KENYA ANIMAL BIO-SURVEILLANCE (KABS) USER GUIDE

AFRICAN UNION
INTERAFRICAN BUREAU
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FOREWORD

New surveillance systems are required to meet the demands of a changing world. Traditional surveillance method in Kenya animal health sector depend on reporting of diseases (indicator based surveillance) but it often operates with considerable delay and disadvantages. This is because it requires sample collection, transport and lab analysis before reporting. Thus, a complementary surveillance system is required for faster reporting of health events in animals. Syndromic Surveillance plays this very important role. The importance of Syndromic Surveillance is further shown by the fact that syndromic surveillance is a core capacity requirement by WHO and OIE.

The Kenya Animal Bio-Surveillance (KABS) is a near-real time system that allow veterinary practioners to enter, transmit and analyze data electronically. The system allows immediate reporting of diseases, conditions, key syndromes, and other epidemiological information.

Once the practioners encounter a diseased animal at the farm/ abattoir, the information is sent through the system to a central server at the Directorate of Veterinary Services. The national and county governments can view the information sent concurrently. The KABS system/platform uses algorithms that enable rapid analysis and generation of potentially actionable data for recognition of and response to disease events. Therefore, immediate feedback is sent to the person who sent the information and relevant offices responsible for response.

Real-time reporting and response through syndromic surveillance will reduce time to detect and respond to disease events, outbreaks and reduce morbidity and mortality. Consequently, it is a critical tool for Kenya to enhance compliance with OIE and WHO requirements for a functional surveillance system. Generally national surveillance will continue to improve as the Directorate of Veterinary Services rolls-out this system nationally to all counties. I am confident this system will help detect diseases and especially zoonotic diseases before they spillover to humans.

We hope that the veterinary practitioners in all counties will find this manual helpful in operating Kenya Animal Bio-surveillance system (KABS) app.

Director of Veterinary Services

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ABBREVIATIONS

ASF	African swine fever
BFES	Biosurveillance Field Entry System
BSE	Bovine Spongiform Encephalitis
CBPP	Contagious Bovine Pleuro-Pneumonia
CCPP	Contagious Caprine Pleuro-Pneumonia
CSD	Clinical Studies Department
DDX	Differential Diagnosis
DVS	Directorate of Veterinary Services
FMD	Foot and Mouth Disease
GIT	Gastrointestinal infections
HPAI	Highly Pathogenic Avian Influenza
KABS	Kenya Animal Biosurveillance System
LSD	Lumpy Skin Disease
NCD	Newcastle Disease
ND1	Notifiable Diseases
OIE	World Organization for Animal Health
PPR	Peste des petits ruminants
RVF	Rift Valley Fever
RVILs	Regional Veterinary Investigation Laboratories
SGP	Sheep and Goat Pox
VEES	Veterinary Epidemiology and Economics Section
WHO	World Health Organization

DEFINITION OF TERMS

Kenya Animal Biosurveillance System (KABS) - This is veterinary information system with focus on animal disease surveillance. KABS aids in electronic data collection, real-time transmission, analysis, and feedback to the animal health workers and stakeholders to improve detection of diseases in both domestic and wild animals.

ND1/Sanitary Report Form - This is a standard form in use by the Veterinary Epidemiology and Economics Section (VEES) for capturing PRESENCE of observed cases of notifiable diseases listed by the OIE.

Zero Report Form - A standard form used by the Veterinary Epidemiology and Economics Section (VEES) for specific trade-sensitive diseases (including Rift Valley fever (RVF), Rinderpest, PPR, FMD, Avian influenza, CBPP and CCPP) to record the ABSENCE of these diseases or pathognomonic signs for the diseases.

Animal Health Workers (surveillance Officers)– Any veterinary surgeons and/or veterinary para-professional working in various areas (private and government) which are source of any animal health information. These will be involved in collection, transmission to the CDVS and /or DVS and of animal disease information and dissemination of the feedback thereof.

Notifiable Diseases - any disease that is required by law to be reported to government authorities. The collation of information allows the authorities to monitor the disease, and provides early warning of possible outbreaks. The list is annexed

Case Definition - A set of standard criteria for deciding whether an animal has a particular disease or health-related condition, by specifying clinical manifestation and limitations on time, place, and animal.

Real-time - Real-time surveillance: Daily or max weekly collection, consolidation and evaluation of public health and/or veterinary data.

Syndrome - A syndrome is a set of signs or symptoms resulting from a single cause or so commonly occurring together as to constitute a distinct clinical picture.

1. INTRODUCTION

Livestock and wildlife disease outbreaks have the potential for rapid spread both nationally and internationally. We are in a continuous risk of exposure to emerging and re-emerging and endemic disease pathogens such as anthrax, brucellosis, rabies, Ebola, RVF, and HPAI due to several factors such as growth in trade and travel, increase in human and animal interactions and an upsurge of bioterrorism activities. An effective surveillance system aimed at rapidly detecting diseases is a crucial component of improving the health of both humans and animals. A functional animal health syndromic surveillance system is a core capacity requirement for surveillance in accordance with World Organization for Animal Health (OIE) and World Health Organization (WHO).

DVS continuously monitors for diseases in livestock and wildlife in order to minimize losses associated with infectious diseases in the country. The current surveillance system in Kenya is largely paper based where reporting officers manually record disease details into forms which are sent via email to the DVS. Whereas this system is useful, it has some shortcomings-- delays in reporting, data transmission, and analysis and feedback mechanisms. The KLWSS has been developed to provide a real time electronic reporting system using a mobile phone-based application with in-built analysis and feedback capabilities. This manual introduces the concept of syndromic surveillance in livestock, provides guide for use of an electronic data collection tool called Kenya Animal Biosurveillance System (KABS) and is a trainer of trainers guide on surveillance. Surveillance goals have been described in here as well as how the field surveillance officers will use this manual to report surveillance data.

2. WHO IS THE GUIDE FOR?

This guide is intended to provide general guidance to field surveillance officers. This includes veterinary surgeons and veterinary paraprofessionals who all have a responsibility to report diseases. This manual seeks to provide a sequential guide to utilization of the Kenya Animal Bio-surveillance System (KABS) to improve and strengthen surveillance system in Kenya. The manual also puts emphasis to syndromic surveillance which is key consideration to improving the surveillance system in Kenya.

The users of this guide are also encouraged to refer to the DVS surveillance training manuals for details on general epidemiological surveillance in Kenya.

3. INTRODUCTION TO SURVEILLANCE

3.1 SURVEILLANCE

Surveillance is a **systematic** and **continuous** collection, analysis and interpretation of health data (often designed to detect the appearance of a specific disease), It allows the **health status** and **associated factors** of given populations to be followed in space and time it is used in generation of information on livestock.

3.1.1 Importance of surveillance

Surveillance will result in generation of disease information. The information can be used for:

- Prediction of the source and progression of the disease outbreaks
- Planning and monitoring of disease control programs; provision of sound animal health advice to farmers
- Emergency preparedness *(Early Warning systems).* This enables the rapid detection of the introduction of or sudden increase in, the incidence of priority livestock diseases (those of socio-economic& public health importance)
- Certification of livestock and livestock products for export
- Facilitation of risk assessment by international trading partners who wish to carry out trade in livestock and livestock products and require regular credible reports on a country's disease status.
- International reporting and providing proof of freedom from diseases for accreditation by the OIE.
- Help to design control measures (goals and targets to be set up) and to assess whether animal health goals and targets are being reached adapt control measures

3.1.2 Types of surveillance

Passive Surveillance

Passive surveillance is the continuous collection of disease information from routine activities for example, data gathered in a diagnostic laboratory where samples are routinely taken for diagnosis, the cases found in the field during routine inspections among others. The system must be well managed and permanently "activated" for it to be effective (e.g. the data must be regularly analysed to interpret it). Passive surveillance is a key part of the veterinary department's early warning system to detect disease outbreaks. The activity is not restricted to a specific disease and it identifies which diseases are present in country and where disease is. It is a continuous activity and a basic requirement of the World Animal Health Organization (OIE). The transmission of Passive Surveillance data is done through a number of channels which include;

Abattoirs Surveillance - forms an important part of passive surveillance system employing ante and post-mortem inspection methods. It can pick up disease incidences at abattoir level thereby triggering active disease search through trace-back of the animals. It is suitable for detecting nonfatal chronic diseases that are difficult to detect in live animals e.g. Parasites e.g. Cysticercosis, Hydatidosis, CBPP, TB etc. Animal welfare issues can also be detected at ante mortem inspection. Weaknesses of abattoir surveillance include under-reporting especially during high speed slaughter where conditions may be missed by inspectors Also some conditions require a certain degree of expertise to detect them and laboratory confirmation is often not there to support the diagnosis.

Rumour register - This is maintained at all level and forms a record of the reports received by the office from livestock keepers, front line personnel (including Meat Inspectors) etc. They also record actions taken and time taken for response by AHSP at different levels.

Markets - During routine livestock market days, animal health service providers inspect animals and issue permits to those that have been purchased. Any disease encountered is reported to the CDVS. Stock routes Inspection of documentation of animals in transit is carried out at designated inspection points along the livestock stock routes. Any disease detected is reported to the CDVS.

Active Surveillance

This is active collection of data to detect and measure the presence/ absence of a specific disease (infection) or diseases in populations or individual animals. It is often used if an outbreak has begun or is suspected to keep close track of the number of cases. It is based on disease search by animal health service providers during stock route/livestock market inspection, farm visits, and border point inspection and in wildlife areas. It involves animal health providers going out into the field to undertake examinations and take samples for confirmatory diagnosis. It is usually part of response to a suspected. Data for active surveillance is generated through:

Surveys: A survey is a detailed study conducted to detect and measure the presence, absence and assessment of the risk factors of a specific disease (infection) by polling a section of population. It is conducted to detect and measure the presence or absence of a specific disease (infection) or diseases in populations or individual animals.

Disease outbreak investigations: They can be designed to generate information about diseases which occur in animal populations. This occurs when emerging and re-emerging disease is detected or unusually high number of cases of endemic disease is detected in a population in a given area.

Zero reporting: Zero reporting is done for specific notifiable high priority diseases such as Rinderpest, HPAI, Rift Valley fever, CCPP, CBPP. Normally the field personnel can carry out inspection of animals at marketplaces/stock routes/poultry farms/border points etc. Any clinical evidence of disease is documented and a zero report for that particular disease when they do not come across it. Zero reporting is important when giving proof of absence of a particular disease.

Syndromic Surveillance: Syndromic surveillance involves collection of clinical signs and symptoms such as abortion, neurological signs, haemorrhagic signs and so on suggesting a likely presence of a health event among the animal population. Syndromic surveillance provides an early warning of human or veterinary public health threats, which require action.

Participatory disease search (PDS): It involves engaging the communities to identify and prioritize animal health issues in their livestock it is the qualitative search of diseases using rapid and participatory rural appraisal approaches.

Sentinel surveillance: Sentinel surveillance involves recruitment of animals where the risk factors of the disease (s) of interest are highest. These animals are then monitored regularly and the signs related to the disease (s) of interest are noted. To check the status of the sentinel herd, routine serological analysis could be deployed. This acts as an early warning system for e.g. surveillance of RVF in the sentinel herds. positive, this indicates that the animal has been exposed to the disease in the time between the current test and the previous (negative) test.

3.2 LAWS AND POLICIES THAT GOVERN DISEASE SURVEILLANCE

The Constitution of Kenya 2010 through Article 2 (5) and Article 2 (6) recognises any international law, treaty, or convention as part of the laws of Kenya. Kenya ratified the World Trade Organization (WTO) Agreement on the Application of Sanitary and Phytosanitary (SPS) Measures on 23rd December 1994. The WTO recognizes OIE as the standards setting bodies for all the members states to ensure the safety of trade in livestock products and commodities. As a member state, Kenya has a responsibility to report occurrence of all OIE listed diseases to the OIE. Likewise, all the Counties in Kenya have a responsibility to report to the OIE delegate for Kenya (Director of Veterinary Services).

According to the animal diseases Act CAP 364 4(2), **any veterinary surgeon** who has reason to believe or suspect that **any notifiable disease** exists on any farm or in any area shall, notwithstanding the provisions of subsection (1), forthwith give notice of that fact to the nearest administrative officer or inspector. Therefore, the veterinary professionals have a **legal duty** to report the diseases.

Therefore, Kenya Animal Bio-surveillance System (KABS) will facilitate the counties and the Country meet their obligation of disease reporting at different levels following the reporting lines outlined in the flow chart below

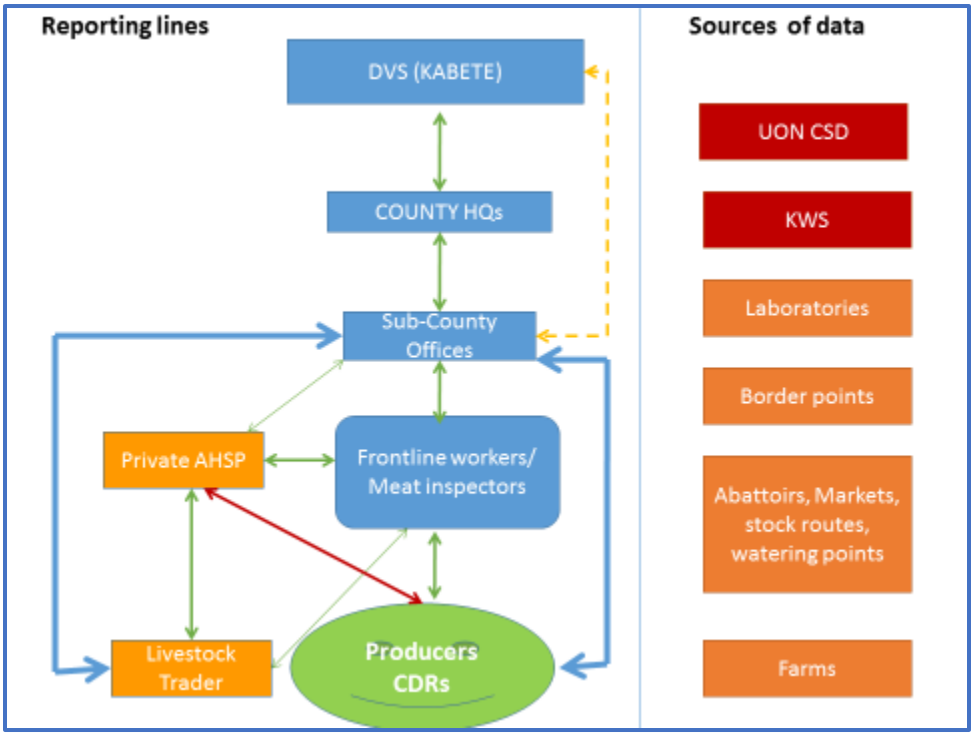


Figure1: Data reporting lines and feedback among the various levels under the DVS.

4. INTRODUCTION TO KENYA ANIMAL BIOSURVEILLANCE SYSTEM (KABS)

Kenya Animal Bio Surveillance System (KAS) is a near real-time disease surveillance system with capabilities for real time data collection, transmission, analysis, and feedback to field surveillance officer to improve detection of diseases in both domestic and wild animals. The KABS provides an electronic platform that allows government and private veterinary surgeons and veterinary para-professionals to capture data electronically and transmit to the server on near- real time basis.

4.1 KABS COMPONENTS

The Kenya Animal Bio-surveillance system has the following key components;

- Mobile application (**KABS)**
- Web viewer known as the **KABS dashboard**

4.1.1 KABS mobile application

This is a mobile application designed for data collection based on Android Operating system.

The application is available on google play store and its icon appears as shown below

Fig: *KABS icon*

Disease reporting forms

The application currently has 2 forms, namely;

a. Sanitary Report Form (ND1)

b. Zero Report Form

Different forms are used under different circumstances as shown in the figure below;

	Reporting form type	When and Who to Use	Diseases reported	Frequency of reporting
1.	Kenya Sanitary Report Form (also known as Notifiable Disease 1 form (ND1)	All Animal Health Workers, Private, County and National GOK and others to report **PRESENCE** of health events of interest. (disease and/syndrome)	All animal diseases	Real-time (KABS) or latest weekly (Manual)
2.	Zero –report forms	All Animal Health Workers Private, County and National GOK to report **ABSENCE** of the priority Diseases	HPAI, CBPP, CCPP, FMD,PPR,RVF, Rinderpest	Real-time (KABS) or latest weekly (Manual)

Note: when filling the ND1 form, the following are points to note:

- Each report should contain only one species and only one disease
- Number at risk only includes animals within the same farm/herd but not affected by the health event
- Disease control measures only captures the measures that has undertaken in that particular farm/herd only

The application allows the Animal health workers in various levels to collect animal health information electronically and submit it on real-time basis directly from the farm, market or abattoir and so on to the server.

When in the server, the information is made accessible to the County Directors of Veterinary services and the Directorate of Veterinary Services (DVS) for further action depending on the health event.

KABS Access Levels

The system has a workflow that allows different access levels depending on the roles and responsibilities of the users

Veterinary Epidemiology and Economics Section (VEES) – National KABS Admin

This is a section under the directorate of veterinary service in charge of surveillance in the country. The National KABS Admin and the application technology support is located here. This is also hosts the server where all the data submitted through KABS is stored and collated with other data. The admin will have access to submitted data from all the counties. Therefore, can be able to download the data, analyze and generate a report for the whole country. He will also manage the national officers' accounts i.e approve accounts for officers creating new accounts nationally.

County Veterinary Officer (Director)- County KABS Admin

This is the veterinary officer in charge of veterinary services in the county. He will have access to the data submitted to the central database (VEES) by field surveillance officers from his county. The County KABS Admin will be able to download data, analyze and generate a report for the county. He will also manage the county officers' accounts i.e approve accounts for officers creating new accounts at their county.

Sub-County Veterinary Officer – Sub County KABS Admin

This is the veterinary officer in charge of a sub-county. He will use the mobile-based app to fill in the ND1/ sanitary report and zero report form that is submitted to the central database and to the county director.

Government Officers - Users

These are Veterinary surgeons and veterinary paraprofessionals employed by the government. They will use the mobile-based app to fill in the ND1/ sanitary report and zero report form that is submitted to the central database and the county director.

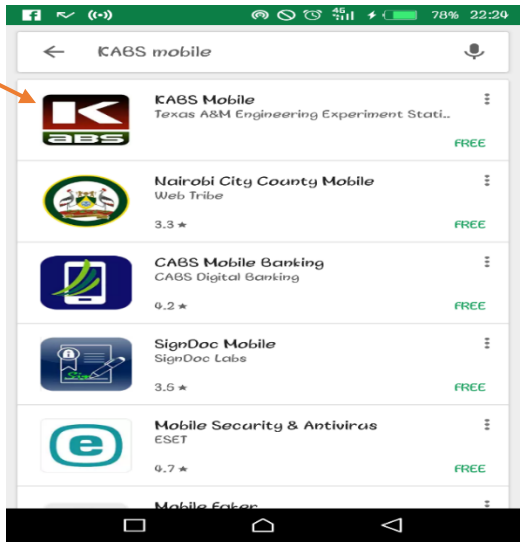
Private Practitioners - Users

These are Veterinary surgeons and veterinary paraprofessionals carrying out private practice. They will use the mobile-based app to fill in the ND1/ sanitary report and zero report form that is submitted to the central database and the county director.

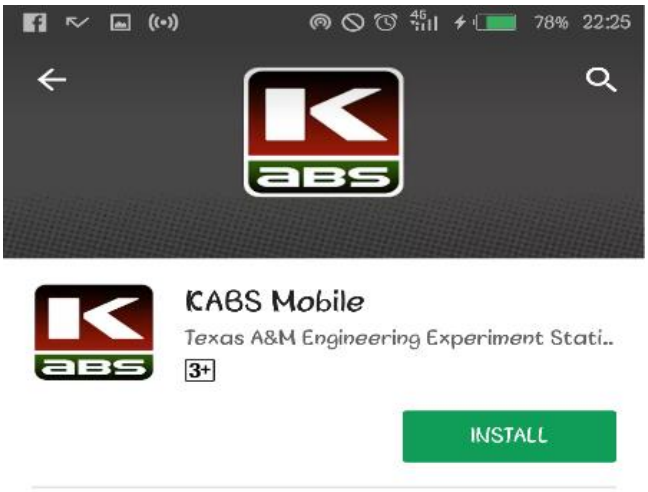
Downloading and installing KABS on smart phone

Search for **KABS mobile** on google play store:

Click on

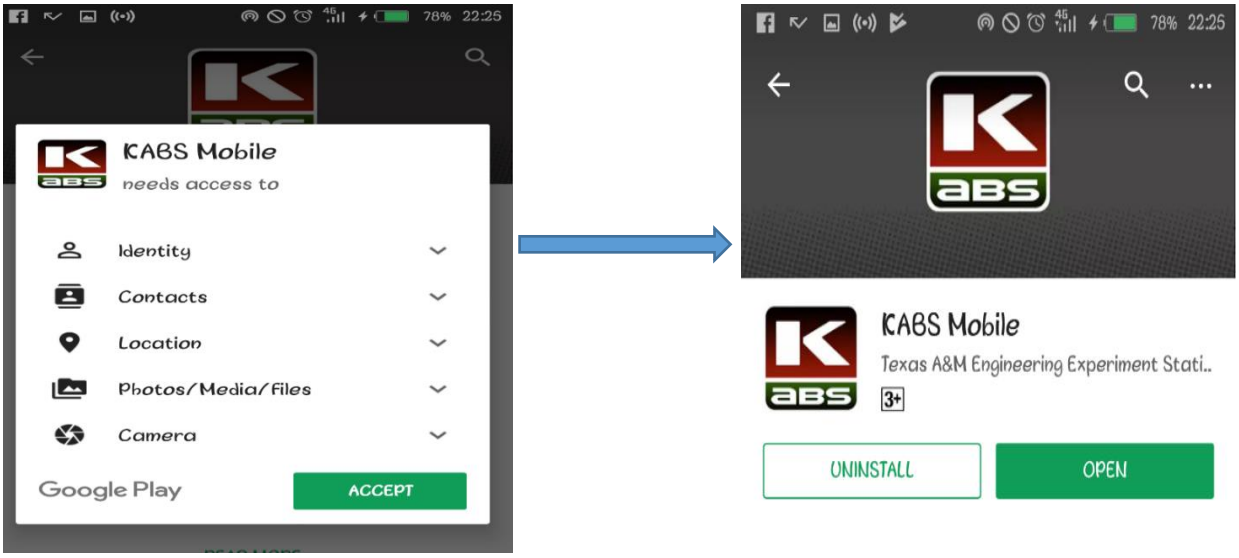


Click on install



Note: At this stage, your phone data must be turned on and there should be space in your internal storage to allow for installation of the application

1 Click on accept and then open after installing until it reaches 100% after which it takes to another stage to open as shown below

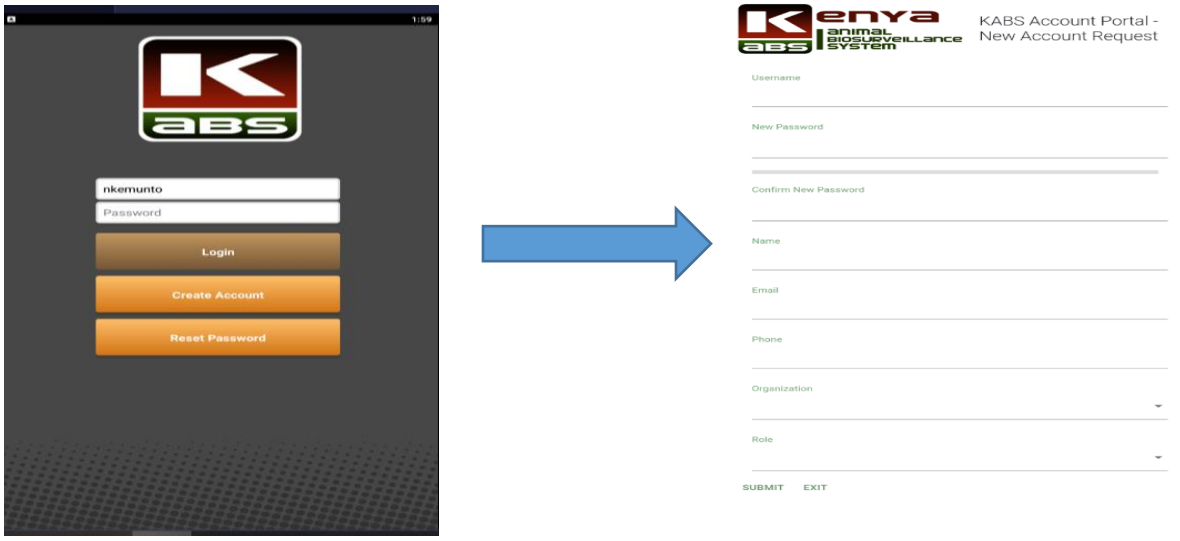


2

Creating own account on KABS and logging in

After installing.

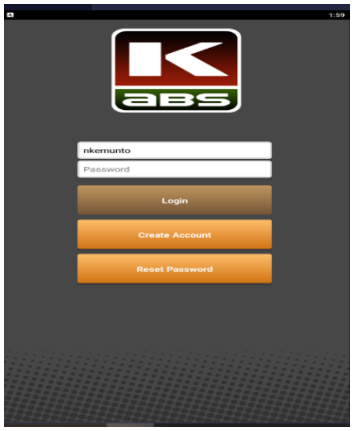
- Go to the menu on your phone where you have the other applications
- Open the application and go to Create account and fill the personal information as per the application



Create a username and password and then enter your details:

For instance;

- **Username:** Use first initial of your first name and your last name (E.g. My first name - Naomi, My last name - kemunto) = nkemunto
- **Password:** What you can easily remember e.g. kabsmobile
- You will get an email notifying you that your account has been received and being processed and verified.



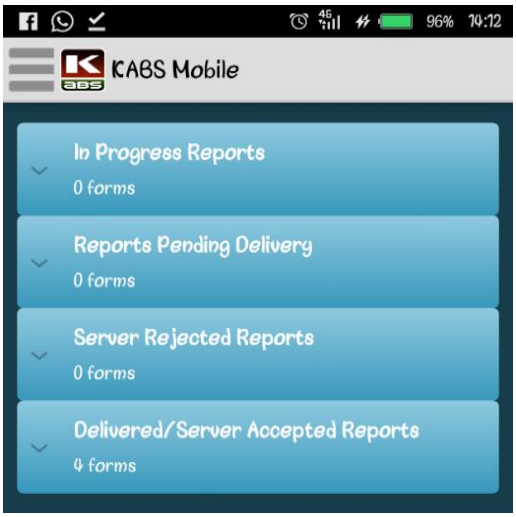
- After your account has been approved by the County KABS Admin or National KABS admin, you can be able to LOG IN using the username and password created.

Note: At this stage you need to be extra careful not to forget the username or password including any capital letters or unique characters you may have put in your login credentials.

Resetting password

- Incase you forget your password, cluck on Reset password to change your password.
- Fill in your username and the email you used to create your account, then you get a prompt telling you that instructions will be sent to your email.

- After logging in, the system will automatically take you to the page below which shows the various stage of reports:



- **In progress reports:** are forms you are filling in and not yet completed
- **Reports pending Delivery:** Are forms submitted but not yet delivered to the server. May be connectivity problems.
- **Server Rejected Delivery:** forms that did not go through to the server. This could be due to a technical error with the server.
- **Delivered/ Server Accepted Reports:** forms that have been submitted successfully

Click on the **menu** (3 lines on upper left)

- This takes you through the stages as shown  in the figure below
- Select **create new form** to access the sanitary/ND1 forms and Zero reports forms

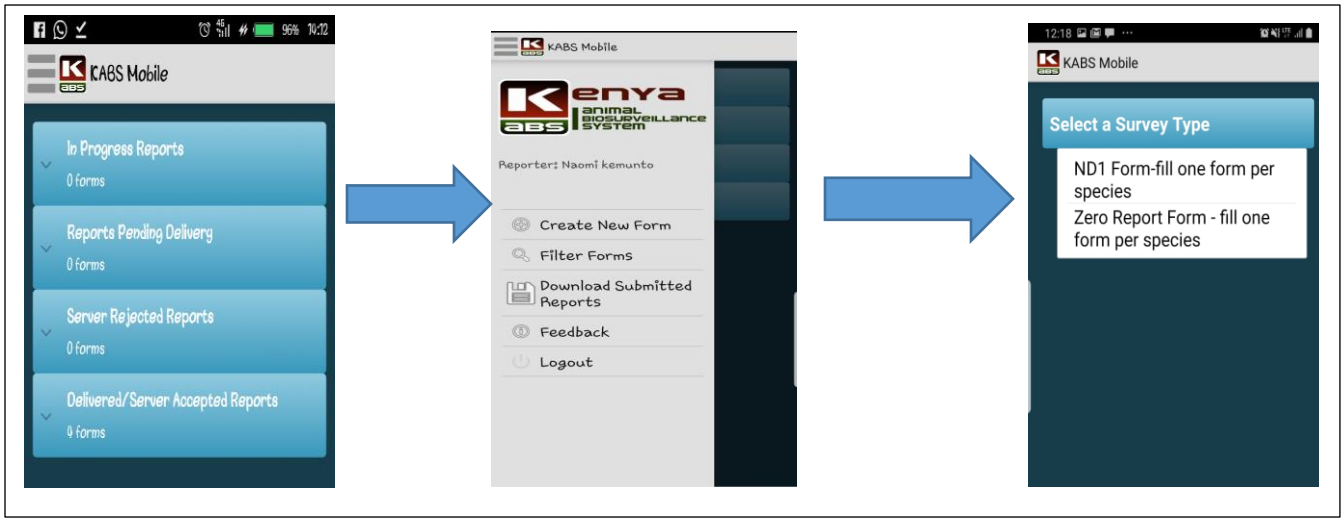
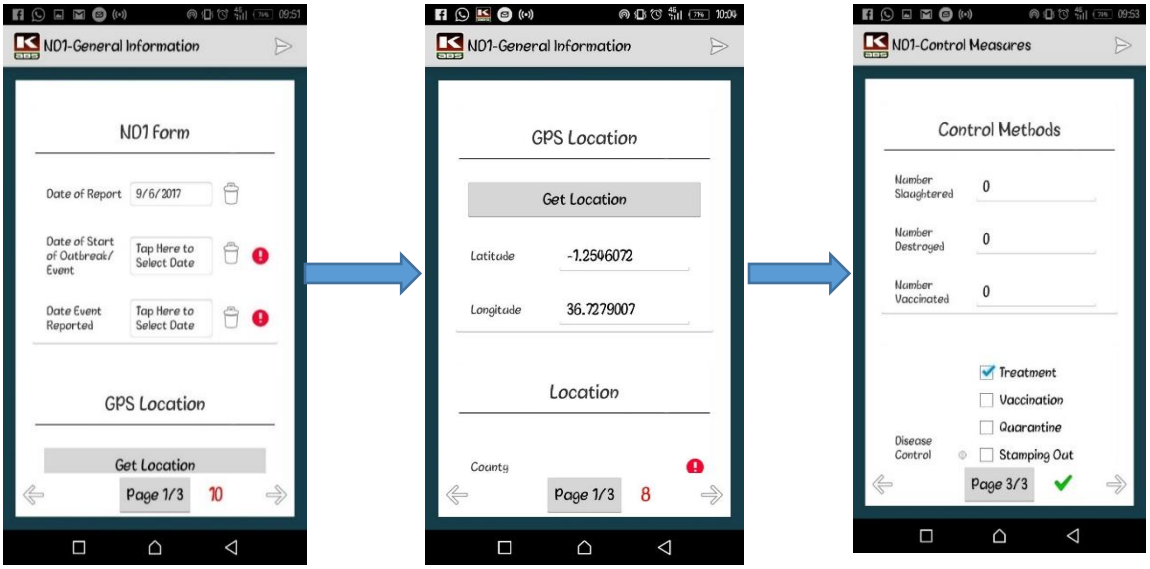


Figure showing progress from Log in to choosing the form you intend to fill

Filling the data in the forms

After getting to the form, fill the data in the sequence provided and proceed from page to page

Note: Once all the mandatory fields are filled on all pages, a green tick appears at the bottom right side as shown on the 3rd figure below.



Use the arrows at the bottom of each page to scroll to the next or previous page

Note: Once all the pages have been filled, **page 3/3 in sanitary report and 2/2 in the Zero report,** you will have a green tick.

In the case of zero report form, there are only 2 pages.

Note: On page 2, once you select the species, answer the syndromic question which seeks to establish if there are NO observable signs suggestive of the target disease.

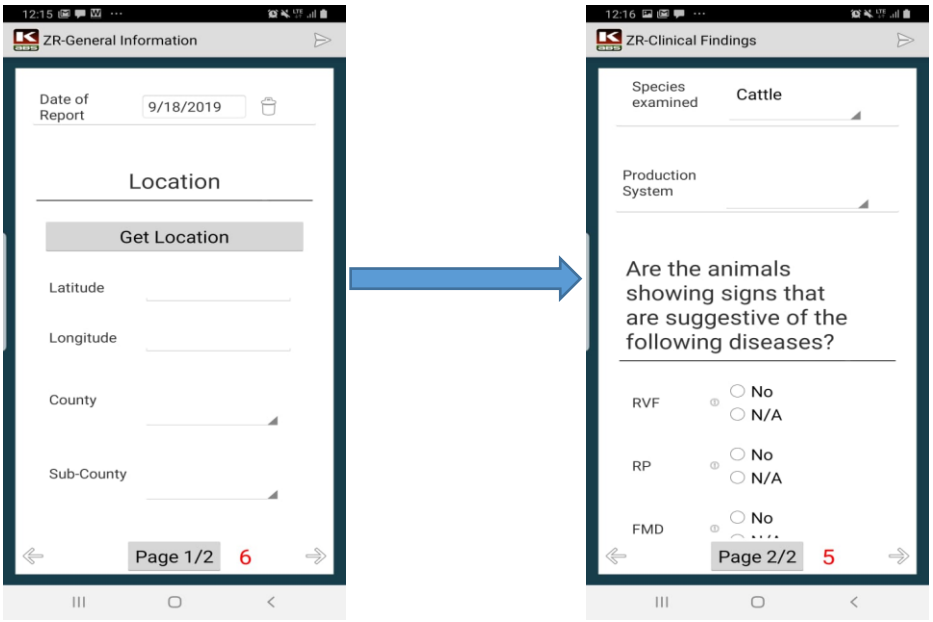


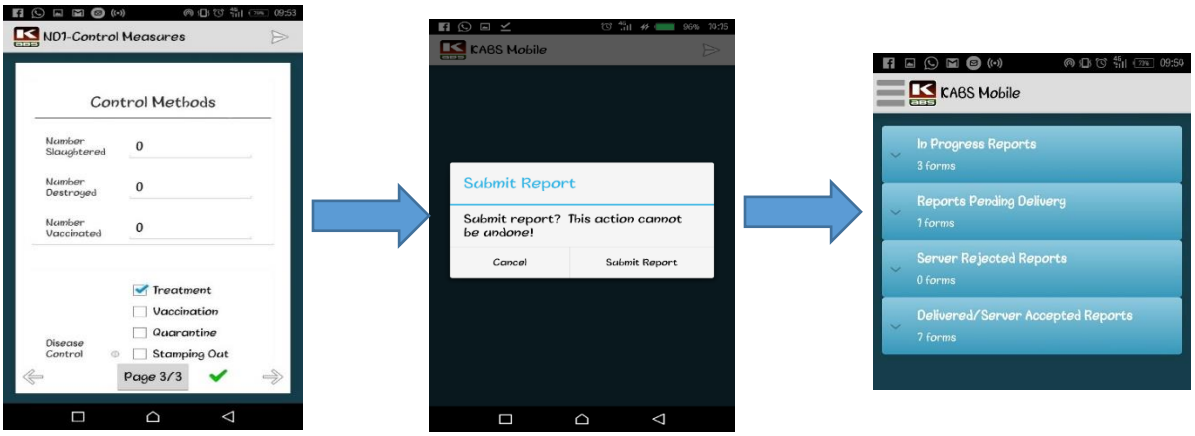
Figure showing the Zero report form pages

Submitting data

This entails uploading data into the central database to make it accessible to the National and County KABS Admin

- Before submitting data, ensure the last page has the green tick on bottom indicating all the fields are filled
- Click on the arrow on the upper right () to submit data. (see figure below)

Note: After clicking on the arrow as above, a question pops up: **Submit report?**
This action cannot be undone! Click on **Submit Report.**

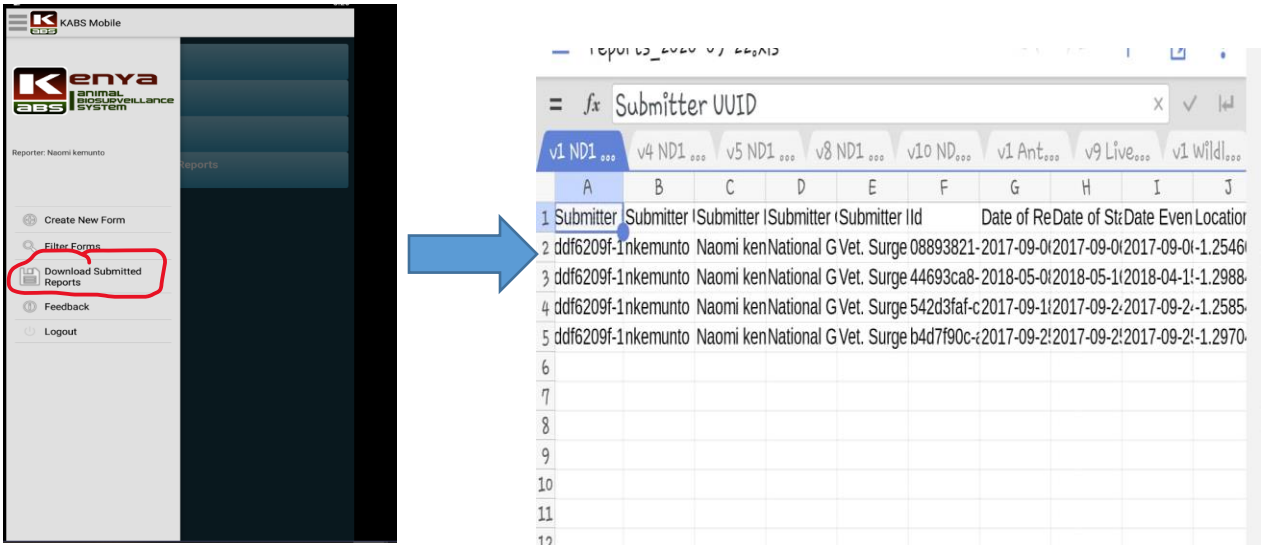


- Once submitted, you will see the report pending delivery.
- When delivered, it will show the number of reports you have sent as shown in figure above

Downloading own submitted forms

This involves downloading the forms you have submitted for your own records.

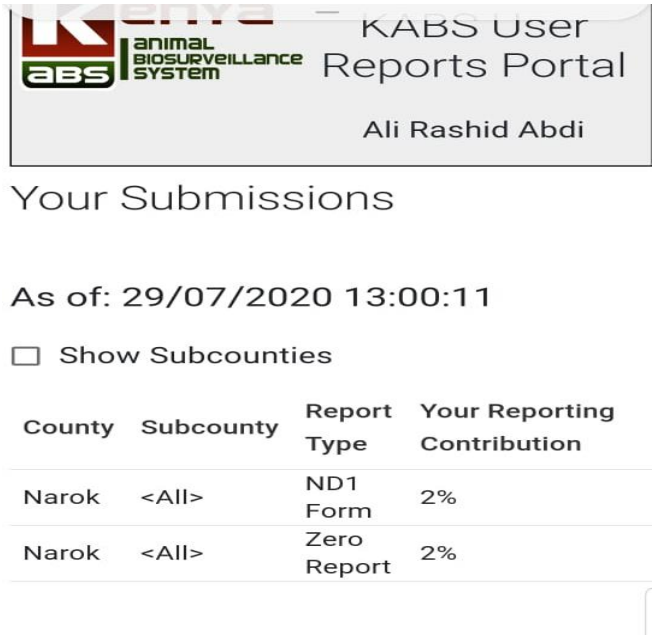
- Click on the **menu**  (3 lines on upper left)
- Select **Download Submitted Reports**



Feedback to the reporting officer.

This provides summary of data submitted in the last 30 days including:

- *Your form (ND1 & zero report) submissions given as a percentage of the total reports of each submitted in the county*



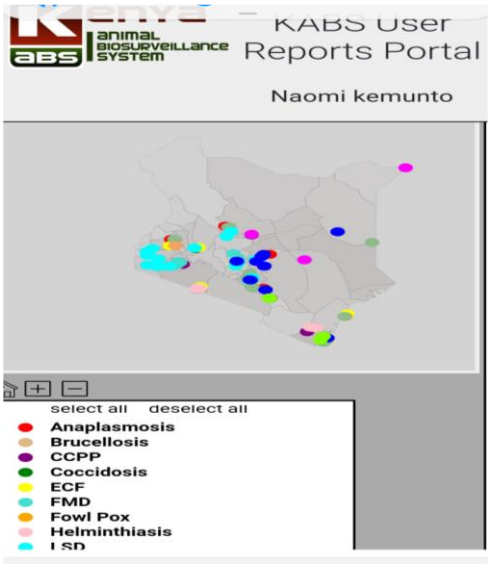
- *Top 10 diseases reported on your county in order of prevalence (from the most reported to the least)*

These diseases have been reported in the last 30 days by order of prevalence:

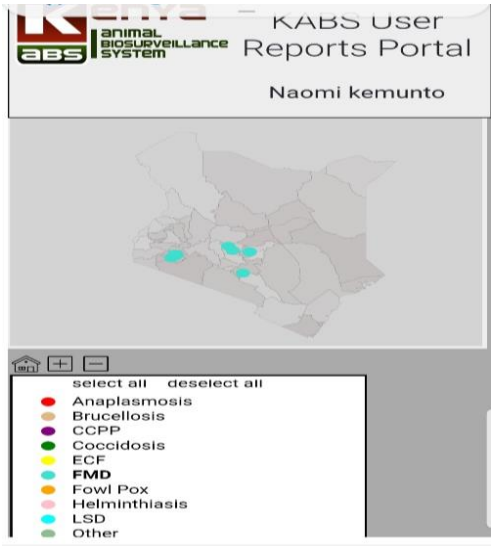
Bungoma

Disease	# of reports	% of reports in county
CCPP	2	20%
RVF	2	20%
LSD	1	10%
CBPP	1	10%
FMD	1	10%
Goat Pox	1	10%

- *Spatial distribution of diseases reported i.e GPS locations from were diseases are reported all over the country*



Shows all the diseases reported from different parts of the country



You can deselect all the diseases and select one or more that of want to see.

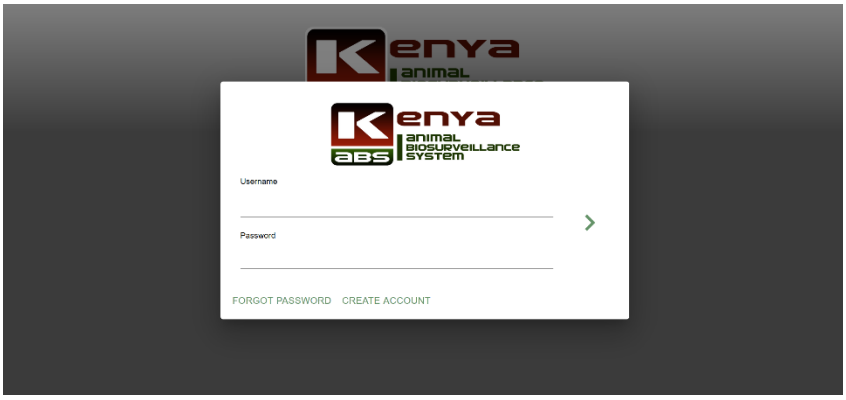
4.1.2 KABS dashboard

This is an electronic interface or the web viewer which allows the National and County Admins who have the login credentials to:

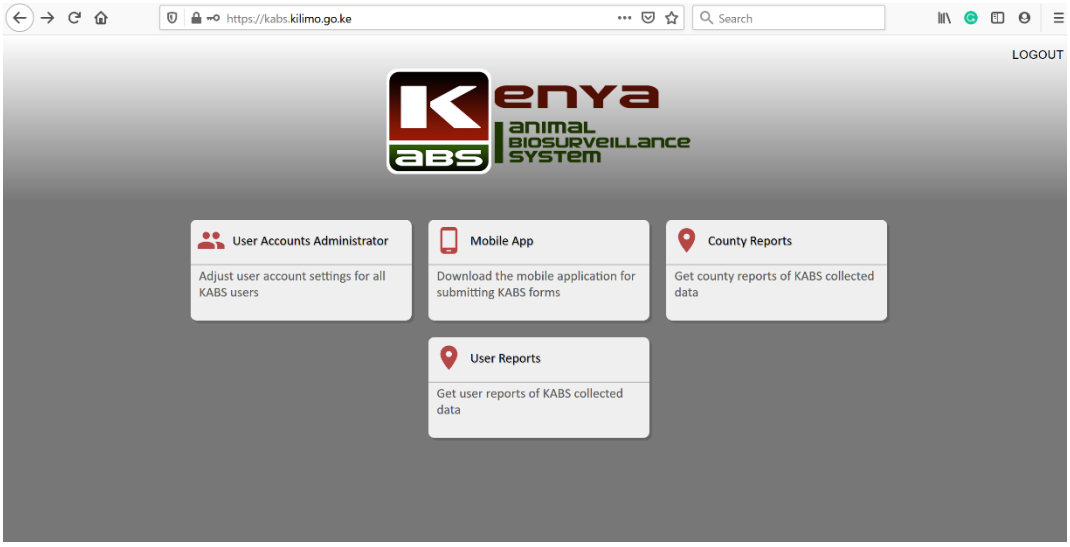
- Approve KABS user accounts
- Accessing and downloading reports in excel format for further manipulation and analysis
- Access basic automated analysis

To login to access the KABS landing page that allows you to open all the KABS service links:

- Click on the link below
  https://kabs.kilimo.go.ke/
- This will lead you to the dialog box to sign in as shown below

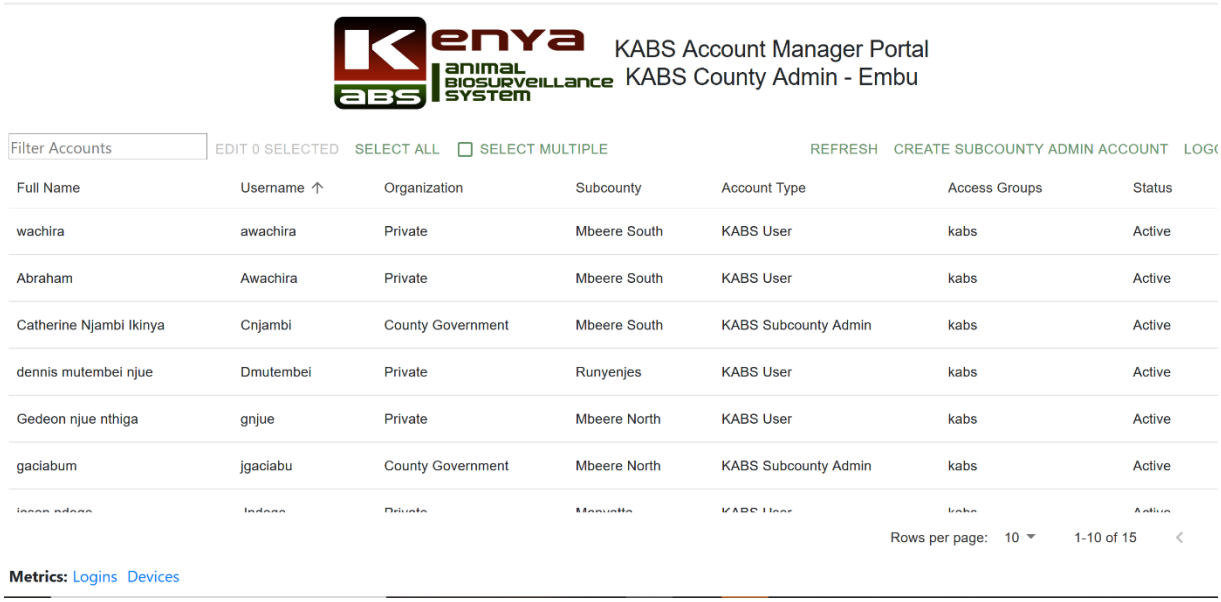


- Enter your login credentials (username and password) and click on the arrow >
- This will lead you to the dialog box (KABS landing page) to sign in as shown below with all the KABS service links

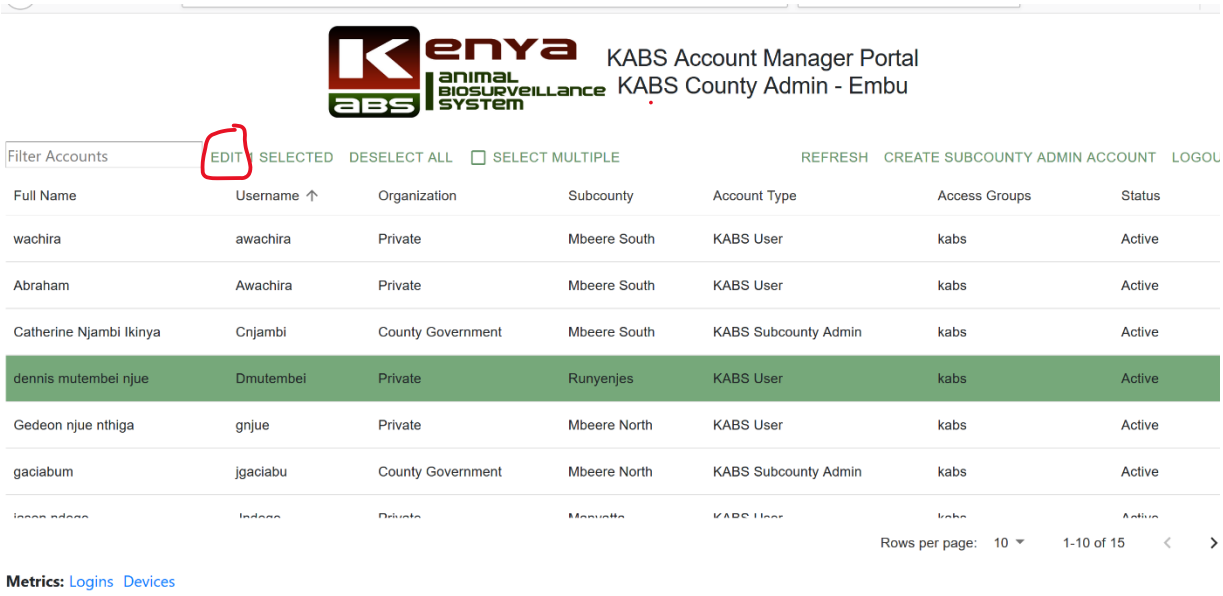


Approval of KABS user accounts

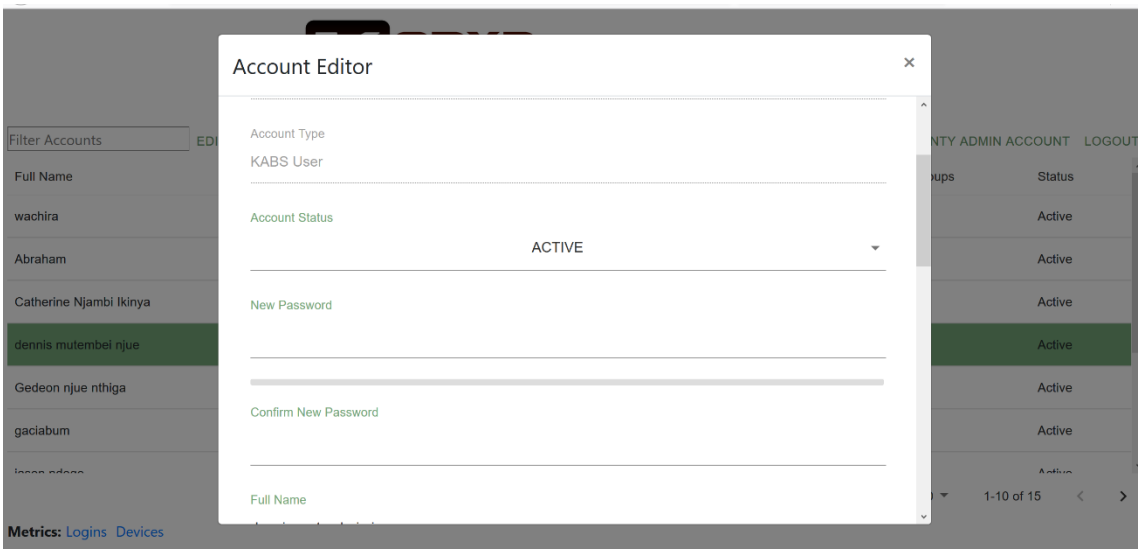
- Click on User Accounts Administrator, the system takes you to names of officers who have created an account as shown below



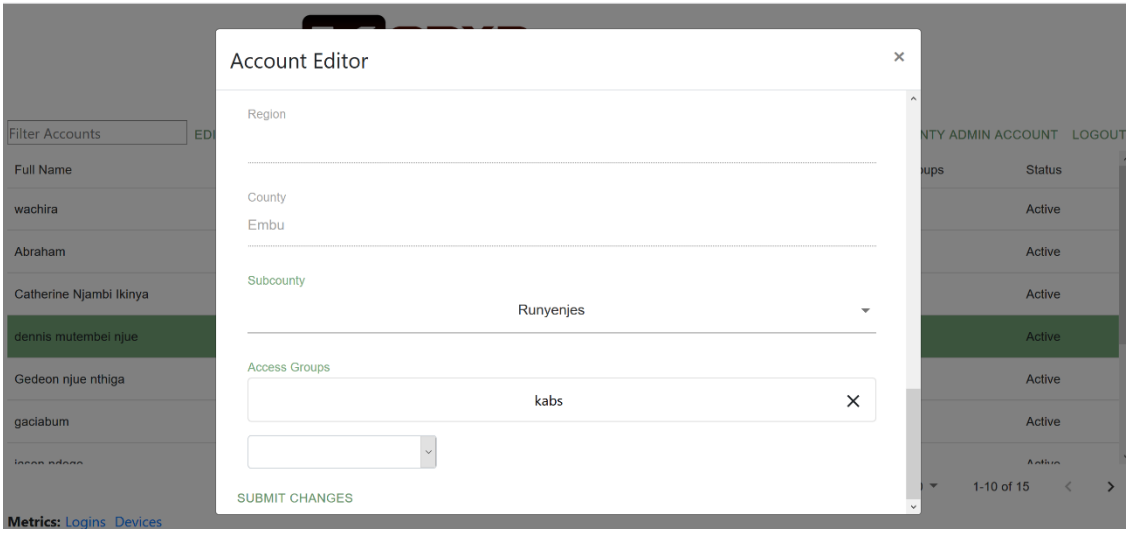
- Choose the user you want to approve an account for (the status will be reading pending) and click on his/her name then click edit



- Scroll on the details of the user on the dialogue box that appears
- On the account status select **ACTIVE**

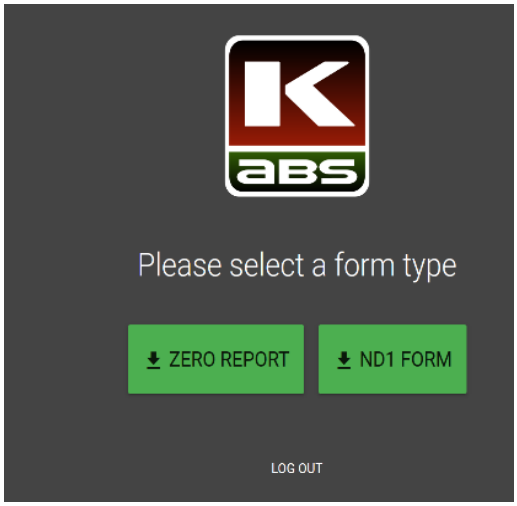


- Then scroll up to **access group** and select **kabs** to enable user to see ND1 and Zero report forms
- Then click on **submit changes** to save and enable the user to log in to the account on their KABS mobile phone application.

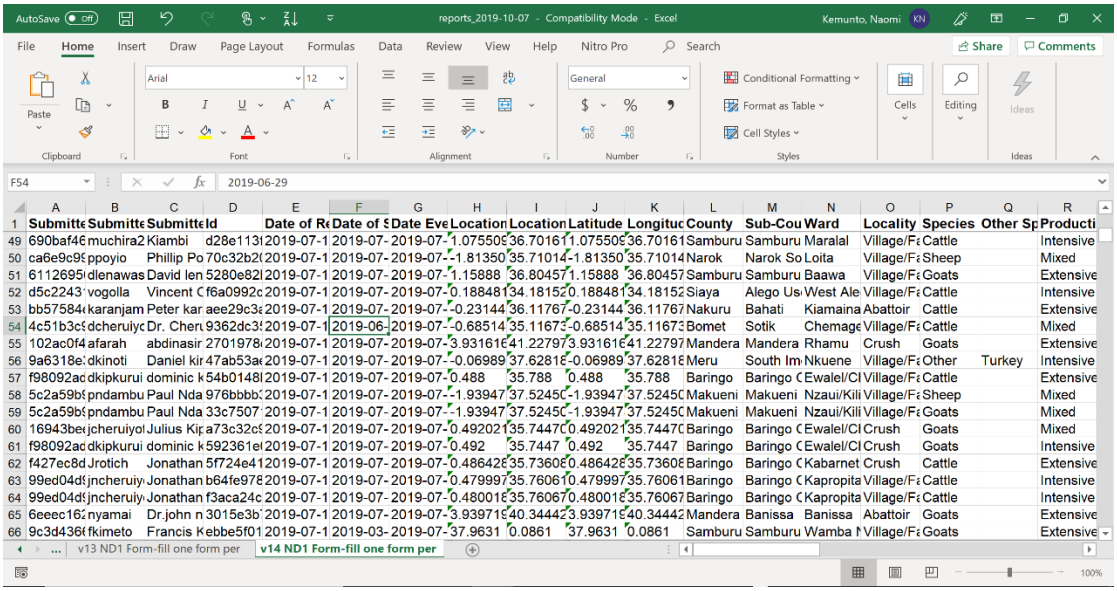


Accessing and downloading reports in excel format for further manipulation and analysis

- On the KABS landing page, click on the county reports
- This will take you to the initial page on the dashboard showing the two forms (ND1 form and zero report form) which are currently the only forms on KABS



- Depending on which forms you are interested in, click one form to download. The download comes in excel format and the user can manipulate and analyze according to the needs. A sample of downloaded data is as shown below

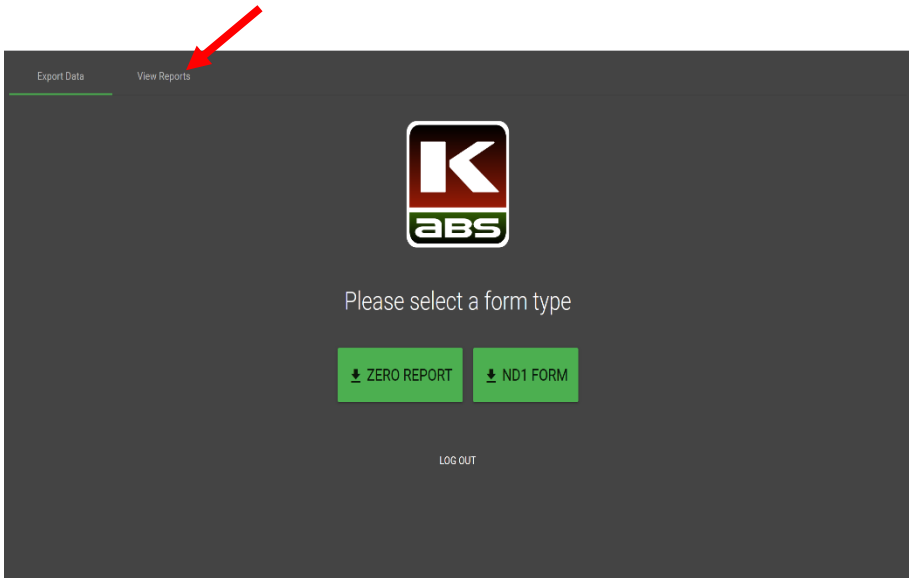


Analysis in KABS

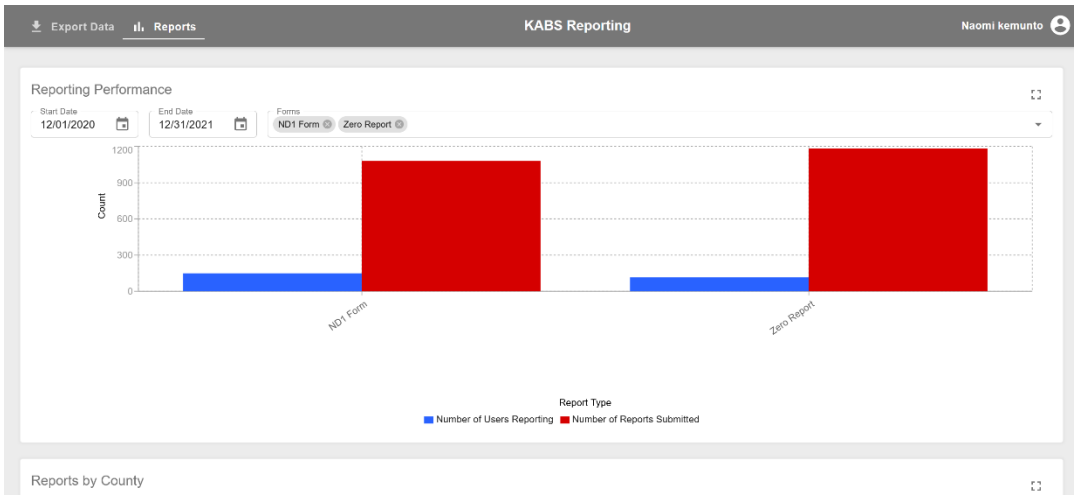
The KABS system has an inbuilt algorithm that allows automated data analysis. The analyzed data summaries can be viewed on this interface and can be downloaded in PDF format.

To view the output (figures and summaries) of the analyzed data

- Click on the bar on the upper left side VIEW REPORTS as shown by the red arrow below



- Once you click, it will take you to a window showing the analyzed data. You can then query the dates when you want to see the analyzed data, your county as well as other relevant fields and download it in a pdf format.



- Transfer the analysis output to your report of interest.

5 ANNEXES

ANNEX 1. EXAMPLES OF SCENARIOS OF DIFFERENT SYNDROMES AND SPECIES.

a. Naserian Lamayan is an agro-pastoral farmer who comes from Bura, a sub-county in Kirinyaga County. Her ward of residence is called Bangale. On December 16th, 2021, she reported abortions in 5 of her cattle and 12 of her sheep. She also reported deaths in 9 of her young goats and bleeding/haemorrhage from 2 of her sheep and 3 of her goats. In her herd, she has 100 (sheep- 45, goats- 35, cattle- 20) livestock and the cases occurred on 15th December 2021. You suspect it to be an RVF case. You impose a quarantine; take samples and advice the farmer to drain all the flooded waters.

b. You are a veterinarian working in Mombasa County. On 15th December 2021, a call just came through from one of your clients, a farmer living in Mvita sub-county in Majengo Ward. The farmer complains that some of his cows are limping and have blisters in the mouth and feet. Upon visit to the farm, you observe that the animals on the farm are zero grazed. After further probing, the client tells you that the signs started to manifest on 7th December 2021. None of the animals have died, been slaughtered, or destroyed. You do confirm that out of 8 cattle, 5 are sick. Further investigations also suggest a probable Foot and Mouth Disease (FMD) case. You impose a quarantine and give supportive treatment.

c. On the morning of 16th December 2021, a farmer calls you and reports death of his 2 out of 5 cattle. He informs you that the cattle were all right the day before and even when they had gone to sleep only to wake up in the morning and found them dead. The farmer comes from Tudor ward in Mvita Sub- County of Mombasa County. Upon arrival at the farm, you observe the two dead cows are bloated with unclotted blood from body orifices (mouth, nose, and anus). You suspect an anthrax case. You take a blood sample, you do not open the carcass, and you bury the carcass plus all the contaminated material. The cattle had been vaccinated against anthrax 4 months ago. You administer an antibiotic to the remaining cattle.

d. During a routine livestock vaccination in Mikinduni ward of Galole Sub County in Tana River County on 16th December 2021, a veterinary practitioner at a local watering point observed 5 steers which were limping and drooling saliva. Upon doing further investigations, he realized that the cattle belong to one herd of 20 cattle, 120 sheep and 200 goats. He reported oral lesions on the tongue and gums. Inflammations were also observed at the coronary band hence the animals had difficulty in walking. The owner

reported that the signs started on the 15th December 2021. At the watering point, a total of 1000 camels, 200 cattle, 450 sheep and 800 goats were presented for vaccination. General examination of other livestock presents at the watering point confirmed they did not have any symptom at the time of vaccination.

e. On 16th December 2021, a farmer calls and informs you that his son was bitten by their dog on 15th December 2021, and the dog is acting very strange. The farmer comes from Kiine ward, Ndia sub-county in Kirinyaga County. On arrival you find there are 3 dogs in the farm, the dog that had bitten the child was very aggressive, hyper salivating and hydrophobic. After investigation, you find out that the child was bitten on the leg and was given a tetanus injection. You inquire on the vaccination status of the dog and the farmer informs you that the dog has never been vaccinated since he got it. You suspect the dog to be rabid and advice the farmer to have the dog locked up for observation for the next 8 days. You further educate the farmer on the importance of vaccinating dogs and cats against rabies and what to do when one has been bitten by a dog and should bring the child to a health center to be started on PEP immediately.

f. On 16th December 2021 you are scheduled to be in a farm located in Nanyuki ward, Laikipia East Sub- County of Laikipia County for herd health. During your general examination you identify 2 cows in the herd of 15 had bite marks. On probing, the farmer informs you that a neighbor's dog had bitten the cows like a week ago and he also informed you that the dog had received the annual rabies vaccination for the year. The farmer also rear goats and before you leave the farm you clinically check for any respiratory signs, mucopurulent discharge/ dyspnoea in his cattle and goats and you observe that there is none.

ANNEX 2: DEFINITION AND PICTORIAL EXAMPLES OF THE SYNDROMES UNDER SURVEILLANCE

A syndrome is a set of signs which characterizes a likely disease or condition.

The syndromes under KLWSS are associated with livestock diseases that are notifiable and are the most common diseases in the country.

The syndromes include:

ABORTION

Premature expulsion of the products of conception, either the embryo or a dead fetus from the uterus.

There are infectious (e.g. Brucellosis) and non-infectious causes of abortions (e.g. physical trauma)

Examples of diseases that present with abortion and still births include RVF, Brucellosis, Bovine viral diarrhoea, Bluetongue, Q fever, Leptospirosis, and Campylobacteriosis.

Table showing clinical signs and samples collected of common diseases that present with abortion

Disease	Samples taken	Images of abortion in cattle and sheep and an aborted camel foetus
Brucellosis is considered all cattle abortions, particularly when multiple abortions (abortion storms) occur in a herd. **Clinical signs** **Cattle**: abortion, reduction in milk yield, stillborn or weak calves, increased frequency of retained placentas, or testicular enlargement or abscesses. **Rams:** Orchitis or Epididymitis **Ewes:** Infertility **Dogs:** bacteremia, abortions, prostatitis, epididymitis, lymphadenitis and splenitis. **Rift Valley Fever** is considered in cattle, sheep, goats and camels when this signs occur: Clinical signs: High mortality rate in the young ones, abortion storms at all stages of pregnancy, haemorrhagic diarrhea.	**Samples:** • uterine discharges(aborting cow lochia) • colostrum • milk • semen • whole blood in EDTA • serum **samples:** • Whole blood • Serum	   

SUDDEN DEATH

Unexplained death occurring in apparently healthy animals within 12-24 hours without previous clinical illness or symptoms.

Sudden death can be caused by infectious and non-infectious agents. Non-infectious include poisoning, acute bloat, electrocution/lighting, trauma,

Examples of diseases that present with sudden death include anthrax, acute heart water, acute ECF, black leg, acute RVF.

Table showing clinical signs and samples collected of common diseases that present with sudden death

Disease	Samples taken	Images of animals presenting with sudden death
Anthrax **Clinical signs:** Sudden death, un-clotted bloodstained discharges through the mouth, nose and anus. **Bloat** **Clinical signs:** sudden death, bloated animals	**Samples:** • blood	  

Biosafety

Any animal that is found dead must be presumed to have died from a contagious or infectious disease until the contrary is shown. If anthrax is suspected, aseptically collect a jugular blood sample for culture. Do not open the carcases. Take every precaution to avoid skin contact with the potentially contaminated carcass. When handling such animal, put on protective, impermeable clothing such as rubber or leather apron, gloves, respiratory equipment and rubber boots with no perforations. The carcass and all materials associated with the carcass should be destroyed and the ground should be disinfected. This can be very difficult. The preferred method of destruction would be incineration of the carcass. Burying the carcass deep (at least 6 feet) and covering with quick lime is still acceptable.

Disposable protective clothing should be burned or buried with the carcasses. If not disposable, decontaminate them after use by washing in hot water and disinfectant.

HEMORRHAGIC SYNDROME

Non-traumatic bleeding which can occur internally, where blood leaks from blood vessels, or externally, either through natural orifices/openings e.g. mouth, ears, nostrils, urethral, vaginal or anal and urethral openings in a live animal or a dead animal in anthrax cases.

Examples of diseases that present with hemorrhagic signs include RVF, ASF, hemorrhagic septicemia, poisoning e.g. Blackfern poisoning etc., Leptospirosis, Anthrax.

Table showing clinical signs and samples collected of common diseases that present with hemorrhagic syndrome

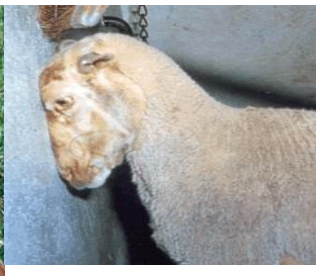
Disease	Samples taken	Images of hemorrhagic syndrome in animals
African Swine Fever: **Clinical signs:** High fever and death in 2-10 days on average, high mortality rate redness of the skin of the ears, abdomen, and legs, respiratory distress, vomiting, bleeding from the nose or rectum and sometimes diarrhoea. Abortion may be the first event seen in an outbreak	**Samples:** • Blood in anticoagulant (EDTA) • Spleen • lymph nodes • tonsil • kidney	   

NEUROLOGICAL SYNDROME

Animal showing abnormal behavior: excessive salivation, aggression, laryngeal/pharyngeal paralysis, vocalization or circling behavior.

Examples of diseases that present with neurological signs include rabies, BSE, Heart water, turning sickness, anaplasmosis, bracken poisoning, bovine babesiosis, and tetanus.

Table showing clinical signs and samples collected of common diseases that present with neurological syndrome

Disease	Samples taken	Images of neurological syndromes in animals
Rabies: **Clinical signs**: Severe encephalitis progressing to aggression, neurologic impairment, and then paralysis and coma. In some animals, aggression may be absent and they have Predominately a paralytic course of illness. From the first signs of illness to death is usually less than 7 days, despite treatment	**Samples:** • Brain tissue	   

RESPIRATORY SYNDROME

Animal having difficulty breathing, has a cough, sneezing, wheezing or eye and nasal discharge.

Examples of diseases that present with respiratory signs include CCPP, CBPP, ASF, Trypanosomiasis, BTB, Infectious Bronchitis, PPR, ECF, Chronic Respiratory Disease, non-specific pneumonias.

Table showing clinical signs and samples collected of common diseases that present with respiratory syndrome

Disease	Samples taken	Images of respiratory syndrome in animals
East Coast Fever: **Clinical signs:** Swelling of the draining lymph node, usually the parotid, Petechial and ecchymotic haemorrhage on most mucous membranes of the conjunctiva and the buccal cavity, lacrimation, corneal opacity, frothy nasal discharge**,** terminal dyspnoea, **Contagious Caprine Pleuropneumonia:** Manifested in goats **Clinical signs:** Laboured breathing (dyspnea), Nasal discharge. In the terminal stages, animals are unable to move, they stand with their front legs wide apart, the neck is stiff and extended, and sometimes saliva continually drips from the mouth	**Samples:** • Blood or Buffy coat smears air-dried and fixed in methanol for demonstration of schizonts • Lymph node aspirate for demonstration of schizonts. **Samples:** • Broncho-alveolar washings • Pleural fluid obtained by puncture.	    

ORAL/FOOT LESIONS

- Animal having vesicles, blisters (wounds) in the mouth or foot, drooling saliva and limping.
- Examples of diseases that present with oral/foot lesions include FMD, Vesicular stomatitis, PPR, Rinderpest, bluetongue, Orf (contagious ecthyema).

Table showing clinical signs and samples collected of common diseases that present with oral and foot lesions.

Disease	Samples taken	Images of oral and foot lesions in animals
FOOT & MOUTH DISEASE (FMD): **Clinical signs:** -Profuse salivation and nasal discharge that is mucoid at first, but becomes mucopurulent, -lameness, vesicles between claws and on coronary band, rupturing to become erosions, -Vesicles in the buccal and nasal mucous membrane that rupture and discharge clear or cloudy fluid, leaving raw, eroded areas surrounded by ragged fragments of loose tissue, Sticky, foamy, stringy saliva.	**Samples:** • Epithelial tissue from vesicles – put in virus transport media • Vesicular fluid. • Nasal and oral secretions • Esophageal-pharyngeal fluids collected to identify carrier animals. Repeated sampling may be necessary to identify carriers, as the amount of virus is often low and fluctuates. • Blood and milk.	   

CUTANEOUS/SKIN LESIONS

Animal with inflamed, irritated or scaly skin, hair loss, change in pigmentation of coat or skin, multiple lumps, pox lesions or visible growths on the body.

Examples of diseases that present with cutaneous/ skin lesions include Lumpy Skin Disease, Sheep and Goat Pox, camel pox, bovine papillomatosis, fowl pox, photosensitization.

Table showing clinical signs and samples collected of common diseases that present with skin lesions

Disease	Samples taken	Images of skin lesions in animals
Lumpy Skin Disease (LSD) **Clinical signs:** • cutaneous nodules in the body head, neck perineum, genitalia, udder, limbs), • Lesions on the muzzle, nostrils, in the mouth, • All superficial lymph nodes ae enlarged, mucopurulent nasal discharge, • Dribbling of saliva, • Coughing and distressed respiration, • Reduced milk production in lactating cows **Sheep and Goat Pox** **Clinical signs:** • Thickened skin lesions and enlarged lympnodes. • Laboured breathing, nasal discharge, • Conjunctivitis.	**Samples:** • Biopsies of skin lesions • Vesicular fluids • Scrapings on skin lesions • Lymph node aspiration • Blood	

GASTROINTESTINAL TRACT SYNDROMES (DIARRHOEA)

Infections that cause gastroenteritis, an inflammation of the gastrointestinal tract involving both the stomach and the small intestine. Symptoms include diarrhea, **vomiting and abdominal pain.**

Examples of diseases that present with GIT infections include ECF, PPR, NCD, ASF, Blackleg, Johnes disease, Bacterial infections, bloating, intestinal parasites etc.

Images of diarrhea and emaciation in animals

ANNEX 3: KABS TROUBLESHOOTING

	PROBLEM	POSSIBLE CAUSE	SOLUTION
1.	***KABS* downloading:** I cannot download the ***KABS*** application.	1. No internet connection 2. Play Store not working properly (e.g., it is out of date). 3. Not enough storage space and memory on the phone.	a) Turn on your internet connection. b) Search for ***KABS*** mobile on Play Store. c) Download ***KABS*** to your phone (ensure you have adequate space) d) If you have problems getting it from Play Store, use the link: https://play.google.com/store/apps/details?id=edu.tamu.tcat.kabs.kabsandroid
2.	**Launching the application:** ***KABS*** does not start completely or getting the message 'Unfortunately ***KABS*** has stopped'.	1. Low memory and storage space on phone. 2. The application crushed. 3. Compatibility issues.	a) Increase phone memory by deleting unnecessary applications or files. b) Reinstall the ***KABS*** application.
3.	**Logging in:** I cannot log in to the KABS application 'log in failure'	1. Wrong username. 2. Wrong password. 3. No account created/approved for you. 4. The application takes longer to log in.	a) Use the assigned username and password. They should be in small letters. Check that the first letter is not typed as capital. b) Be a little patient (sometimes it takes longer to log in). c) Try again. d) restart your phone e) Ask for assistance.
4.	**GPS/Location :** I cannot get the latitude and longitude readings after I tap on 'Get Location'	1. GPS/Location is turned off. 2. Device taking longer to pick geocodes.	a) Turn on the GPS/Location from the same point where you turn on your Wi-Fi or data. Your GPS/Location should be on always. b) Turn off power/battery saver mode (on your phone, go to **settings>power saving management>**turn off **power saving mode** c) Go to **settings**> **location**>**mode**>select **device only** (uses only GPS to determine your location). d) Be a little more patient e) Go to **settings>location>apps> kabs app> force stop**
5.	**Report submission failure :** I get an error when submitting the report.	1. Missing data fields	a) Ensure you fill in all the required fields. Take note of the **must enter** fields (those with red circles beside the response)
6.	**Lost/replaced phone**	?????	a) Replace the phone. b) Install ***KABS*** application. c) Log into your account using your credentials. d) Fill in and submit reports.

ANNEX 4: LIST OF NOTIFIABBLE DISEASES

#	Cattle	Sheep & Goats	Pigs	Poultry	Horses	Zoonoses
1.	Contagious Bovine Pleuro-pneumonia (CBPP)	Contagious Caprine Pleuro-Pneumonia (CCPP)	-	-	-	-
2.	-	-	African Swine Fever	-	-	-
3.	-	-	Classical Swine Fever	-	-	-
4.	-	-	-	Avian Influenza	-	Avian Influenza
5.	-	-	-	-	African Horse Sickness	-
6.	Foot & Mouth Disease (FMD)	Foot & Mouth Disease (FMD)	Foot & Mouth Disease (FMD)	-	-	-
7.	-	-	-	Newcastle Disease (NCD)	-	Newcastle Disease (NCD)
8.	-	-	-	-	West Nile Virus	West Nile Virus
9.	Rift Valley Fever(RVF)	Rift Valley Fever (RVF)	-	-	-	Rift Valley Fever (RVF)
10.	-	-	-	Paramyxovirus in pigeons	-	-
11.	-	-	-	-	Equine Infectious Anaemia	-
12.	Lumpy Skin Disease(LSD)	-	-	-	-	-
13.	-	Peste des Petits Ruminants (PPR)	-	-	-	-
14.	-	-	Aujeszky's Disease	-	-	-
15.	-	-	-	Fowl typhoid	-	-
16.	-	-	-	-	Contagious Equine Metritis	-
17.	-	-	-	-	Equine Viral Encephalomyelitis	Equine Viral Encephalomyelitis
18.	Rabies	Rabies	Rabies	-	Rabies	Rabies
19.	-	-	-	Avian chlamydiosis	-	-
20.	Brucella abortus	Brucella melitensis	Brucella suis	-	-	Brucellosis

#	Cattle	Sheep & Goats	Pigs	Poultry	Horses	Zoonoses
21.	-	-	-	Avian infectious bronchitis	-	-
22.	-	-	-	-	Epizootic Lymphangitis	-
23.	Anthrax	Anthrax	-	-	-	Anthrax
24.	-	Contagious Agalactia	-	-	-	-
25.	-	-	Swine Vesicular Disease	-	-	-
26.	-	-	-	Infectious Bursal Disease (IBR)	-	-
27.	-	-	-	-	Equine Viral Arteritis	-
28.	Vesicular Stomatitis	-	Vesicular Stomatitis	-	Vesicular Stomatitis	-
29.	-	-	-	Pullorum Disease		-
30.	Bluetongue	Bluetongue	-	-	-	-
31.	-	-	Teschen Disease	-	-	-
32.	-	-	-	Avian mycoplasmosis	-	-
33.	-	-	-	-	Glanders and Farcy	Glanders and Farcy
34.	Tuberculosis (Bovine)	-	-	-	-	Tuberculosis (Bovine)
35.	-	Sheep and Goat Pox (SGP)	-	-	-	-
36.	-	-	Porcine cycticercosis	-	-	Porcine cycticercosis
37.	-	-	-	-	Dourine	-
38.	Rinderpest	-	-	-	-	-
39.	-	Sheep scab	-	-	-	-
40.	-	-	Porcine reproductive and respiratory syndrome	-	-	-
41.	-	-	-	-	Equine Viral Encephalomyelitis	-
42.	Bovine viral diarrhoea (BVD)	-	-	-	-	-
43.	-	Scrapie	-	-	-	-
44.	Bovine Spongiform Encephalitis (BSE)	-	-	-	-	Bovine Spongiform Encephalitis (BSE)
45.	Trypanosomiasis	-	-	-	-	Trypanosomiasis
46.	Echinococcosis	-	-	-	-	Echinococcosis
47.	East Coast Fever (ECF)	-	-	-	-	-
48.	Enzootic Bovine Leukosis	-	-	-	-	-

ANNEX 5. EXAMPLES OF SCENARIOS OF DIFFERENT SYNDROMES AND SPECIES.

a. Nkaru is an agro-pastoral farmer who comes from Purko, a sub-county in Kajiado County. Her ward of residence is called Purko. On December 22nd, 2021, she reported abortions in 5 of her cattle and 12 of her sheep. She also reported deaths in 9 of her young goats and bleeding/ haemorrhage from 2 of her sheep and 3 of her goats. In her herd, she has 100 (sheep- 45, goats- 35, cattle- 20) livestock and the cases occurred on 19th December 2021. You suspect it to be an RVF case. You impose a quarantine; take samples and advice the farmer to drain all the flooded waters.

b. You are a veterinarian working in Kajiado County. On 22nd December 2021, a call just came through from one of your clients, a farmer living in Kajiado West sub-county in Mosiro Ward. The farmer complains that some of his cows are limping and have blisters in the mouth and feet. Upon visit to the farm, you observe that the animals on the farm are zero grazed. After further probing, the client tells you that the signs started to manifest on 21st December 2021. None of the animals have died, been slaughtered, or destroyed. You do confirm that out of 8 cattle, 5 are sick. Further investigations also suggest a probable Foot and Mouth Disease (FMD) case. You impose a quarantine and give supportive treatment.

c. On the morning of 22nd December 2021, a farmer calls you and reports death of his 2 out of 5 cattle. He informs you that the cattle were all right the day before and even when they had gone to sleep only to wake up in the morning and found them dead. The farmer comes from Mihang'o ward in Embakasi East Sub- County of Mombasa County. Upon arrival at the farm, you observe the two dead cows are bloated with unclotted blood from body orifices (mouth, nose, and anus). You suspect an anthrax case. You take a blood sample, you do not open the carcass, and you bury the carcass plus all the contaminated material. The cattle had been vaccinated against anthrax 4 months ago. You administer an antibiotic to the remaining cattle.

d. During a routine livestock vaccination in Imaroro ward of Kajiado East Sub County in Kajiado County on 22nd December 2021, a veterinary practitioner at a local watering point observed 5 steers which were limping and drooling saliva. Upon doing further investigations, he realized that the cattle belong to one herd of 20 cattle, 120 sheep and 200 goats. He reported oral lesions on the tongue and gums. Inflammations were also observed at the coronary band hence the animals had difficulty in walking. The owner reported that the signs started on the 20th December 2021. At the watering point, a total of 1000 camels, 200 cattle, 450 sheep and 800 goats were presented for vaccination. General examination of other livestock presents at the watering point confirmed they did not have any symptom at the time of vaccination.

e. On 22nd December 2021, a farmer calls and informs you that his son was bitten by their dog on 20th December 2021, and the dog is acting very strange. The farmer comes from Kawangware ward, Dagoretti North sub-county in Nairobi County. On arrival you find there are 3 dogs in the farm, the dog that had bitten the child was very aggressive, hyper salivating and hydrophobic. After investigation, you find out that the child was bitten on the leg and was given a tetanus injection. You inquire on the vaccination status of the dog and the farmer informs you that the dog has never been vaccinated since he got it. You suspect the dog to be rabid and advice the farmer to have the dog locked up for observation for the next 8 days. You further educate the farmer on the importance of vaccinating dogs and cats against rabies and what to do when one has been bitten by a dog and should bring the child to a health center to be started on PEP immediately.

f. On 22nd December 2021 you are scheduled to be in a farm located in Iloodokilani ward, Kajiado West Sub- County of Kajiado County for herd health. During your general examination you identify 2 cows in the herd of 15 had bite marks. On probing, the farmer informs you that a neighbor's dog had bitten the cows like a week ago and he also informed you that the dog had received the annual rabies vaccination for the year. The farmer also rear goats and before you leave the farm you clinically check for any respiratory signs, mucopurulent discharge/ dyspnoea in his cattle and goats and you observe that there is none.