicaemia ; Highly pathogenic avian influenza (HPAI); Lumpy skin disease; Mange; Marek disease; Newcastle disease; *Peste des petits ruminants* (PPR); Pullorum disease; Rabies; Rinderpest; Swine erysipelas; Trypanosomiasis; Tuberculosis
Priority zoonotic diseases (OHZDP)
1. Anthrax 2. Rabies 3. Zoonotic avian influenza 4. Zoonotic tuberculosis 5. Viral haemorrhagic fevers (Ebola, Lassa, yellow fever, dengue, etc.) 6. Trypanosomiasis

Surveillance is financed by a general budget allocated to the VSD for all of its activities. There are internally generated funds for some activities conducted in the country, such as import and exports inspections, movement permits for live animals and slaughter house fees, however only 16 percent of internally generated revenues remain within the VSD for implementation of its activities (VSD, 2017) .

Sub-national (Regional) level

At the subnational (regional) level, Regional Veterinary Officers (RVOs) are posted each of the 16 regions and they oversee District and/or Municipal Veterinary Officers (DVOs, MVOs) in each of the 254 districts/municipalities. Community Animal Health Workers (CAHWs) have been trained in the past, but they are currently not active in Ghana and data collection from the field is generally done by technical officers.

The country has been divided into three epidemiological zones (Southern, Middle, Northern) and a zonal epidemiologist is available to support disease surveillance activities in each area.

Supervision of the subnational level is conducted during routine visits to the regions by the Chief Veterinary Officer (CVO), although the CVO may not be able to visit all regions as scheduled. These visits address many aspects of the officers' work beyond surveillance activities.

Surveillance activities

The majority of animal disease data in Ghana comes from passive surveillance. Livestock owners contact the regional or district veterinary services when cases of animal diseases or mortalities are noted. If resources permit, veterinary staff travels to the field to conduct investigations and gather more information.

Animal disease information flows from the field to the district/municipal, where it is then compiled and submitted on a monthly basis to the RVO and central epidemiology unit for analysis (Fig. 2). Standardised veterinary forms (VF) are used throughout the country to record different types of animal disease data. The VF packet can be used for all livestock disease and surveillance activities, ranging from

disease reporting to vaccines administered, meat inspections and more. Within the VF packet, Form 1 is used to report epidemiological and clinical data on animal disease outbreaks. No formalised syndromic surveillance activities for animal diseases were noted during the evaluation.

The VSD reports disease situations to international organisations regularly, such as the OIE every six months, FAO, and the African Union Interafrican Bureau for Animal Resources (AU-IBAR) monthly.
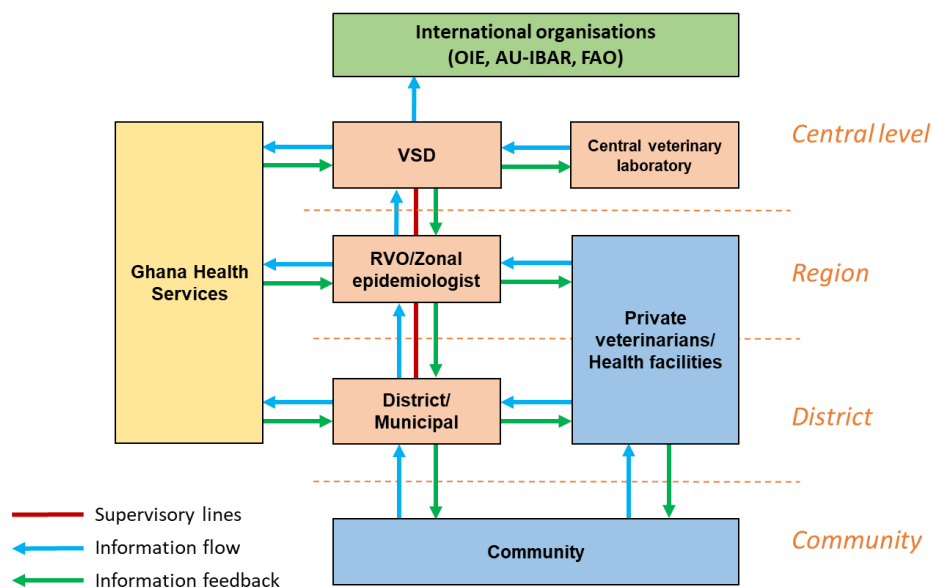
Figure 2. Animal disease reporting system in Ghana, March 2019 (VSD = Veterinary Services Division; RVO = Regional Veterinary Officer).
FAO, 2019.

Interviews with stakeholders revealed a good reporting rate from the regional to the central level, although underreporting rates of 40 percent are estimated from the field to the district. This is due to limited human resources in the field, low motivation and inadequate logistics for field reporting. For example, it was noted that agents may not collect data on all diseases reported because of the lack of transportation capabilities (vehicle, gasoline) to conduct follow-up activities in the field. This leads them to report and conduct investigation only for those diseases they deem more important, such as zoonoses (e.g. HPAI or rabies).

Since February 2019, FAO launched a pilot Event Mobile Application (EMA-i) project in 20 districts within four regions of the country (Greater Accra, Upper East, Volta and Brong Ahafo.). Thirty staff from the VSD have been trained in the use of EMA-i leading to an increase in data reported from those areas.

Active surveillance is resource-heavy and therefore is conducted on an *ad hoc* basis to gather more data when disease events are identified, like was done in live bird markets during an HPAI outbreak in 2007, and 2015. Nevertheless, the VSD plans active surveillance activities on a yearly basis though only half of planned activities are conducted due to lack of resources. Opportunities to conduct active surveillance mostly occur whenever external funding from a project is available. For example, surveillance is carried out in live bird markets in three zones of Ghana (Northern

Zone, Middle & Southern zones), with funds from USAID under the Emergency assistance for prevention and control of H5N1 HPAI in West and Central Africa project

The only regular active surveillance noted at the time of the evaluation was related to activities of the VSD's Tsetse Unit, which traps and identifies vectors for African animal trypanosomiasis throughout the country.

In 2012, the VSD developed a guide for surveillance of animal diseases (commonly referred to as the "Yellow Book") which describes the vision, mission and objectives of the veterinary services. The book also details case definitions, samples to collect, disease images and VSD policies for many notifiable diseases. This Yellow Book is a valuable resource for field staff to guide their investigation activities. The evaluation team noted minor changes that can improve this resource, such as updating the disease case definitions and providing guidance for sample packaging. Unfortunately, a limited number of printed copies was available for distribution so many technical officers do not have access to a hardcopy of the guide, although an electronic version is available. Other than the Yellow Book, very few detailed protocols for disease investigation, sampling and other disease-specific SOPs were noted by the team, although the VSD is working jointly with FAO to develop surveillance plans for anthrax, zoonotic tuberculosis and trypanosomiasis.

There are about 334 main slaughter facilities in Ghana, four main abattoirs in the country, three of which have the appropriate slaughter facilities to be classified as an abattoir (VSD, Annual Report 2017). Interviews at abattoirs in the field revealed facilities that are staffed by one or two veterinary meat inspectors. In some instances, only one person is present, who may work seven days per week. Inspectors have a dedicated VF form (VF9) to record their findings, which are sent to the Veterinary Services Head Office on a monthly basis. However, due to staff shortages, it is difficult for many inspectors to record their findings while conducting inspections at the same time.

Land quarantine station facilities for animals in Ghana are located at Paga, Mognori, Kupulima and Hamile. The Kotoka International Airport (KIA) is the air entry point for livestock products and live animals, located in Accra. Tema and Takoradi are the seaports, located in the Greater Accra and Western Region respectively. There is one veterinary officer with the rank of Deputy Director of veterinary service in-charge of KIA, Tema and the Takoradi Ports, assisted by six veterinary para professionals each at Tema port, Takoradi port and twelve at KIA (VSD, 2019). VSD has rented offices at the KIA, Tema and Takoradi seaports. Animals imported are inspected either at the border or upon arrival to markets by a technical officer who verifies importation papers and issues permits for intra-country movements. There are specific official border crossings in Ghana where animals are inspected, however many cross-border transits bypass these border points and may not be subjected to inspections.

The overlap of inspection duties between the FDA and VSD can create confusion as to which organisation is responsible for inspections at both the border and in abattoirs. Also, procedures may differ between agents from different groups because the mandate of each administration differ.

Interviews with veterinarians in the private sector revealed a limited role in surveillance. In some occasions, proximity of private veterinarians to DVO or RVO office fosters informal communication between the public and private sectors. The Disease of Animals Act of 1961 highlights that all individuals in charge of animals

must notify the Director of the VSD in cases of diseases or mortalities in animals, however interviews with private veterinarians noted that reporting modalities were unclear.

Major gaps identified in surveillance activities in Ghana related to the limited resources for field activities, including animal disease investigations and sampling leading to failure of field officers to submit samples to the laboratories. Indeed, many RVOs, DVOs and technical officers used personal vehicles and financed gasoline out of their own pocket to travel to the field. This reduces significantly the impact of the field arm of the surveillance system.

Data management

Animal disease data collected from the field is transmitted to the DVOs/MVOs and RVOs then validate the information and follow-up with officers when missing/incorrect information is noticed.

At the national level, descriptive analyses are conducted on a quarterly, semi-annual and annual basis to fit the reporting requirements set by the AU-IBAR and OIE during emergencies or outbreak events.

MS Excel is primarily used for data management and analysis, although the Animal Resources Information System (ARIS) and Epi Info have been used as well. Data entry from the field is done manually and it takes about two weeks to enter the data from all regions into the master Excel database for monthly reports. At the time of the evaluation, there was no relational database consistently used by the epidemiology unit to conduct more in-depth analyses. The Tsetse unit uses geographic information systems (GIS) for their activities and is available to support the epidemiology unit for mapping if needed.

Workforce and training

As of 2018 the number total of staff within the VSD was 643, which is less than half of the required workforce to fully operate the surveillance system according to the VSD (Table 4).

Table 4. Staffing gaps within the VSD, Ghana 2018

Staff category	Number at post	Number required	Gap
Professionals (veterinary officers)	54	224	170
Professional (veterinary nurses)	17	318	301
Sub-professionals (animal health officers)	116	580	464
Technical	456	856	400
Total	643	1 978	1 335

At the national level, the epidemiology unit consists of three full-time staffs who validate and analyse data received from the subnational levels. In addition, the VSD placed three epidemiologists in each of the distinct epizones in the country (Southern, Middle and Northern). These can provide support to RVOs and/or the epidemiology unit for surveillance-related activities.

The recent JEE mission (WHO, 2017) noted this gap in animal health human resources and, consequently the Government of Ghana opened several new vacancies to address this need. At the time of this mission, 460 technician vacancies and 42 veterinary surgeons were in the process of being filled. Because the hiring process was underway, the impact of understaffing was still felt during interviews in the field, especially at abattoirs or during emergencies. Once hiring on the staff is complete, much of the gap in workforce will be filled.

Staff-specific terms of reference (ToRs), known as work schedules exist, although these were written 10-15 years prior to the evaluation and as such are not adapted to the current situation of the surveillance system. It is important to note that the VSD staff at the subnational level share many duties beyond surveillance, including providing animal care, conducting vaccination campaigns and more.

Staff conducting epidemiological analyses consist of the two veterinarians in the Tsetse unit, three veterinarians in the epidemiology unit, and the three zonal epidemiologists. All of them possess a Doctor in Veterinary Medicine (DVM) and an additional advanced degree (e.g. MPhil in Field Epidemiology and Disease Control).

There is no standardised training program for staff within the surveillance system. Initial training upon starting work may differ depending on the position level. In some regions visited, veterinarians benefit from on-the job training as they start their appointment however it was noted during the mission that most field officers may not receive any structured/standardised orientation training.

Forty seven staff from the VSD have received training in the basic level of the Field Epidemiology Training Program (FETP) led by CDC and more were currently enrolled in the higher levels during the mission (three at the intermediate level and 17 in the advanced level). In addition, FAO started rolling out the In-Service Applied Veterinary Epidemiology Training (ISAVET) program, with two staff of the VSD having undergone an ISAVET pilot training in Uganda in November 2018 at the time of the mission.

For the rest of the workforce within the system, refresher trainings largely depend on external donors and projects, and thus are not conducted in a regular way. During interviews in the field, staff referred the evaluators to trainings related to surveillance financed by FAO and USAID in 2017 and 2018. Several workers in abattoirs mentioned a training they attended in Botswana in 1987, in addition to trainings of meat inspectors between 2014 and 2016, supported by the United States Department of Agriculture (USDA). Three thousand training manuals were also developed and distributed to all the 10 regions. The VSD may be able to provide some training on surveillance or disease reporting but they are significantly limited by the funding available for these activities.

Laboratory network

The Central Veterinary Laboratory (CVL) is located in Pong-Tamale, with the Accra veterinary laboratory acting as a *de facto* CVL for much of the surrounding area. Each regional veterinary office possesses a laboratory space, bringing the total number of Regional Veterinary Laboratories (RVLs) in the country to 10. However, there are varying levels of operational capacity across the RVLs ranging from advanced and newly renovated to inoperable and unequipped (Table 5). There are no laboratories functioning at the district level, though they are planned in the network structure.

Laboratory samples may be submitted directly by farmers and abattoir staff or collected by district/regional veterinary staff during field visits, which often occur in response to multi-case events. Transportation in the field is available for those staff at selected functioning laboratories (e.g. Accra, Kumasi), however for other staff within the system (including regional/district veterinary personnel) specimen transport is the responsibility of the farmer, leading to few and/or poor quality samples available for testing. Sample transport between laboratories is likely to be through public transportation. During sample submission, staff at all laboratories keep records on a paper-based system; electronic records are utilised only as a backup and not fully integrated into the laboratory system.

Table 5. Status of veterinary laboratories visited during the SET mission to Ghana, March 2019

Laboratory visited	Status	Findings
Accra RVL	Functional	BSL 2 and 3, able to perform PCR, ELISA, microscopy, culture for a variety of diseases; undergoing OIE Twinning program; operational for vaccine production
Bolgatanga RVL	Not functional	
Winneba	Not functional	
Cape Coast RVL	Not functional	Purchased new microscope but laboratory space not in use due to rainwater entering room
Ho RVL	Functional	Able to perform tests for brucellosis, parasitology, anthrax, tuberculosis, post-mortems, haematology
Koforidua RVL	Not functional	Refurbished but not staffed
Kumasi RVL	Functional	Newly renovated structure with capacity to perform basic microbiology, parasitology, and serology; partners with Kumasi Centre for Collaborative Research in Tropical Medicine (KCCR) for rabies diagnosis using real time PCR
Pong-Tamale CVL	Functional	BSL 2 and 3, undergoing OIE Twinning program; operational for vaccine production of three viral vaccines
Sunyani RVL	Limited capacity	Only able to perform post-mortems, no equipment available but two dedicated staff
Takoradi RVL	Limited capacity	Newly renovated to BSL 2 and 3, able to perform haematology and culture. Limited by lack of reagents to perform ELISA and PCR test, cost of electricity consumption and problems with attempted break-ins into facilities.
National Food Safety and AMR Laboratory	Functional	Testing for AMR in animal products

*BSL = biosafety level; ELISA = enzyme-linked immunosorbent assay; FAT = fluorescent antibody test; PCR = polymerase chain reaction

Testing capacities vary considerably depending on the facility, with reagent shortages highlighted as a primary issue by all laboratories. A slight disconnect was seen between testing required to identify notifiable diseases and those tests

available, even in the central level laboratory. Maintenance and calibration of laboratory equipment is costly and often requires the contracting of external experts. This issue, combined with reported power outages, results in extended periods where equipment is unavailable for diagnostic use and represents key intervention point for quality assurance improvement within the laboratory system. Lastly, a substantial amount of funding originates through project donations. Significant investment by both FAO and Foreign Affairs Canada were observed during the mission, which is commendable but implies that regular funding of the laboratory system is inadequate for both improvement and day-to-day operations of the network.

Communications (internal/external)

No current overarching strategy was seen during the evaluation for internal and external communications. Interviews noted that a communication plan was once in place 15 years prior to the mission, which emphasised the use of telephone and fax. Currently, most staff of the VSD involved in surveillance share information through a variety of WhatsApp groups and emails at all levels of the system – though very few of them are moderated and formalised. Other methods of communications within the system include sharing all telephone numbers of actors within the system to be able to reach them directly.

Feedback of results of surveillance (including diagnostic testing) is usually done only when positives are found – although this may differ geographically and some regional laboratories may more readily share results with officers and farmers.

During the Pan African Programme for the Control of Epizootics (PACE) project between July 2000 and October 2005, resources were available to publish regular epidemiology bulletins summarising surveillance results to different stakeholders. Since the end of this project 14 years ago, funding for this type of activity is no longer available. At the time of the evaluation, the VSD was interested in resuming publication of an epidemiology bulletin but was slowed down by the absence of communication officers or specific software to assist this process. In the meantime, epidemiology summaries may be shared during monthly regional officers meetings although there is no tracking mechanism to ensure the communication took place.

Outreach to stakeholders such as livestock owners may depend on available funding or activities implemented in specific regions. For example, the VSD was able to produce posters on avian influenza prevention with the support of external donors in the past during the outbreaks of H5N1 in 2007 and during 2015-2018. In some specific regions, government and private radio stations provide airtime to local veterinary offices to inform farmers about animal health issues – this is largely a local initiative and such activities are not present in the whole country.

Intersectoral collaborations and One Health

The mission revealed overall good collaborations between the human health and animal health sectors, although mostly informal. At the national level, the VSD regularly attend meetings held by the GHS, such as the National Technical Coordination Committee meetings where topics related to zoonoses are discussed – these occur on a monthly basis and whenever there is an outbreak. Communication lines for sharing of zoonotic disease information between ministries appear to be well operating both centrally and in the field, though no specific protocols for data sharing were in place. Likewise, from a general perspective, joint

outbreak investigations occur when dealing with specific zoonoses such as rabies and HPAI, but few detailed procedures were seen to guide these activities, besides the Integrated Disease Surveillance and Response (IDSR) guidelines used by GHS.

Several projects in the field have led to the creation of multisectoral groups to formalise response to threats at the interface between human and animal health, however these represent region-specific initiatives rather than a national programme. In Takoradi for example, a network of specific experts can be mobilised into rapid response teams depending on a specific event. In another region, multidisciplinary teams have been created under a project financed by the United States to conduct active surveillance for influenza in piggeries and live-bird markets and follow up on disease rumours.

Other successes of intersectoral collaborations were noted, especially at the border. The Noepe Joint Border Post, commissioned in 2018 between Ghana and Togo with funding from the EU and the Economic Community of West African States (ECOWAS), brings together animal and human health officers from both countries in the same facilities. Likewise, a Joint Border Surveillance platform has been implemented at the Aflao border post with support from the International Organization for Migration (IOM). Although few animals pass through Aflao, the platform recently started to include the animal health sector to their regular cross-border meetings.

Overall, interviews with stakeholders from GHS noted that challenges such as the limited number of VSD staff in the field significantly limit the amount of intersectoral activities possible at that level.

Collaborations with the environmental health sector for surveillance was not as established as with human health and occur mostly in *ad hoc* fashion. Park rangers do not receive formal surveillance training but may report cases of sick or dead wildlife to their local veterinary officer.

Lastly, a OH Platform was under development with ToRs for its technical working group being drafted at the time of the evaluation mission. Although not yet operational at the time of the mission, the platform convened two meetings with major stakeholders and the next steps include the development of a OH National Policy.

In general, the evaluation mission revealed that intersectoral collaborations are informal and focus on the interface between human and animal health, with a lesser role played by environmental health. Specific examples of successful projects have fostered multidisciplinary collaboration at a local level. Once operational, the OH Platform will significantly improve on the situation by formalising intersectoral collaboration at a national level, develop common data sharing mechanisms and joint response procedures that incorporate the environmental aspect.

Outputs of the Surveillance Evaluation Tool

Two different types of outputs are provided by the evaluation:

1. Core results (Table 6, Fig. 3)

2. Performance attributes (Table 7, Fig. 4)

Core results

The core results describe the operation and general status of the surveillance system, assigning a score to subcategories within each area evaluated by the SET (Table 1). All scores are expressed as percentages, based on an ideal situation where scores of 4 are given to all indicators (100 percent).

The strongest individual category scores were "Workforce management" (73.3 percent), "Animal health investigation" (66.7 percent), and "External evaluations" (58.3 percent). Categories that received the lowest scores included "Internal evaluation" (22.2 percent), "External communication and resources" (22.2 percent) and "Central institutional organization" (28.6 percent) (Table 6, Fig.3).
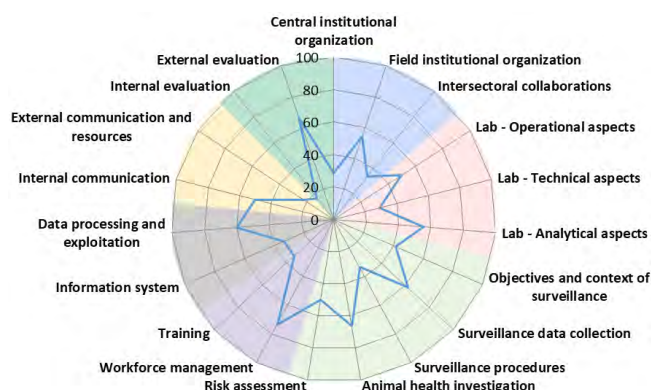
Figure 3. Comparative SET graphical outputs for Ghana by category, March 2019. FAO, 2019.

Table 6. SET outputs for Ghana, March 2019.

Area	Score by area (%)	Category	Score by category (%)
Institutional	36.8	Central institutional organization	28.6
		Field institutional organization	54.2
		Intersectoral collaborations	33.3
Laboratory	41	Lab - Operational aspects	50.0
		Lab - Technical aspects	29.2
		Lab - Analytical aspects	55.6
Surveillance activities	48.4	Objectives and context of surveillance	41.7
		Surveillance data collection	61.9
		Surveillance procedures	33.3
		Animal health investigation	66.7
		Risk assessment	50.0
Epidemiology workforce	44.4	Workforce management	73.3
		Training	33.3
Data management	52.4	Information system	33.3
		Data processing and exploitation	60.0
Communications	38.1	Internal communication	50.0
		External communication and resources	22.2
Evaluation	50	Internal evaluation	16.7
		External evaluation	66.7

Performance attributes

Qualitative attributes have been identified and used by several international organisation to evaluate the general performance of a surveillance system (Table 7) (CDC, 2001; CDC, 2004; Health Canada, 2004; WHO 1997). The SET Excel spreadsheet calculates the progress of the surveillance system relative to these performance attributes and generates visual outputs in the form of a spider graph (Fig. 4). Scores for indicators are weighed according to their importance to a specific attribute and outputs are generated as percentages of an ideal situation (scores of 4 on all indicators). An exhaustive list of the relationship between indicators and attributes is available upon request.

Table 7. Performance attributes evaluated by SET[1]

Attribute	Definition
Sensitivity	The ability of a surveillance system to detect true health events i.e. the ratio of the total number of health events detected by the system over the total number of true health events as determined by an independent and more complete means of ascertainment.
Specificity	A measure of how infrequently a system detects false positive health events i.e. the number of individuals identified by the system as not being diseased or not having a risk factor, divided by the total number of all persons who do not have the disease or risk factor of interest. Because of the difficulties in ascertaining the total population at risk in surveillance, determination of the number of misclassified cases (false positives) can be used as a measure of the failure of the system to correctly classify health events.
Representativeness	A surveillance system that is representative accurately observes both the occurrence of a health event over time and the distribution by person / animal and place of that event in the population at any point in time.
Rapidity/Timeliness	The interval between the occurrence of an adverse health event and (i) the report of the event to the appropriate public health agency, (ii) the identification by that agency of trends or outbreaks, or (iii) the implementation of control measures.
Flexibility	The ability of the surveillance system to be easily adapted to new reporting needs in response to changes in the nature or the importance of the health event, the population monitored, or the resources available.
Data quality (reliability)	Reflection of the completeness and validity of the data recorded in the public health surveillance system.
Stability	The surveillance system's ability to collect, manage, and provide data properly, and its availability (the ability to be operational when it is needed).
Acceptability	Assessed by the willingness of persons conducting surveillance and those providing data to generate accurate, consistent and timely data.
Simplicity	Refers to both its structure and ease of operation. Surveillance systems should be as simple as possible while still meeting their objectives.
Utility/usefulness	The usefulness of a surveillance system is assessed by whether it leads to prevention or control or a better understanding of health events.

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[1] CDC, 2001; CDC, 2004; Health Canada, 2004; WHO 1997

Performance outputs for animal disease surveillance in Ghana revealed a surveillance system with low scores for "representativeness" (25 percent). This is in part explained by underreporting from the field to the regions, as well as limited active surveillance activities. Likewise, "rapidity" received a 27 percent score from the lack of resources available to data collectors to conduct efficient field activities (e.g. vehicle, gasoline).

On the other hand, the "simplicity" of the surveillance system received the highest score (58 percent) due to the direct reporting line for animal diseases from the field to the national level, presence of case definitions and the wide use of the VF packets for disease reporting across the country. The harmonised VF packets also contribute to a higher "utility" of the system (51 percent), along with surveillance objectives that are defined and formalised in the Yellow Book.

Attribute	Score
Sensitivity	41%
Specificity	42%
Representativeness	25%
Rapidity	27%
Flexibility	37%
Data quality	44%
Stability	32%
Acceptability	48%
Simplicity	58%
Utility	51%
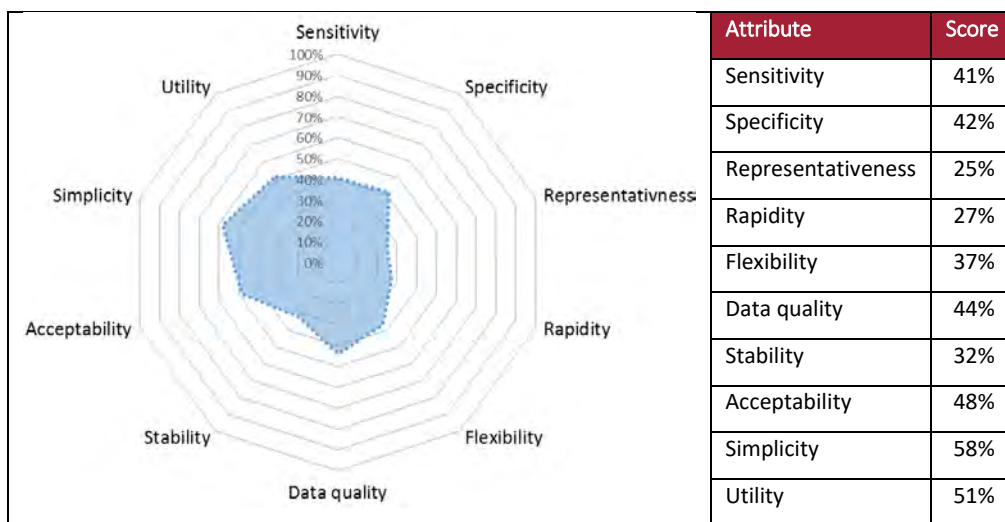
Figure 4. SET outputs for Ghana by performance attribute of the system, March 2019. FAO, 2019.

Recommendations

Strengths, weaknesses, opportunities, threats analysis

A SWOT analysis was conducted to gain a better understanding of the animal disease surveillance system in place in Ghana.

Strengths

Institutional Organisation

- The surveillance system's structure covers the entire country and data flow is formalised from the field to the national level
- The infrastructure at national and regional levels is adequate
- A system of permits is in place for: animal movement, abattoir inspections

Laboratory network

- Prompt turnaround time for samples tested in laboratories
- Confirmation testing conducted for:
    - Avian influenza (Padova)
    - Newcastle (International Atomic Energy Agency)
    - African swine fever (Côte d´Ivoire, Japan)
- Laboratories in Accra, Takoradi and Pong-Tamale with BSL 2 and 3
- Accra laboratory with diagnostic capacity for wide ranges of diseases (PCR, ELISA, FAT, etc.)
- OIE Twinning programs in place at Accra and Pong-Tamale laboratories
- Kumasi and Accra laboratories with collaboration programs with different universities for diagnostic testing University of Ghana (Noguchi Memorial Institute for Medical Research), Kwame Nkrumah University of Science and Technology (Kumasi Centre for Collaborative Research)

Workforce development

- New vacancies open and additional staff in the process of being hired and deployed at the time of the mission
    - 460 technician vacancies
    - 42 veterinarian vacancies
- Multiple levels of in-service epidemiology training in place – e.g. FETP, ISAVET

Surveillance activities

- Standardised VF used for monthly disease reporting
- Good reporting rate from all regions to central level (~ 100%)
- Active surveillance projects in place during outbreaks (e.g. avian influenza)
- "Yellow book" developed by the VSD with formalised: case definitions, guidelines/policies for specific diseases, images, reporting
- Risk-based Tsetse fly surveillance ongoing with GIS & risk assessments capacities
- Investigation teams from Epidemiology Unit available to support regions/districts in case of outbreaks

Coordination and supervision

- Monthly coordination meetings occur in many regional offices
- Quarterly RVO meetings at national level
- Mid-year and annual VSD review meetings
- Different WhatsApp groups in use:

- o All veterinary officers in system
- o Specific regional groups
- o For scientific discussions

Intersectoral collaboration

- One Health Platform under development
- Existence of multisectoral regional and national rapid response teams
- Veterinary services included in many multisectoral coordination meetings
  - o National Technical Coordination Committee
  - o Regular meetings at local level
  - o Joint Border Surveillance System (Aflao)
- Joint Border Post at Noepe newly established, bringing together animal and human health from both countries in same facility

Data management and epidemiology

- Pilot EMA-i project in three regions, at central level, and in laboratory – greatly improved reporting numbers
- Zonal epidemiologists present in three epizones (Southern, Middle, Northern)
- Risk analyses for some diseases conducted (e.g. HPAI)
- Descriptive data analysis done quarterly & reports sent to AU-IBAR, OIE and FAO

Evaluation

- Several external evaluations conducted and recommendations implemented (e.g. hiring of new staff)

Weaknesses

Institutional Organisation

- Surveillance objectives listed in "Yellow book" are too broad
- All surveillance activities are not covered by existing legislations
- No dedicated budgetary line for surveillance
  - o Only 16 percent of revenue generated by activities come back to VSD
  - o No designated group to advocate for more funding
  - o Staff in charge of budgeting have not received training to do so
  - o Leads to personnel using own funds to travel to field to respond to diseases

Laboratory

- Equipment were not regularly maintained and calibrated
- Few samples sent to laboratories due to: limited sampling training/supplies, cost of transport
- Estimated 50 percent of samples received from farmers are unviable for testing
- Few SOPs available in laboratories – staff generally follow OIE guidelines, which are not specific to the local context
- No quality assurance system for diagnostic activities
- Laboratories vary in capacities and resources
  - o Most laboratories suffer from power fluctuations
  - o Inadequate capacity to test for all notifiable diseases
  - o Cape Coast laboratory is lacking in equipment and has no working reagents and consumables
  - o Takoradi Regional laboratory recently renovated but lacking reagents
  - o Sunyani Laboratory has limited capacity while, Koforidua Regional and Bolgatanga laboratories are non-functional. .
- Limited feedback/interpretation of results for data collectors

Workforce

- Understaffing at the national epidemiology unit (three) is insufficient for advanced epidemiological analyses, bulletin, surge capacity
- Inadequate frontline staff
- Low veterinary-farmer ratio
    - Farmers with limited access to veterinary officers treat their own animals
    - Understaffing in regional laboratories
    - Few staff at abattoirs (current personnel may work seven days per week)
- Duty schedules (terms of reference) do not include all surveillance activities
- Underfunding of surveillance activities lead to low motivation and high staff turnover (e.g. activities may require personal funding)
- Enforcement system for non-reporting field staff is not currently enforceable

Training

- Lack of training plan to coordinate implementation of available trainings (e.g. to prioritise distribution of trainings based on gaps)
- Initial training/orientation of new staff is not uniformly present and/or standardised
- Refresher trainings are limited and project-based – not standardised across workforce
- Curriculum of animal health and technical officers does not include applied surveillance and One Health concepts

Surveillance activities

- Inadequate detailed SOPs at all levels (including laboratories, abattoirs, outbreak investigation)
- Workforce in the field may not be aware of all notifiable diseases
- Limited capacity to conduct field activities due to lack of transportation (vehicle, gasoline) for field staff
- Role of private veterinarians in surveillance unclear – not mandated by law
- Activities that generate fees are underreported by actors of the surveillance system
- Unclear roles of different organisations (FDA, VSD) in regard to inspection work (ports of entry)
- Limited access to supplies (e.g. sampling materials, personal protective equipment, knives at abattoirs – agents purchase out of their own pocket)
- limited surveillance plans in place for all diseases

Data management

- VF forms need update (e.g. better history taking) and staff need refresher training in their use
- Limited advanced epidemiology analysis done (e.g. risk assessments, GIS, etc.) due to understaffing and limited training programs
- Monthly reporting of diseases not done electronically from the district to regional level
- Underreporting from districts to regions
- Incompleteness of data

Supervision

- No specific supervision procedures for surveillance activities from central to regional levels

Communication

- Limited feedback on local disease information to field actors
- Limited outreach to stakeholders on surveillance activities – Veterinary Services activities are not visible
- Lack of dedicated communications personnel to coordinate activities (e.g. bulletin production)
- Newsletter no longer produced

Coordination

- Few memoranda of understanding (MoU) with local NGOs to include them in surveillance activities

Opportunities

Laboratories

- Several assessments of laboratory systems are available to further characterise capacities in that domain (e.g. PVS Laboratory, LMT, Sandia National Laboratories' LINA tool, ATLASS, Fleming Fund Assessment Tool)
- External partners (Canada's Modernising Agriculture in Ghana) continue to improve laboratory system

Surveillance activities

- Private veterinarians can increase data reporting

Communications and outreach

- Private/public radio stations can provide airtime for government
- Professional associations (veterinary, livestock, butchers, etc.) can conduct outreach at a places where stakeholders already congregate (e.g. association meetings)
- Public health bulletin can incorporate animal disease data for distribution

Support from international organisations

- WHO training for rapid response teams at regional and district levels
- Ghana Poultry Project (GPP) and PREDICT will leave behind guidelines, protocols, and trained staff
- Fleming Fund project

Threats

- Ghana has limited export of livestock, downplaying the importance of veterinary services
- Poor sustainability due to project-based activities (e.g. GPP and PREDICT projects ending in 2019)
- Poor information technology/data infrastructure in the field
- Unregulated access to medications/biologicals
- Animals move through unapproved routes without veterinary inspection
- Service charges to stakeholders (e.g. farmers) can reduce disease reporting
- Security issues at all laboratories (e.g. breaking-in, theft)
- Illegal practice of veterinary services ("Quacks") and illegal slaughter points
- No insurance and compensation systems for farmers

Recommendations and action plan

The final product of a SET evaluation is a series of strategies for the improvement of the local animal disease surveillance system. These strategies are presented in the form of an action plan with specific, measurable, agreed-upon, and time-bound recommendations (SMART). To design this action plan, the evaluation team discussed and identified major recommendations using the information gathered during interviews.

Each proposed recommendation was then plotted qualitatively on a feasibility/impact chart to help prioritize their implementation within the local context (Fig. 5), where cost includes budgetary constraints as well as logistical ones (e.g. workload). Recommendations that were kept in the final action plan were those that were considered to provide a significant impact for the improvement of the surveillance system, with the ideal situation being high impact/high feasibility strategies (upper right quadrant in Fig. 5).

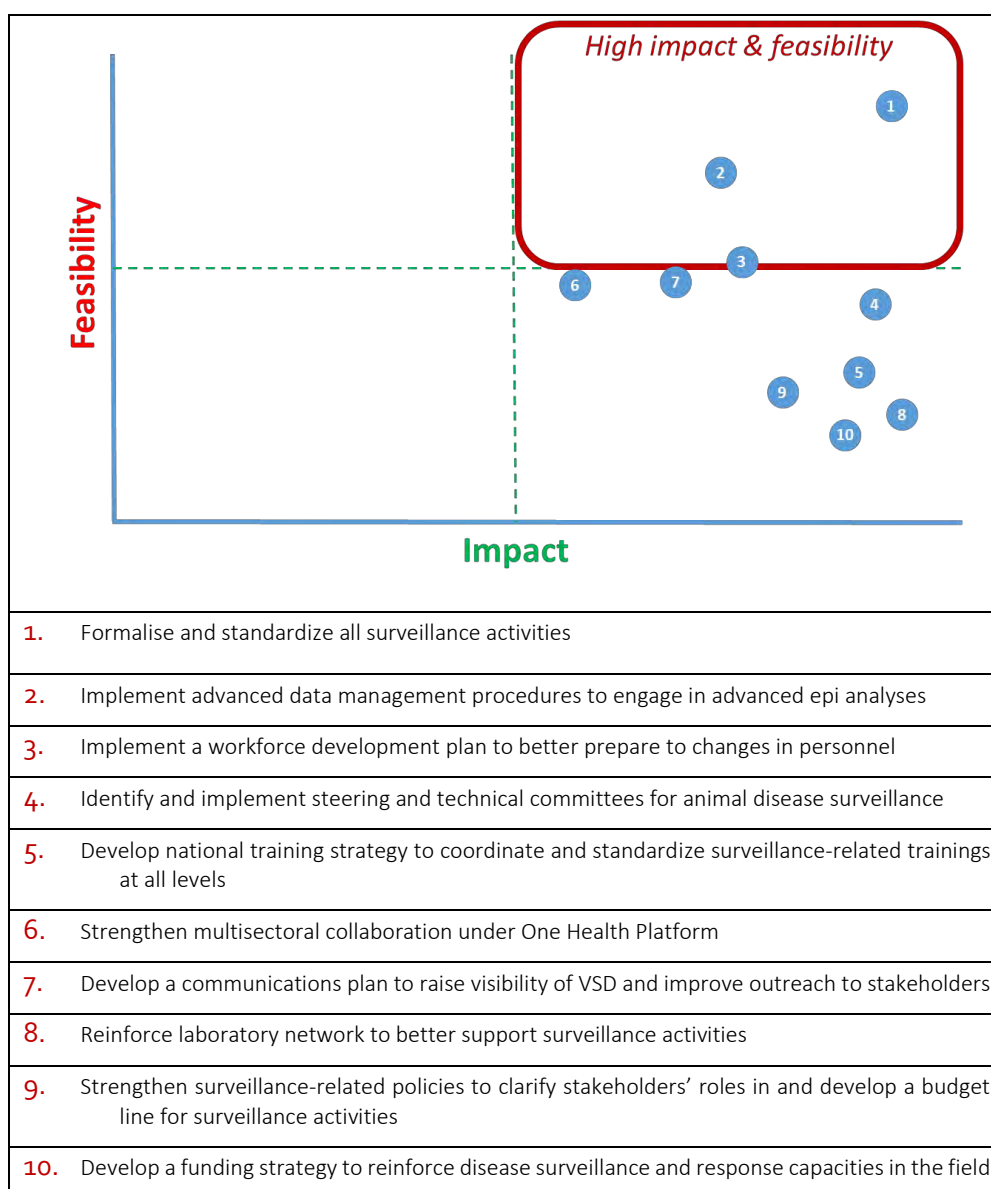| 1.	Formalise and standardize all surveillance activities
2.	Implement advanced data management procedures to engage in advanced epi analyses
3.	Implement a workforce development plan to better prepare to changes in personnel
4.	Identify and implement steering and technical committees for animal disease surveillance
5.	Develop national training strategy to coordinate and standardize surveillance-related trainings at all levels
6.	Strengthen multisectoral collaboration under One Health Platform
7.	Develop a communications plan to raise visibility of VSD and improve outreach to stakeholders
8.	Reinforce laboratory network to better support surveillance activities
9.	Strengthen surveillance-related policies to clarify stakeholders' roles in and develop a budget line for surveillance activities
10.	Develop a funding strategy to reinforce disease surveillance and response capacities in the field

Figure 5. Feasibility/impact graph of proposed recommendations identified during the SET mission in Ghana, March 2019.
FAO, 2019.

Recommendations were then prioritized into short-term (1-2 years), mid-term (2-4 years) and long-term (4-6 years) based on their impact and feasibility (Table 8).

Table 8. Prioritized recommendations from SET outputs, Ghana, March 2019.

Recommendations		Short-term 1-2 years	Mid-term 2-4 years	Long-term 4-6 years
Priority 1	1. Formalise and standardize all surveillance activities	🟥		
	2. Implement advanced data management procedures to engage in advanced epidemiological analyses	🟥		
	3. Implement a workforce development plan to better prepare to changes in personnel	🟥		
	4. Identify and implement steering and technical committees for animal disease surveillance	🟥		
Priority 2	5. Develop national training strategy to coordinate and standardize surveillance-related trainings at all levels	🟧	🟧	
	6. Strengthen multisectoral collaboration under One Health Platform	🟧	🟧	
	7. Develop a communications plan to raise visibility of VSD and improve outreach to stakeholders	🟧	🟧	
Priority 3	8. Reinforce laboratory network to better support surveillance activities	🟩	🟩	🟩
	9. Strengthen surveillance-related policies to clarify stakeholders' roles in and develop a budget line for surveillance activities	🟩	🟩	🟩
	10. Develop a funding strategy to enhance disease surveillance and response capacities in the field	🟩	🟩	🟩

Action plan

(A summarized version of this action plan is available as a stand-alone document in Appendix I)

1	**Formalise and standardize all surveillance activities (Priority 1)**

Strategy:

- Update, print and distribute Surveillance Guidelines (Yellow Book) to all RVOs & DVOs
  - Items to update include: case definitions, shipment/storage/labelling procedures
- Draft protocols and SOPs for all notifiable diseases, including:
  - Field investigation and sampling procedures
  - Disease-specific & general surveillance plans
  - Information feedback mechanisms

Roles and responsibilities:

- Lead: VSD, laboratories
- Partners: International organisations

Deliverables:

- Updated Surveillance Guidelines are printed and distributed to all RVOs and DVOs
- Standardised SOPs for field investigation and sampling are developed and distributed
- All priority diseases are covered by formalised protocols

Timeline for completion: Within 2 years of SET evaluation

2	Implement advanced data management procedures to engage in advanced epidemiological analyses (Priority 1)

Strategy:

- Improve disease reporting capacities
    - Update VF reporting forms (e.g. field for history taking)
    - Scale up EMA-i to the rest of territory
    - Standardise data entry media at regional level (e.g. Excel templates)
- Hire/identify and train additional staff within the epidemiology unit to conduct regular GIS and risk assessments

Roles and responsibilities:

- Lead: VSD
- Partners: International organisations

Deliverables:

- Updated VF forms are distributed and staff are trained in their use
- EMA-i is in use in the entire territory
- Staff at the VSD's epidemiology unit conducts GIS and risk analyses at regular pre-determined intervals

Timeline for completion: Within 2 years of SET evaluation

3	Implement a workforce development plan to better prepare to changes in personnel (Priority 1)

Strategy:

- Conduct review of workforce capacities across levels to identify and anticipate gaps (e.g. retirement, staff turnover) every two years
- Identify areas of understaffing to be prioritised when new posts are available
- Develop/update ToRs (including supervision mechanisms) for all posts for:
    - Central level
    - Zonal epidemiologists
    - Regional and district officers
    - Field officers
    - Inspectors (abattoirs, points of entry)

Roles and responsibilities:

- Lead: VSD
- Support: international organisations

Deliverables:

- Gaps in personnel distribution are identified
- Formal TORs are developed for all actors of the surveillance system

Timeline for completion: Within 2 years of SET evaluation

| 4 | Identify and implement steering and technical committees for animal disease surveillance (Priority 1) |

Strategy:

- Identify roles of committees, e.g.:
    - *Steering committee:* Review surveillance objectives/mission/vision, evaluate performance, provide input on veterinary training curricula to promote surveillance activities (animal health officers, technical officers, veterinarians, etc.)
    - *Technical committee:* identify techniques and methodology to achieve goals, develop SOPs, protocols, plans
- Identify stakeholders/partners involved in each committee
    - E.g. laboratory, One Health platform, GHS, Ministry of Environment, Science, Technology and Innovation (MESTI), private sector, NGOs, universities, etc.
- Convene launching and regular meetings of committees

Roles and responsibilities:

- Lead: VSD, MOFA
- Partners: GHS, MESTI, international organisations

Deliverables:

- Members of committees are identified
- Roles and responsibilities of committees are formalised
- Launching meeting of committees

Timeline for completion: Within 2 years of SET evaluation

| 5 | Develop national training strategy to coordinate and standardize surveillance-related trainings at all levels (Priority 2) |

Strategy:

- Implement standardized training programs based on need
    - Include initial and refresher trainings on staff's roles related to surveillance and current reporting protocols
    - Identify other topics of interest:, sampling/packaging (e.g. International Air Transport Association [IATA] training), disease recognition, ISAVET
- Include surveillance refreshers during regular regional meetings

Roles and responsibilities:

- Lead: VSD
- Partner: International organisations, NGOs

Deliverables:

- All staff in the surveillance system benefit from standardised initial and refresher trainings on their roles and responsibilities
- Extra trainings are implemented to build epidemiology/surveillance capacities (e.g. ISAVET, disease recognition)

Timeline for completion: Within 4 years of SET evaluation

6	**Strengthen multisectoral collaboration under One Health Platform (Priority 2)**

Strategy:

- Formalise multisectoral collaboration at all levels, including
  - Data sharing mechanisms, joint investigation protocols, joint trainings
  - Roles of VSD for the upcoming One Health Platform
- Conduct multi-sectoral simulation exercise at the border for a selected priority zoonotic disease

Roles and responsibilities:

- Lead: VSD, One Health Platform
- Partners: GHS, international organisations

Deliverables:

- Multisectoral activities are formalised
- A cross-border simulation exercise is conducted to reinforce multisectoral response protocols for zoonotic diseases

Timeline for completion: Within 4 years of SET evaluation

7	**Develop a communications plan to raise visibility of VSD and improve outreach to stakeholders (Priority 2)**

Strategy:

- Identify specific staff responsible for communications activities
- Develop specific outreach messages adapted to each stakeholder
  - Policy-makers
  - Livestock owners – radio, posters, association meetings
  - Private veterinarians – association meetings, continuing education credits
- Publish and distribute regular epidemiology bulletins

Roles and responsibilities:

- Lead: VSD
- Partners: international organisations, NGOs, professional associations

Deliverables:

- Personnel dedicated to communication is identified working within the VSD
- Outreach messages directed at specific stakeholders are disseminated
- An epidemiology bulletin is produced and distributed at a pre-determined frequency

Timeline for completion: Within 4 years of SET evaluation

8	Reinforce laboratory network to better support surveillance activities (Priority 3)

Strategy:

- Train staff for in-house equipment maintenance and calibration
- Secure dedicated funds for laboratory support from VSD budget
- Conduct LMT in all laboratories within the country to thoroughly assess individual laboratories' capacities
- Develop a procurement plan of necessary supplies for each laboratory to ensure continuous operations by addressing:
    - o Access to reagents and supplies
    - o Premises renovation of certain laboratories
    - o Continuous power (e.g. solar panels)
- Enhance standardisation across network
    - o Implement Laboratory Information Management Systems (LIMS)
    - o Develop and distribute standardized SOPs for equipment use, quality assessments, results, feedback and interpretation
- Develop MoUs with other sectors to promote collaboration and resource sharing (e.g. joint resource use for fisheries and animal health laboratory diagnostics)

Roles and responsibilities:

- Lead: VSD, MOFA
- Partners: GHS, international organisations, Fisheries commission,

Deliverables:

- Laboratory staff perform their own instrument calibration as applicable
- LMT assessments are conducted in all laboratories, ATLASS
- A procurement plan is developed to address gaps in the laboratory network
- Standardised SOPs for laboratory activities are developed and distributed
- MoUs with other ministries are developed to improve intersectoral collaboration and resource sharing

Timeline for completion: Within 6 years of SET evaluation

9	Strengthen surveillance-related policies to clarify stakeholders' roles in and develop a budget line for surveillance activities (Priority 3)

Strategy:

- Review existing policies to identify gaps
- Update policies to clarify:
    - o Role of private sector in disease reporting
    - o Roles/responsibilities of different organisations related to inspections according to OIE standards

      ○ Operationalisation and enforcement of laws
      ○ Sustainability of activities and autonomy of budget based on revenue generated

Roles and responsibilities:

- Lead: VSD, MOFA
- Partners: Veterinary Council of Ghana

Deliverables:

- A coherent set of policies exists that describes role of different parties related to disease reporting and inspections of animals/animal products
- Existing policies incorporate implementation/enforcement components
- Existing policies contribute to sustainability of surveillance activities based on revenue generated by the service

Timeline for completion: 5 years

10	Develop a funding strategy to enhance disease surveillance and response capacities in the field (Priority 3)

Strategy:

- Conduct a needs assessment of missing materials across the network
- Develop proposals to lobby for funding from financial partners
- Conduct resource mobilization to provide for:
  - ○ Transportation support to field staff (vehicles, maintenance, fuel)
  - ○ Supplies needed for effective surveillance (sampling supplies, personal protective equipment, disposables, knives for abattoir workers)

Roles and responsibilities:

- Lead: VSD, MOFA
- Partners: international organisations, financial partners, NGOs

Deliverables:

- Gaps and needs are listed in a document that is shared with financial partners
- Funding from various partners is implemented in a coordinated way following an established strategy

Timeline for completion: Within 6 years of SET evaluation

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Appendix I – Evaluation mission summary, Ghana

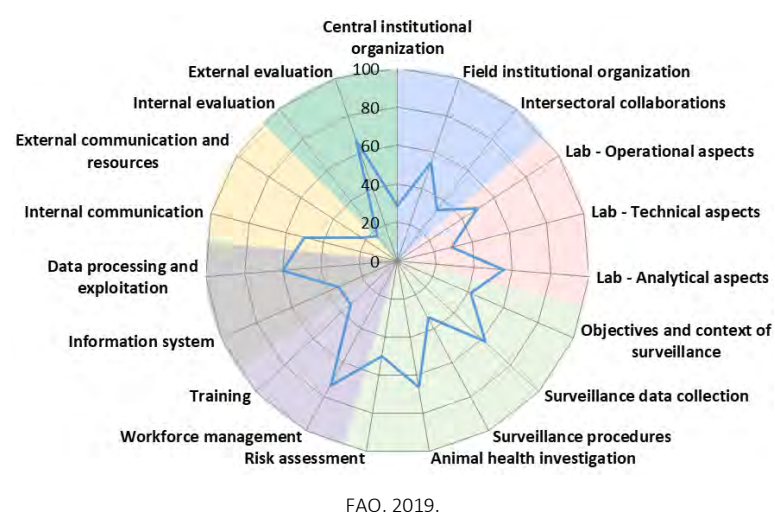| MISSION INFORMATION |
| --- |

Country: Ghana

Dates of mission: 17-28 March 2019

Evaluation team: 8 assessors divided into 3 teams

- 4 veterinarians from Ghana VSD, 2 epidemiologists from FAO ECTAD Ghana, 2 epidemiologists from FAO Rome

Number of stakeholders interviewed: 134

EVALUATION RESULTS	AREAS VISITED

FAO, 2019.

United Nations, 2019.

MAJOR STRENGTHS	TARGETED AREAS OF IMPROVEMENT
- The surveillance system's structure covers the entire country and data flow is formalised from the field to the central level - Laboratories in Accra, Takoradi and Pong-Tamale with BSL 2 and 3 - New vacancies open and additional staff - Multiple levels of in-service epidemiology training in place – e.g. FETP, ISAVET - Standardised Veterinary Forms used for disease reporting - Good reporting rate from all regions to central level (~ 100%) "Yellow book" developed by the VSD with formalised: case definitions, guidelines/policies for specific diseases, images, reporting - Pilot EMA-i project in three regions, at central level, and in laboratory – greatly improved reporting numbers - Monthly coordination meetings occur in many regional offices and quarterly RVO meetings at national level	- Budget planning for surveillance - Maintenance and calibration of Laboratory equipment - Capacities of sample collection and transportation - Small ratio of veterinary personnel to farmers - Training plan for surveillance (e.g. to prioritise distribution of trainings based on gaps) - Development of detailed SOPs at all levels - Clarification of roles of different organisations (FDA, VSD) in regard to inspection work (ports of entry, abattoirs) - External communications (e.g. newsletter) - Improve capacity to conduct field activities due to lack of transportation (vehicle, gasoline) for field staff

SET ACTION PLAN			
Recommendations	**Short-term 1-2 years**	**Mid-term 2-4 years**	**Long-term 4-6 years**

Priority 1 — 1. Formalise and standardize all surveillance activities
  a. Update, print and distribute Surveillance Guidelines
  b. Draft protocols/SOPs for all notifiable diseases
	🟥		

2. Implement advanced data management procedures to engage in advanced epidemiological analyses
  a. Update VF reporting forms (e.g. field for history taking)
  b. Scale up EMA-i to the rest of territory
  c. Standardise data entry media at regional level
	🟥		

3. Implement a workforce development plan to better prepare to changes in personnel
  a. Conduct review of workforce capacities across levels
  b. Identify areas of understaffing to be prioritised
  c. Develop/update ToRs (including supervision mechanisms)
	🟥		

4. Identify and implement steering and technical committees for animal disease surveillance
  a. Identify stakeholders and roles of committees
  b. Convene launching and regular meetings of committees
	🟥		

Priority 2 — 5. Develop national training strategy to coordinate and standardize surveillance-related trainings at all levels
  a. Implement standardized training programs based on need
  b. Include surveillance refreshers during regional meetings
	🟧	🟧	

6. Strengthen multisectoral collaboration under One Health Platform
  a. Formalise multisectoral collaboration at all levels
  b. Conduct multi-sectoral simulation exercise
	🟧	🟧	

7. Develop a communications plan to raise visibility of VSD and improve outreach to stakeholders
  a. Identify staff responsible for communications activities
  b. Develop outreach messages adapted to stakeholder
  c. Publish and distribute regular epidemiology bulletins
	🟧	🟧	

Priority 3 — 8. Reinforce laboratory network to better support surveillance activities
  a. Train staff for in-house equipment calibration
  b. Develop a procurement plan for each laboratory
  c. Enhance standardisation across network
	🟩	🟩	🟩

9. Strengthen surveillance-related policies to clarify stakeholders' roles in and develop a budget line for surveillance activities a. Review and update existing policies to identify gaps and clarify roles/responsibilities of different partners	🟩	🟩	🟩

10. Develop a funding strategy to enhance disease surveillance and response capacities in the field
  a. Conduct a needs assessment of missing resources
  b. Develop document to mobilise resources
	🟩	🟩	🟩