Detection and diagnostic services
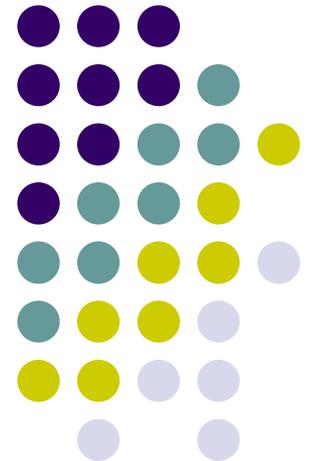
Why diagnostic services are required?
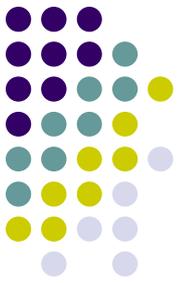
- Plant pests and diseases are responsible for about 30% of crop losses annually. Plant clinics have been helping farmers in reducing such losses.

- Plant doctors occasionally need expert support from plant health diagnostic laboratories to accurately diagnose plant health problems that are difficult to identify.

- Diagnostic services are provided at
  - Agricultural institution level
  - Private company level
  - National level
  - Global level

Diagnostic services at agricultural universities
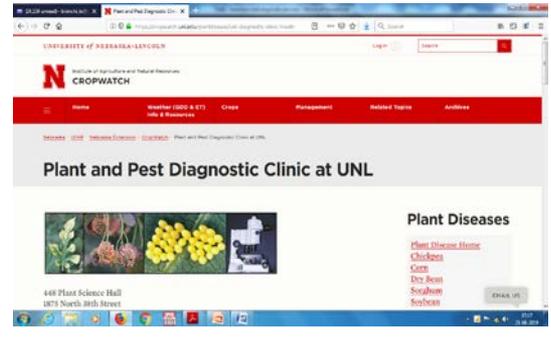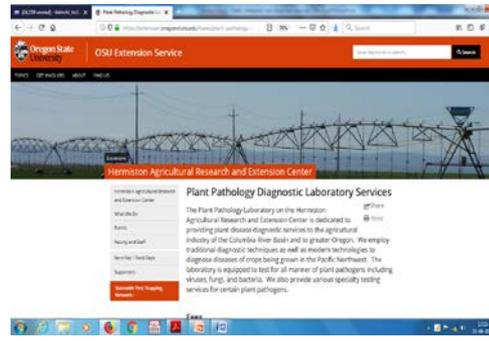
Private service providers

Services provided at the diagnostic centres
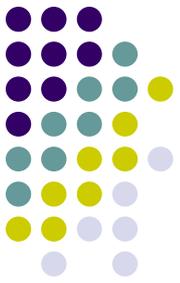
- Identification and diagnosis of plant diseases
- Screening of water, soil and nursery potting mix for plant pathogens
- Fungicide trials for evaluating chemical and biocontrol products
- Seed testing for plant pathogens
- Consultancy on planning for reduction in pathogen population
- Disease control advice

The challenge ahead

- Worldwide, over 500 million smallholder farmers provide food for two-thirds of the earth's growing population. Achieving a zero hunger world by 2030 depends on increasing the productivity of these smallholder farmers – but their crops face a significant threat. Yearly, an estimated 40% of crops grown worldwide are lost to pests.

- The lack of access to timely, appropriate and actionable extension advice makes it a fundamental challenge for farmers to get the right information at the right time to reduce crop losses.

Global Solutions
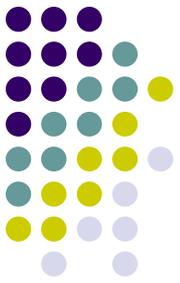
plantwise

- Plantwise is a global programme led by CABI. It helps farmers lose less of what they grow. Working closely with national agricultural advisory services, it has established a global plant clinic network, run by trained plant doctors, where farmers can find practical plant health advice. Farmers visit with samples of their crops, and plant doctors diagnose the problem and make science-based recommendations on ways to manage it.

- The plant clinic network is reinforced by the Plantwise Knowledge Bank, a gateway to practical online and offline plant health information, including diagnostic resources, best-practice pest management advice and plant clinic data anlaysis for targeted crop protection. Together, these two unique resources are part of the Plantwise approach to strengthen national plant health systems to help farmers provide a safe and sustainable food supply and improve their livelihoods.

The wider context

- Plantwise is also strengthening national plant health systems by bringing together different people who play a role in delivering knowledge to farmers. These include extensionists, researchers, educators, policy makers, agricultural input suppliers, farmer organizations, NGOs and more.

- Since its launch in 2011, Plantwise has supported over 30 million smallholder farmers across the world with the knowledge they need to lose less of what they grow to pests and diseases, increasing food security and improving rural livelihoods.

PlantVillage: A deep-learning app diagnoses crop diseases
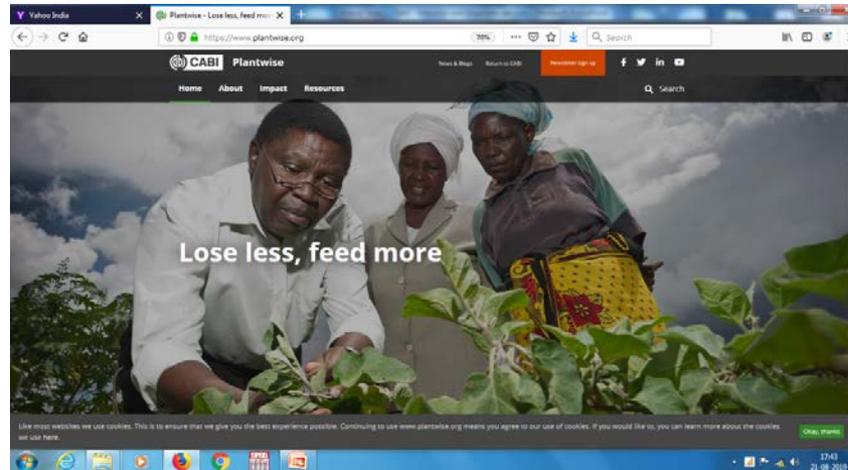
- Scientists at the Swiss Federal Institute of Technology (EPFL) and Penn State have developed a computer algorithm to identify crop diseases with extremely high accuracy.

- The algorithm when incorporated in a smartphone app help farmers prevent future food shortages.
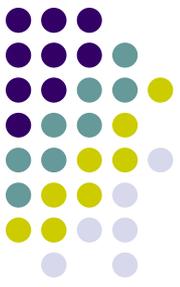
- More than 53,000 images of diseased and healthy plants were fed into the network and trained it to recognize patterns in the data

- Neural networks provide a mapping between an input, such as an image of a diseased plant, to an output, such as a crop-disease pair

- An example of how this emerging technology works is the way Facebook can identify a user by analyzing an uploaded photo

- Within the PlantVillage data set, the model achieved an accuracy rate as high as 99.35 percent, meaning it correctly classified crop and disease from 38 possible classes in 993 out of 1,000 images

- ## **Nuru**
- It is an Artificially Intelligent (AI) that has been developed to diagnose multiple diseases in Cassava, fall armyworm infections in African Maize, potato disease and wheat disease.
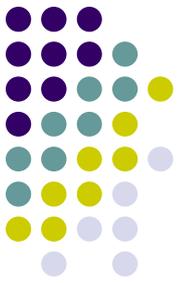
- **Drones**
- Images and video are collected by cheap, affordable drones so that extension workers in low income countries can rapidly measure disease pressure in smallholder farmer fields.
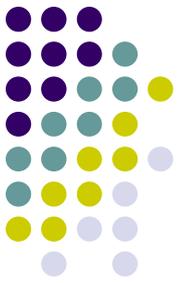
- **Mobile Spectrophotometry**
- A nanotech enabled mobile spectrophotometer has been built to diagnose viral infections in cassava even when the plant looks healthy. Mobile spectrophotometry can provide rapid disease diagnostics in the field, in real time
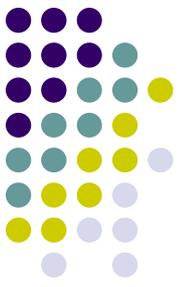
App

- **Plantix** is a free mobile application which offers farmers and gardeners the possibility to receive decision support directly on their smartphone. Due to image recognition, the **app** is able to identify the plant type - as well as the appearance of a possible disease, pest or nutrient deficiency.

plantix

SUCCESS STORY IN FOCUS
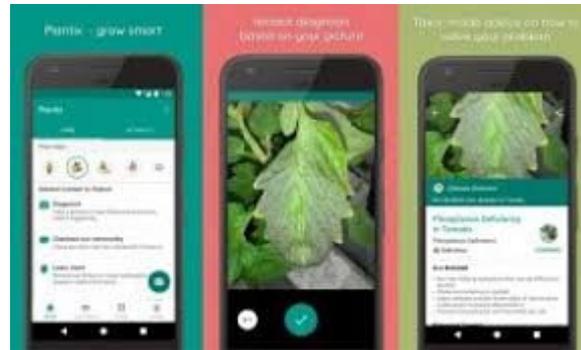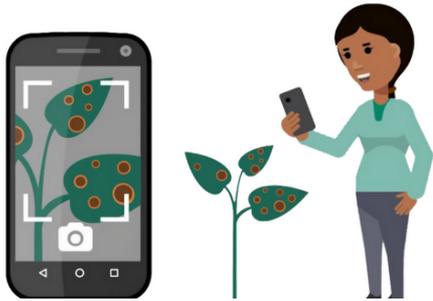
- Born of research in the Amazon forest, the Plantix mobile app is helping farmers on three continents quickly identify plant diseases using artificial intelligence.

- farmers in Germany, Brazil and India use Plantix to upload photos of diseased crops. The images are part of a huge and growing crowdsourced database that is helping farmers to identify, treat and prevent crop diseases