Addressing Current and Emerging Threats to Crops in the Democratic Republic of Congo and Kenya: A Collaborative and Interdisciplinary Approach

PlantVillage Nuru App Training

Training report

Kisumu campus, Maseno University on 24th May, 2022

Current and Emerging Threats to Crops (CETC) Innovation Lab, Pennsylvania State University

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Preamble

Maseno University was granted a sub-award by University of Maryland Eastern Shore to investigate the research titled “Addressing Current and Emerging Threats to Crops in the Democratic Republic of Congo and Kenya: A Collaborative and Interdisciplinary Approach.” The project has components in Kenya and the DRC. The DRC project is titled: “Addressing Current and Emerging Threats to Crops in the Democratic Republic of Congo: The Case of Cassava and Banana/Plantain” while the Kenyan project is titled: “Maize and Mango Postharvest Loss Reduction Strategies to Increase Food Security and Employment of Women and Youth in Kisumu, Siaya, and Kitui Counties of Kenya.” The Kenyan project is sub-awarded to Jomo Kenyatta University of Agriculture and Technology (JKUAT) investigating the mango component while Maseno University will investigate the maize component. An interesting component of the project is the use of artificial intelligence (AI) to scout current and emerging threats to crops using smartphones. Therefore, Maseno University teamed up with PlantVillage to offer the training on PlantVillage Nuru App at Kisumu campus, Maseno University on 24th May, 2022. Participants included undergraduate and postgraduate students and their faculty at Maseno University as well as youth and women community leaders from Kisumu and Siaya Counties of Kenya. This report documents the proceedings of the training.

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1.0 The Organizers: PlantVillage Team and Maseno University

The PlantVillage App is a mobile app tool that uses artificial intelligence to monitor and diagnose pests and diseases damage affecting crops. The Plant village team is working in Kenya as well as other countries internationally, and they help farmers in identification of pests and diseases and offer advice on the control. They are in partnership with other organizations such as Un-FAO, USAID, Feed the Future, SHA, Moi University, Mercy Corps, Mediae Company, CGIAR and Bill and Melida Gates. Their local partners include GoK, ICIPE, Ustadi foundation, County Governments of Kilifi, Busia and Bungoma, Research Triangle Institute, Toothpick and Mboni ya Vijana Tanzania.

Maseno University on the other hand is the research institute of higher learning engaging students on the current project "M*ango and Maize post-harvest loss reduction strategies to increase food security and employment among women and youth in Kisumu and Siaya Counties"*. Having PlantVillage Nuru team involved in the project is just but an added advantage towards addressing post-harvest losses in the Kenyan agriculture sector and an effort towards attaining food security in Kenya.

1. **Facilitators**

a) Dr Fredrick Aila – Maseno university
b) Mr Lawrence – PlantVillage
c) John Mayeka – PlantVillage
d) Gladys Ntango – PlantVillage

2.0 The PlantVillage Nuru App

The PlantVillage App overview was introduced by Ms Gladys, who took the team through some of their activities, partners and their area of operation. According to her presentation, most of their app users are extension officers, lead farmers, seed entrepreneurs, the pastoralists community and the Hoodies-Russia. She insisted on the main goal of their team as being able to address farmer issues in relation to pest and diseases on their crops, which is a main contributor to the post-harvest losses in crops and a min challenge towards attainment of food security.

According to Mr. Lawrence, the app uses artificial intelligence to monitor and diagnose pests and diseases damage affecting crops. By means of scanning the infected plant, the app is able to detect the diseases and offer instant, or in some cases, for new disease detected, it may take up to less than 24 hours to give feedback. The control is bases on the IPM and not Chemical control, which is an advantage to reduce the excessive use of chemicals on food crops that may be harmful to human health in the long run. The app is also able to identify the farm infected through the use of GPS coordinates, as well as link you to the nearby service providers for any assistance.

Some of the uses of the app to a farmer include:

- Detect crop diseases
- Diagnose the diseases detected
- Provide advice on management and or control practices for disease recognized
- Show the symptom of the disease it has recognizes-teaching tool
- Connects farmers to agricultural experts, seed entrepreneurs and other Nuru App users
- Gives weather update tailored to farmers region.

Use of the app to field experts and researchers include;

- Collect data on disease infection and post damage
- Evaluate data detected
- Provide E- extension services
- Create awareness on the emerging, diseases and pests on specific regions

App Installation

The plant village team took the team through the installation process of the app on their mobile phones and helped in the process of diagnosing an infected plant, and the scouting process, to be able to get the infection rates of a particular disease on the farm.

3.0 The Ag Observatory

Mr. John Mayeka explained that the Ag Observatory tool was developed by PlantVillage to enable the farmers to do crop monitoring through the data collected by mobile phones. The monitoring would help to precisely assist farmers by integrating the information provided by the farmers, satellites and agriculture experts. This information can be used by the dream team, extension workers, private companies and chastity's to offer technological solutions to farmers i.e pesticides.

Contents of the Ag observatory

1. Weather forecast
2. Observatory my network
3. Farmer contacts
4. Broadcast
5. Analytics.

Some of the contents managed by the Ag observatory include:

- Details on lead farmers
- Lead farmer travels to FF field and register that field
- The name of the field the PlantVillage Nuru App record through GPS
- Once the farm has been registered, the lead farmer is expected to return and check in with the farms by pressing the button on the farm.

The training ended with a brief presentation of the use of the ODK collect tool App, which will be used in data collection by the post graduate student attached to the Project.

The team later, led by Dr Aila and the PlantVillage team visited a nearby farm with maize to be able to practically use app on their mobile phones to detect any diseases, particularly fall army warm (FAW).

Annex 1: PlantVillage Presentation

PlantVillage

PlantVillage Nuru

dream team AGRO CONSULTANCY

FAO FIAT PANIS

IITA Transforming African Agriculture CGIAR

PennState College of Agricultural Sciences

PlantVillage

PlantVillage Nuru

- Mobile app that uses artificial intelligence to monitor and diagnose pest and diseases damage affecting crops.
- PlantVillage Nuru has the ability to instantly detect diseases and pest damage by scanning the leaves for symptoms.
- "*Nuru*" is swahili for Light

Who can use Nuru App?

1.Farmer

A farmer can use Nuru to;

- Detect crop diseases (on specific crops) and pest damage damage(FAW in maize)
- Diagnose the diseases detected.
- Provide advice on management and/or control practices for the disease/pest it has recognize. The farmer receives real time feedback .
- Show the symptoms of the disease it has recognized (teaching tool).
- Connects farmers to agricultural experts, seed entrepreneurs and other Nuru users in different regions.
- It gives weather update tailored to farmers region.

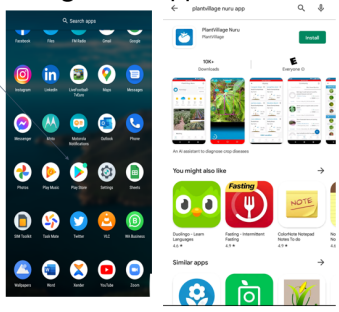
2. Experts in the field of agriculture (Researchers, extension officers, government, ministry of agriculture, e.t.c)

Benefits.

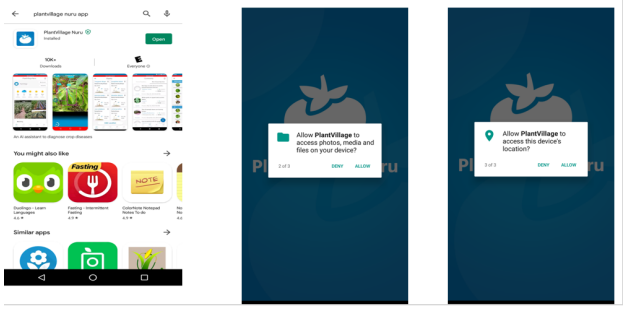
- Collect data on the disease infection and pest damage.
- Evaluate data collected.
- Provide E-extension services.
- Create awareness on emerging, diseases and pests on specific regions.

How to access plantVillage nuru app

- Go to google playstore
- search plantvillage nuru
- click on ''install'' and allow the app to download



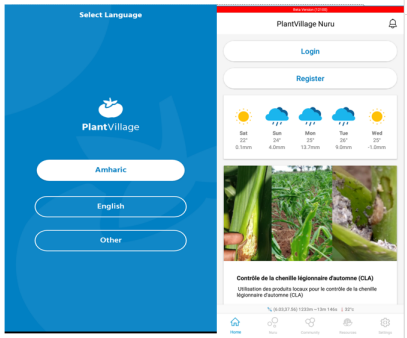
App permission



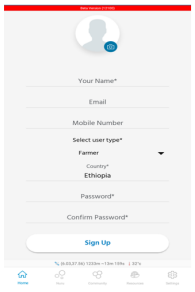
Language setting

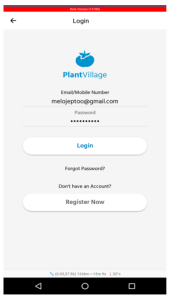
Select your preferred language

N/B- Amharic is in translation process so for now we can use English

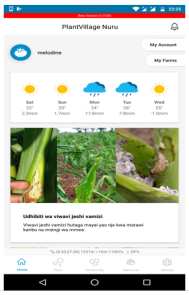


How to register and Login



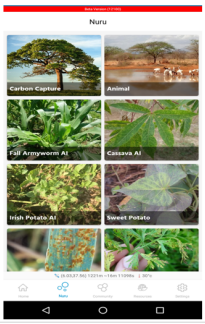


Features of Nuru App



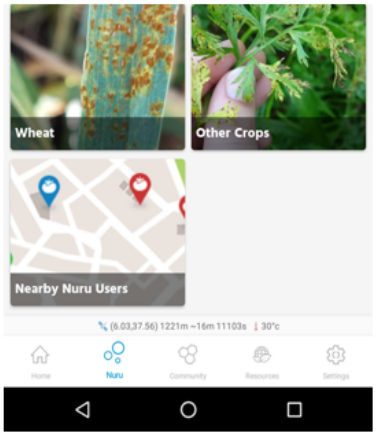
Home page.

1. Name of the user- it shows the name you registered with.
2. Notification button- Answer to questions you've asked.
3. My farm-all the farms the user has registered. Provide water condition of each field. There is option to add or register new farms when using every AI
4. Weather updates customized for the current region of the famer. (5days)
5. Short preview of PlantVillage current activity.



Nuru tab

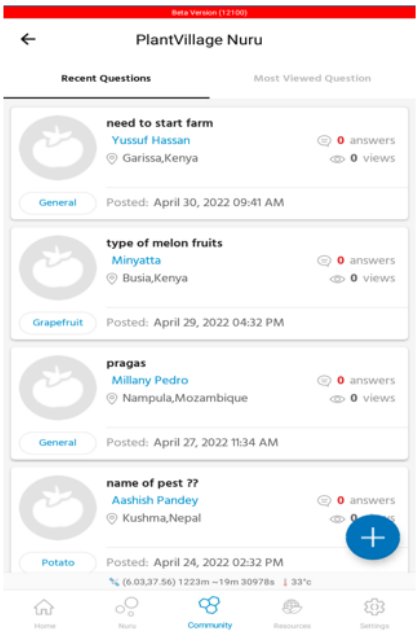
1. Carbon capture- under development
2. Animal - provides an animal disease survey form used by the trained animal health practitioners to report animal disease presence.
3. Fall armyworm AI- detection and diagnosis for FAW damage.
4. Cassava AI- detection and diagnosis for cassava disease-CMD, CBSD and CGM.
5. Irish potato AI-detection and diagnosis for early blight, late blight.
6. Sweet potato AI- under development



7. Wheat- its under development however it been tested for Stem rust and Yellow rust.

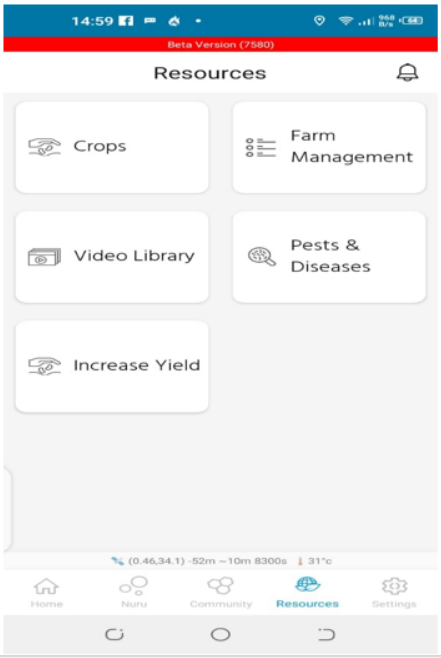
8. Other crops- provide diagnosis by human experts for all other crops that have not been specified within Nuru AI.

10. Other users- Shows all Nuru users in a map.



Community tab

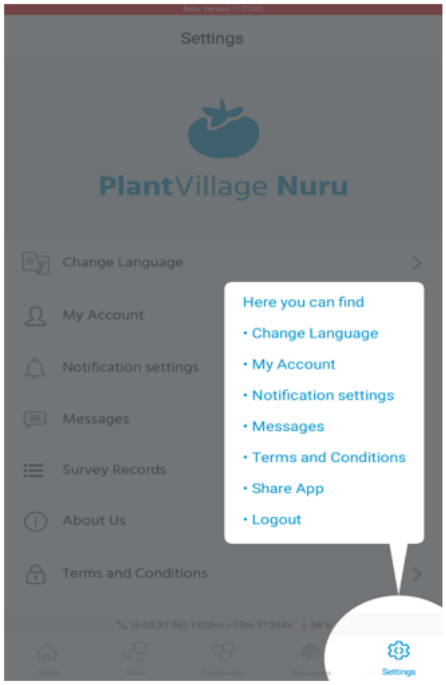
- Provides an opportunity to farmers to post
- question on different crops. You send picture of affected part of the crop with clear description of the symptoms then get answered by experts.
- It is also a platform for farmers across the globe to interact and share more knowledge with experts in the field of agriculture.



Resource tab.

All the tools, applications and methodology that are /have been used in PlantVillage can be accessed.

- Crops- library of popular crops. It provides description, diseases, propagation, uses, questions and reference on each crop.
- Farm Management- provide information about usage and performance of applications and tools, research methodology and data analytics on PlantVillage work and publications.
- Video library-under development
- Pests and diseases-provides information to specific pests and diseases that PV have worked on.
- Increase yield- under development.

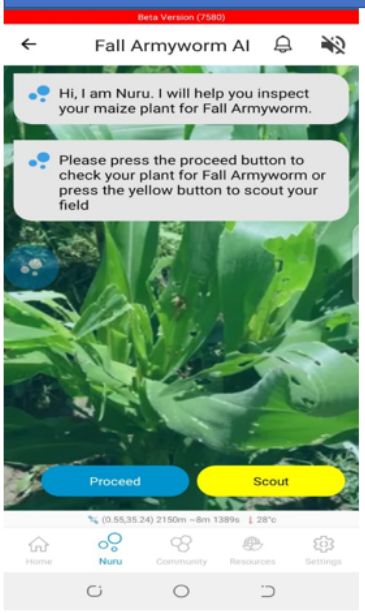


Setting tab.

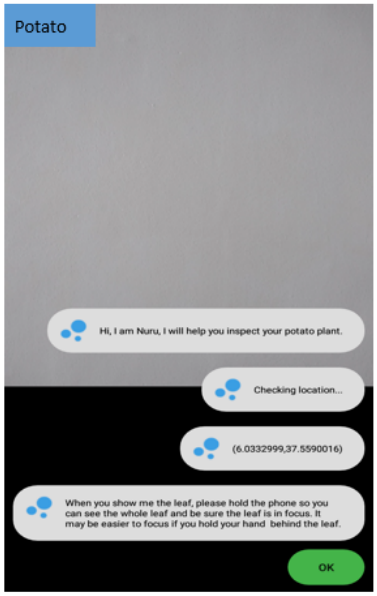
- Change language- choose the language you want to use. Available in over 20 languages.
- Notification setting- choose option on how you want to receive the notification.
- Messages- feedbacks you get after asking question, sending message to human experts and all the advices provided after every diagnosis.
- Surveys records- You can check all the surveys you've done and the status if it has been submitted or not.

- About us- directs you to our website for more information.
- Terms and conditions- General License guide of the application.
- Share app- provides link for sharing app to another person(S) or device.
- App tour- short detour about the main tabs in the app.
- Log out- access setting.

Different methods while using Nuru App

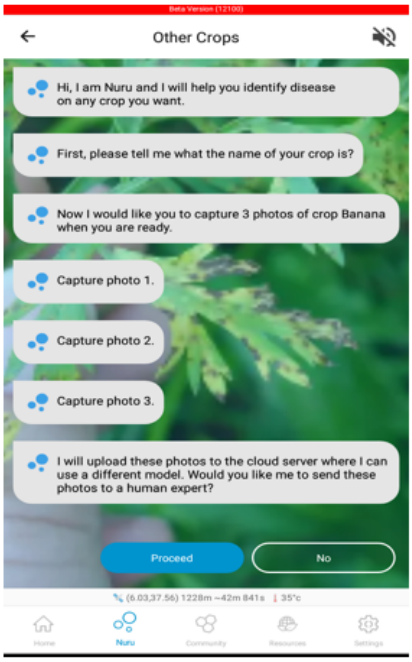


1. **Proceed**-used while diagnosing individual crop. (cassava-6 leaves and maize-1 leaf)
   - Recommended for frequent regular check-ins and diagnosis.
2. **Scout**- done on the whole field to detect, diagnose, evaluate and analyze the percentage of disease infection and pest damage. (cassava-10 plants and maize- 50 plants)
   - Provide the percentage of damage or infection of the whole field.
   - Recommended to be done in the first visitation to the field.
   - The data can be interpreted and used by the farmer/researcher to forecast the possible future outcome and to make reasonable decisions.



- **scanning**-used while diagnosing sweet potato and irish potato.
- **Taking picture**-Used while diagnosing wheat and other crop.

Other crops use

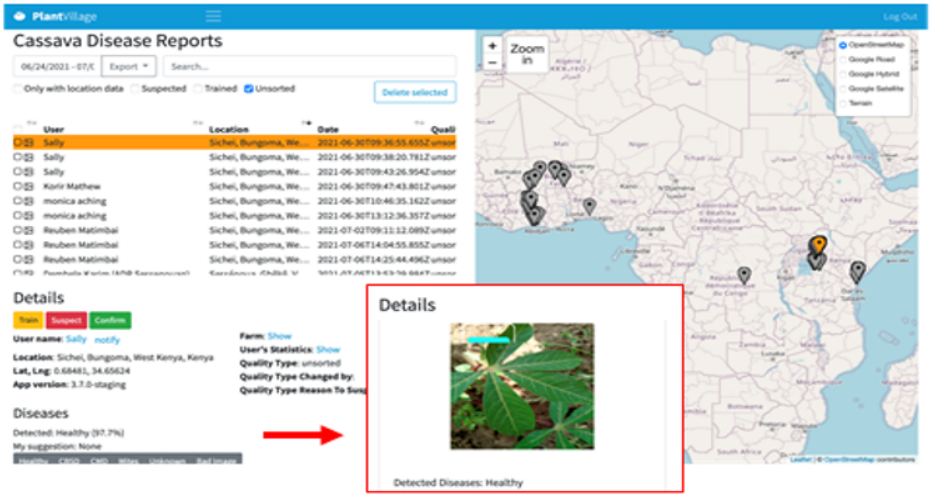


Procedure

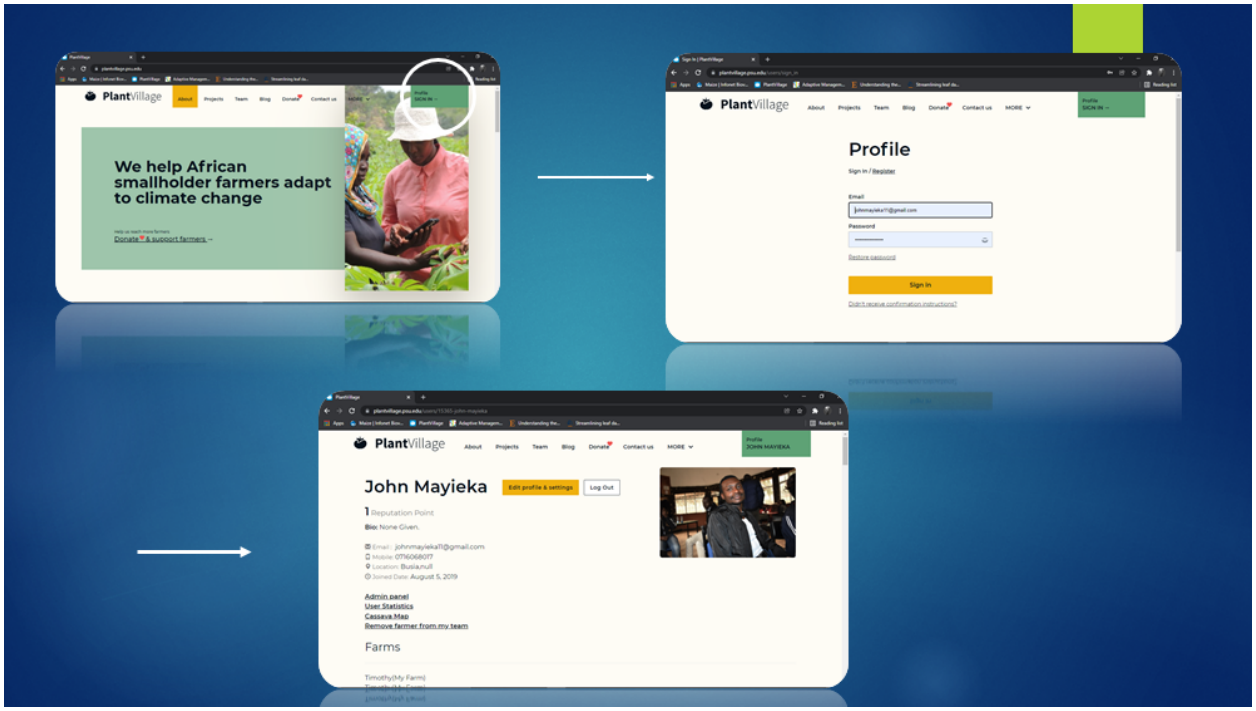
- Click on other crops
- Select farm or add farm location
- enter the name of the crop-select from the list , if not available select other groups then enter the name.
- capture 3 photos of the affected region.
- submit - send photo to human expert where you will receive the feedback through an email, notification and message section on the app.

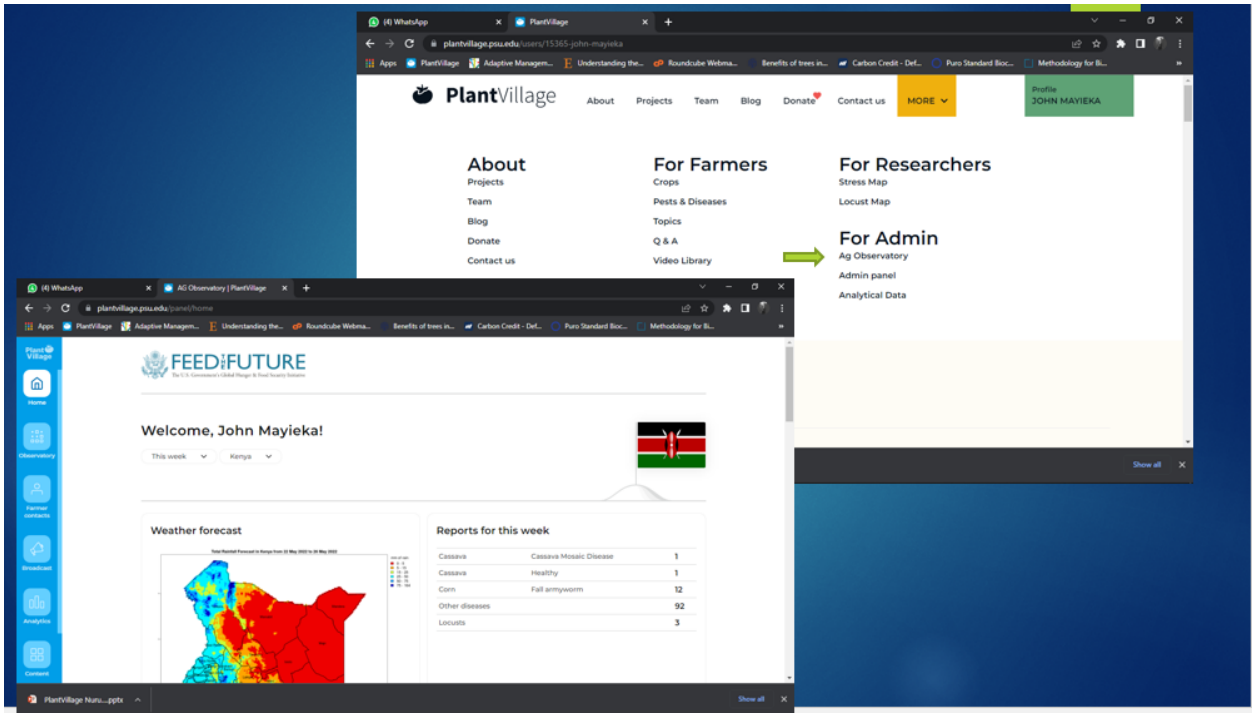
Observatory

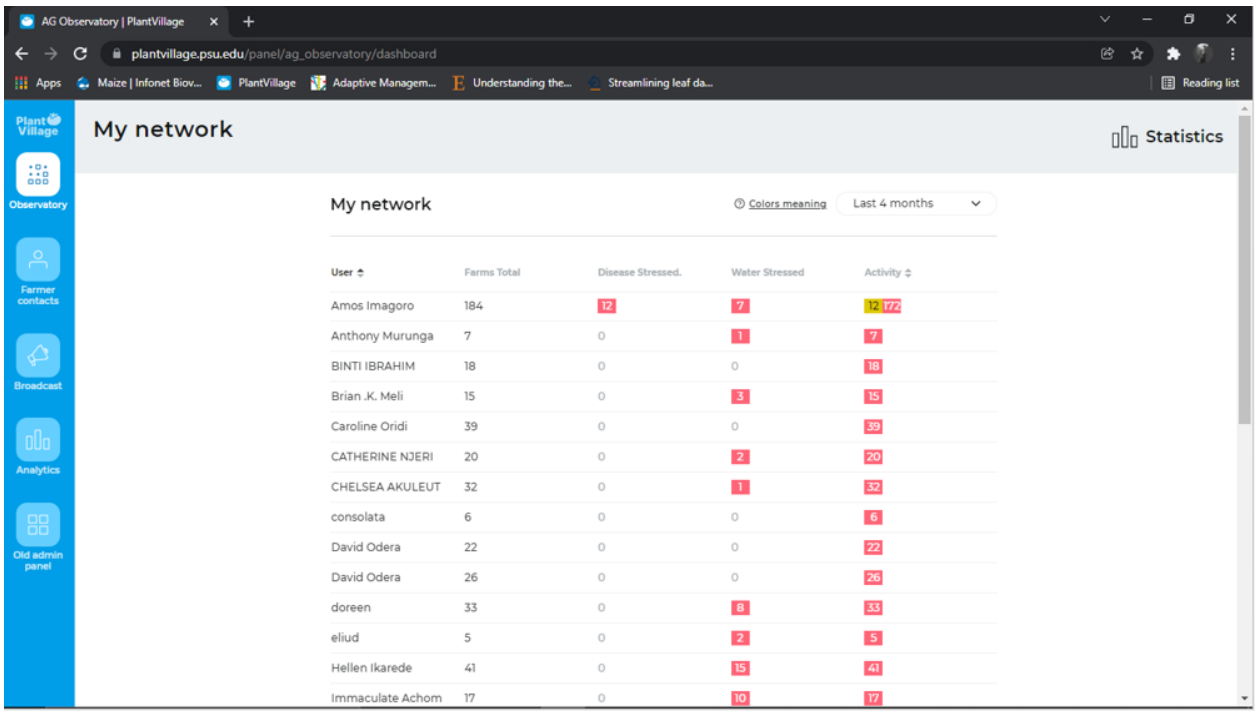
Global Monitoring of Cassava Diseases



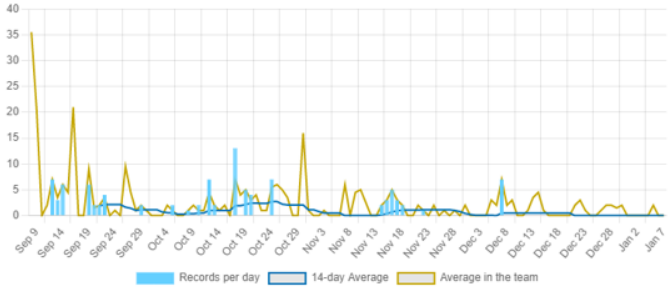
- Surveys upload here for human verification and follow up with farmers
- Discovered the first case of CMD in Cambodia
- >10000 app downloads
- >30000 reports
- Reports from 20 countries in Africa




PlantVillage
About
Projects
Team
Blog
Donate
Contact us
MORE
Profile
JOHN MAYIEKA
About
Projects
Team
Blog
Donate
Contact us
For Farmers
Crops
Pests & Diseases
Topics
Q & A
Video Library
For Researchers
Stress Map
Locust Map
For Admin
Ag Observatory
Admin panel
Analytical Data
FEED the FUTURE
Welcome, John Mayieka!
This week
Kenya
Weather forecast
Reports for this week
Cassava
Cassava Mosaic Disease
1
Cassava
Healthy
1
Corn
Fall armyworm
12
Other diseases
92
Locusts
3


AG Observatory | PlantVillage
plantvillage.psu.edu/panel/ag_observatory/dashboard
Apps
Maize | Infonet Biov...
PlantVillage
Adaptive Managem...
Understanding the...
Streamlining leaf da...
Reading list
Plant Village
Observatory
Farmer contacts
Broadcast
Analytics
Old admin panel
My network
Statistics
My network
Colors meaning
Last 4 months
User
Farms Total
Disease Stressed.
Water Stressed
Activity
Amos Imagoro 184 12 7 12 172
Anthony Murunga 7 0 1 7
BINTI IBRAHIM 18 0 0 18
Brian .K. Meli 15 0 3 15
Caroline Oridi 39 0 0 39
CATHERINE NJERI 20 0 2 20
CHELSEA AKULEUT 32 0 1 32
consolata 6 0 0 6
David Odera 22 0 0 22
David Odera 26 0 0 26
doreen 33 0 8 33
eliud 5 0 2 5
Hellen Ikarede 41 0 15 41
Immaculate Achom 17 0 10 17

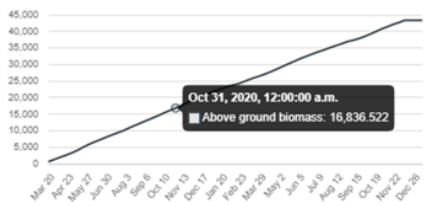
Farms User activity



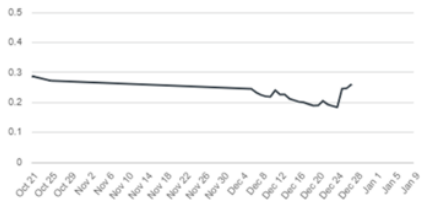
Surveys

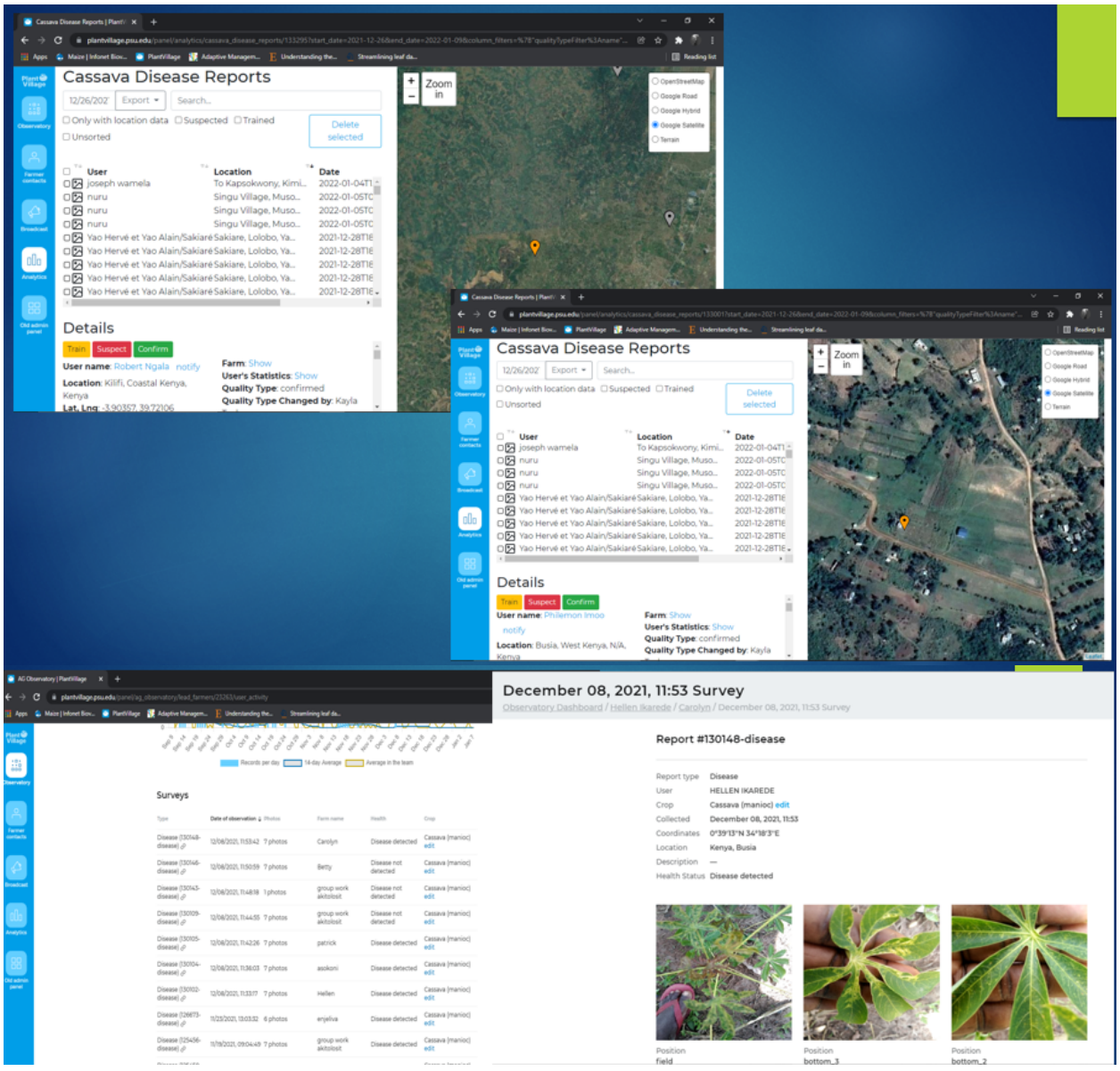
Type	Date of observation	Photos	Farm name	Health	Crop
Disease (130148-disease)	12/08/2021, 11:53:42	7 photos	Carolyn	Disease detected	Cassava (manioc) edit

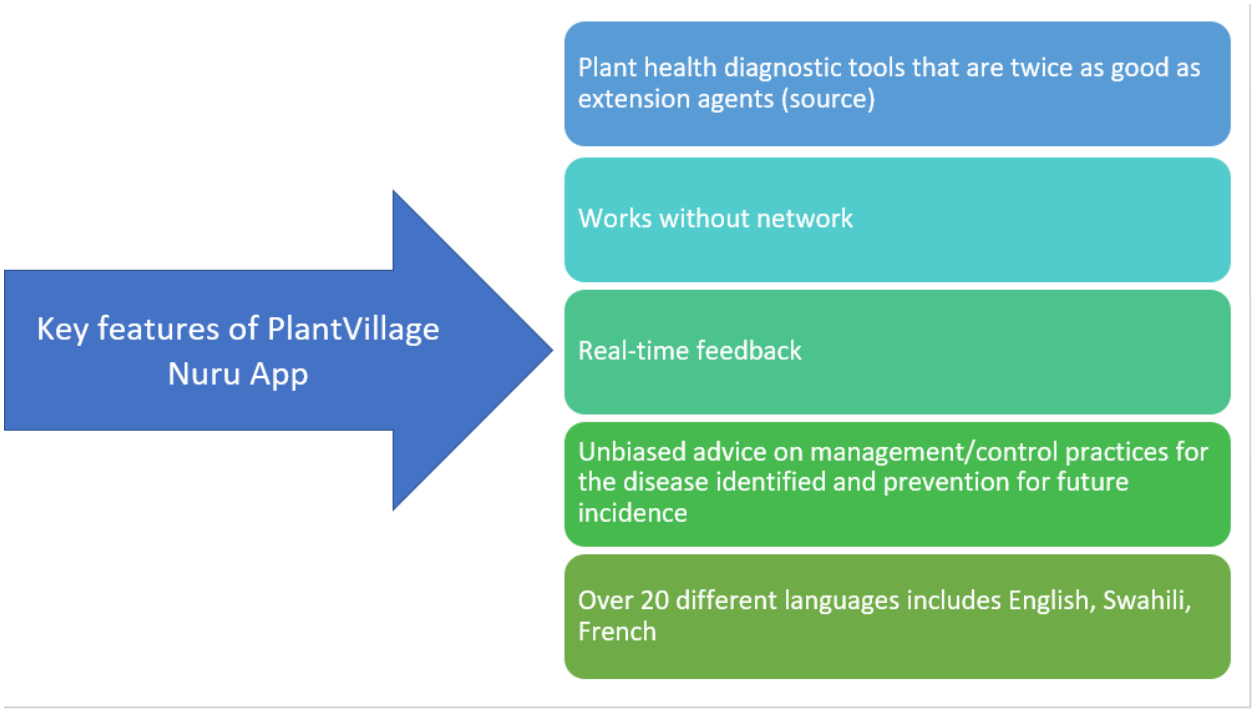
Above ground biomass



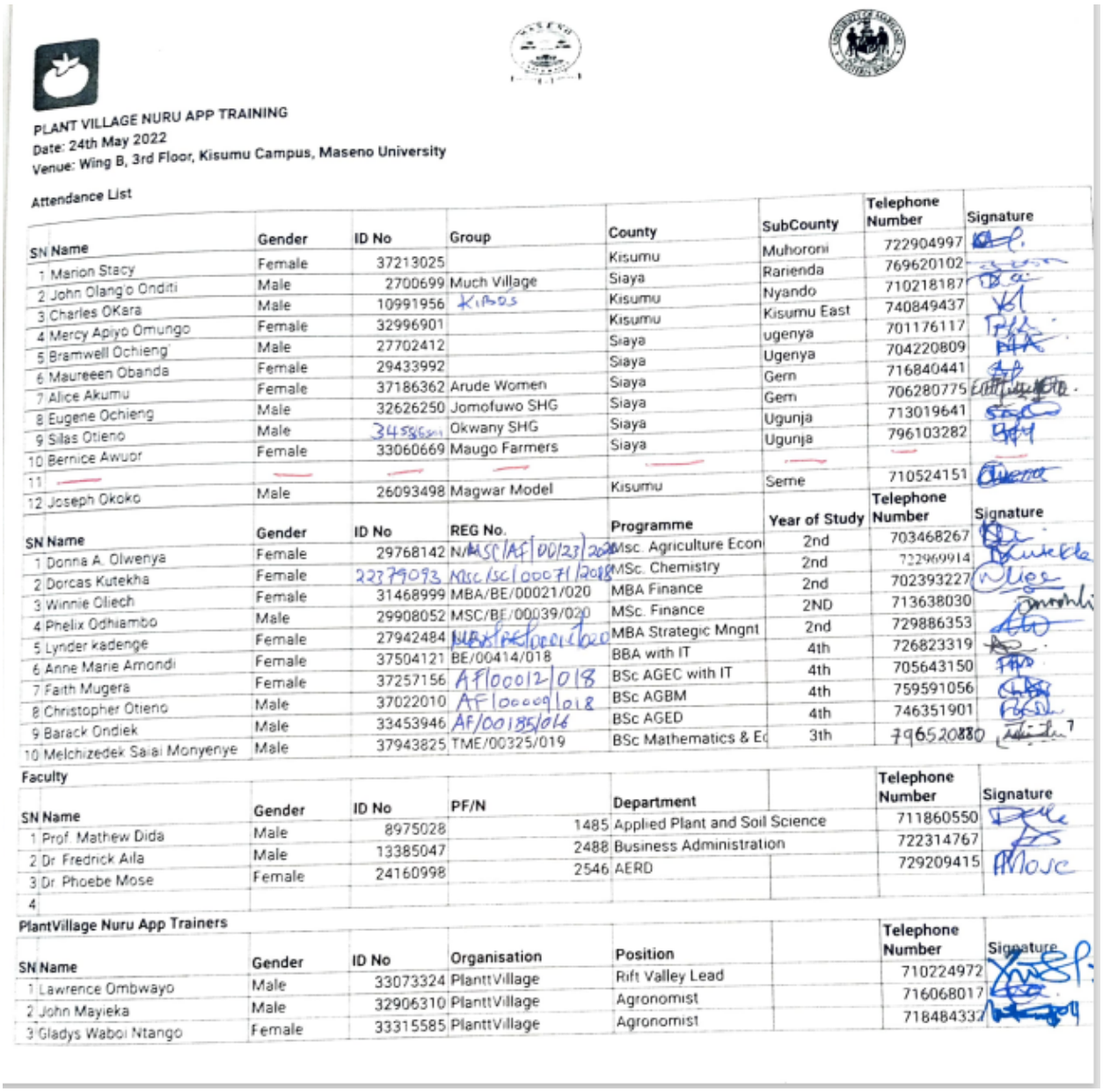
Soil Moisture




Cassava Disease Reports
Details
Cassava Disease Reports
Details
December 08, 2021, 11:53 Survey
Report #130148-disease
Surveys


Key features of PlantVillage Nuru App
Plant health diagnostic tools that are twice as good as extension agents (source)
Works without network
Real-time feedback
Unbiased advice on management/control practices for the disease identified and prevention for future incidence
Over 20 different languages includes English, Swahili, French

Annex 2: Attendance List



PLANT VILLAGE NURU APP TRAINING
Date: 24th May 2022
Venue: Wing B, 3rd Floor, Kisumu Campus, Maseno University

Attendance List

SN	Name	Gender	ID No	Group	County	SubCounty	Telephone Number	Signature
1	Marion Stacy	Female	37213025		Kisumu	Muhoroni	722904997	
2	John Olang'o Onditi	Male	2700699	Much Village	Siaya	Rarienda	769620102	
3	Charles OKara	Male	10991956	KIBOS	Kisumu	Nyando	710218187	
4	Mercy Apiyo Omungo	Female	32996901		Kisumu	Kisumu East	740849437	
5	Bramwell Ochieng'	Male	27702412		Siaya	ugenya	701176117	
6	Maureeen Obanda	Female	29433992		Siaya	Ugenya	704220809	
7	Alice Akumu	Female	37186362	Arude Women	Siaya	Gem	716840441	
8	Eugene Ochieng	Male	32626250	Jomofuwo SHG	Siaya	Gem	706280775	
9	Silas Otieno	Male	34586511	Okwany SHG	Siaya	Ugunja	713019641	
10	Bernice Awuor	Female	33060669	Maugo Farmers	Siaya	Ugunja	796103282	
11								
12	Joseph Okoko	Male	26093498	Magwar Model	Kisumu	Seme	710524151	

SN	Name	Gender	ID No	REG No.	Programme	Year of Study	Telephone Number	Signature
1	Donna A. Olwenya	Female	29768142	N/MSC/AF/00123/20	Msc. Agriculture Econ	2nd	703468267	
2	Dorcas Kutekha	Female	22379093	MSc/Sc/00071/2018	MSc. Chemistry	2nd	722969914	
3	Winnie Oliech	Female	31468999	MBA/BE/00021/020	MBA Finance	2nd	702393227	
4	Phelix Odhiambo	Male	29908052	MSC/BE/00039/020	MSc. Finance	2ND	713638030	
5	Lynder kadenge	Female	27942484	MBA/BE/00021/020	MBA Strategic Mngnt	2nd	729886353	
6	Anne Marie Amondi	Female	37504121	BE/00414/018	BBA with IT	4th	726823319	
7	Faith Mugera	Female	37257156	AF/00012/018	BSc AGEC with IT	4th	705643150	
8	Christopher Otieno	Male	37022010	AF/00009/018	BSc AGBM	4th	759591056	
9	Barack Ondiek	Male	33453946	AF/00185/016	BSc AGED	4th	746351901	
10	Melchizedek Saiai Monyenye	Male	37943825	TME/00325/019	BSc Mathematics & Ec	3th	796520880	

Faculty

SN	Name	Gender	ID No	PF/N	Department	Telephone Number	Signature
1	Prof. Mathew Dida	Male	8975028	1485	Applied Plant and Soil Science	711860550	
2	Dr. Fredrick Aila	Male	13385047	2488	Business Administration	722314767	
3	Dr. Phoebe Mose	Female	24160998	2546	AERD	729209415	
4							

PlantVillage Nuru App Trainers

SN	Name	Gender	ID No	Organisation	Position	Telephone Number	Signature
1	Lawrence Ombwayo	Male	33073324	PlanttVillage	Rift Valley Lead	710224972	
2	John Mayieka	Male	32906310	PlanttVillage	Agronomist	716068017	
3	Gladys Waboi Ntango	Female	33315585	PlanttVillage	Agronomist	718484337	