



The Plant Quarantine and Biosecurity Station (PQBS) of KEPHIS

An Overview
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SEMIS UoN

Seed Enterprises Management Institute

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Outline

- Introduction to KEPHIS
- Vision and Mission
- Legal Framework governing operations
- KEPHIS Offices
- Functions of KEPHIS
- The Plant Quarantine and Biosecurity Station
- Questions and Tour of Facilities

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KEPHIS a state corporation in the Ministry of Agriculture mandated to offer regulatory services in the agricultural sector

The Kenya Plant Health Inspectorate Service is a regulatory body established under the State Corporations Act (Cap 446) pursuant to Legal Notice No. 305 of 18th October 1996.

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The Corporation commenced operations in 1997.





VISION

The lead regulatory agency in agriculture

MISSION

To provide an effective and efficient science-based regulatory service for assurance on quality of agricultural inputs and produce thereby promoting sustainable economic growth and development



Mandate of KEPHIS:

Among others -

- Preventing the introduction of harmful foreign pests, diseases and weeds
- Grading and inspection of agricultural produce
- Certification of the quality of seeds, fertilisers and monitoring of agrochemical residue levels
- Offering advisory services on pest/disease management
- Plant variety protection

KEPHIS offices

- (20) Distributed in major entry points and production areas.

1. Headquarters- Karen	2. Kisumu Regional Office (Kisumu)
3. Muguga Plant Quarantine and Biosecurity Station	4. Busia
5. Jomo Kenyatta International Airport,	6. Isebania
7. Namanga,	8. Embu Regional Office (Embu)
9. Iloitoktok	10. Moyale
11. Kitale Regional office (Kitale)	12. Timau
13. Eldoret	14. Mombasa regional office (Msa)
15. Malaba	16. Taveta
17. Suam	18. Lunga lunga
19. Nakuru Regional office (Nakuru)	20. Bura



Legal instruments guiding KEPHIS Operations

- Agriculture Act, Cap 318
- Agricultural Produce (Export) Act, Cap 319
- Agricultural Produce Marketing Act, Cap 320
- **Plant Protection Act, Cap 324**
- The Suppression of Noxious Weeds Act, Cap 325
- **Seeds and Plant Varieties Act, CAP 326**
- The Fertilizers and Animal Foodstuffs Act, Cap 345
- The Pest Control Products Act, Cap 346
- **Biosafety Act, 2009**

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Legal Instruments guiding KEPHIS Operations, Cont'

Supported by a number of International Instruments such as -:

- **UPOV** Convention, (Union for the Protection of Plant Varieties)
- **OECD** seed schemes (Organization for Economic Cooperation and Development),
- **IPPC** (International Plant Protection Convention)
- **CDB** and the **Cartagena protocol** on Biosafety etc

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Mandates of KEPHIS – Broadly

Phytosanitary Certification

Seed Certification

Plant Variety Protection

Quality control of agro-inputs and produce

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Phytosanitary_Services



*KEPHIS ensures that planting material is free from pests and diseases and that all **imported and exported** plant products are of high quality and meet international standards of health and purity.*

KEPHIS also offers diagnostic services for plant disease through its plant health clinic.

Plant import permits

PLANT MATERIAL PERMIT No. _____

URGENT NOTICE to all Officials of Customs, Post Office, Airways and Plant Protection Services

Please forward this permit with the least possible delay to:

OFFICER-IN-CHARGE—PLANT QUARANTINE STATION - MUGUGA
 P. O. BOX 49421 NAIROBI,
 TEL: 0154-32718

FOR
MANAGING DIRECTOR
KENYA PLANT HEALTH INSPECTORATE SERVICE

5/536/2006

(THIS)

June, 2006

Printed

1) All Cuttings to be the produce of and grown in Germany

2) The consignment to be inspected on arrival and the importing authority reserves the right to treat, destroy or refuse the importation.

3) Plants or plantparts must be entirely free from soil, chaff and/or leaf mould.

4) Each consignment shall be accompanied by an original copy of this import permit and Phytosanitary Certificate (International Model or its equivalent) from country of origin.

Additional Declarations:

(i) The plants or parent plants were inspected during active growth and found to be free from viruses including tomato spotted wilt.

(ii) (If rooted). The plants were propagated and grown in a sterile medium.

Failure to furnish the required certificates may result in prohibition of entry of the plant material.

5) **Packaging** The following materials must not be used: banana leaves, maize, rice, sorghum, jute, wheat straw, soil or leaf mould. If any other plant residue is used as packaging material, the consignment must be accompanied by a certificate stating: a) seeds, pathogens and insects have been killed before use of the material either by heating to 180°F / 83°C for ten minutes or by chemical treatment (N.B.- Details to be stated on Phytosanitary Certificate).

This permit is valid for six months from date of issue, but may be cancelled at any time by the Director of Agriculture or by the officer issuing the permit on his behalf.

Official Stamp

Elizabeth Langat
 (Signed)
 for Director of Agriculture

*The permission hereby granted is additional to any permission or licence required under any other law.
 Full name and address of supplier to be stated

Permit No. KEPHIS/536/2006

REPUBLIC OF KENYA
 MINISTRY OF AGRICULTURE & RURAL DEVELOPMENT
 KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)
 PLANT IMPORTATION PERMIT
 (Plant Protection Act Cap 324)

Date 9 June, 2006

The importer must furnish the supplier with a copy of this import permit before plant material is despatched.

Permission is hereby granted to **KEPHIS/536/2006**
 of P. O. Box 64132, NAIROBI, KENYA
 to import from Germany,

the following Cuttings

4000 CUTTINGS Heliotropium spp
 subject to the following conditions

1) All Cuttings to be the produce of and grown in Germany

2) The consignment to be inspected on arrival and the importing authority reserves the right to treat, destroy or refuse the importation;

3) Plants or plantparts must be entirely free from soil, chaff and/or leaf mould

4) Each consignment shall be accompanied by an original copy of this import permit and Phytosanitary Certificate (International Model or its equivalent) from country of origin.

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Seed Certification



Field certification of seed beans



Field certification of seed potato

KEPHIS undertakes seed certification by conducting rigorous tests all through the process - from the seed field to the seed stockist.

KEPHIS thus ensures that farmers have access to adequate amounts of certified seed of the best performing varieties thereby promoting agricultural productivity and sustainable growth.

Plant Variety Protection



KEPHIS performs rigorous testing of new varieties for their value for cultivation and use (VCU) thus encouraging breeders to develop and protect their new varieties.

This ensures that farmers have access to the most suitable and superior varieties for maximum productivity as the country looks forward to attainment of Vision 2030.

Analytical Chemistry Services



*KEPHIS provides quality testing and certification services
for various Agro inputs including Agro chemicals and
Fertilizers*

Testing of Soil and Irrigation Water



KEPHIS ensures that farmers can have their soil and irrigation water tested for suitability in agricultural use.

The use of these services ensures that farmers use optimum quantities of the right kind of fertilizer

Plant Quarantine and Biosecurity Station (PQBS)



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Introduction and history

- Quarantine services in East Africa started in 1931 at Amani, Tanzania
- In 1951, the quarantine facility was transferred from Amani to the present site at Muguga.
- It served the three East Africa countries (Kenya, Uganda and Tanzania) until July 1977
- Moved to **Muguga Plant Quarantine Station** in 1977 Under ministry of Agriculture and later KARI
- Handed over to KEPHIS upon its Formation in **1996**
- The station stands on an isolated 4 hectare land, 30 Km west of Nairobi and 6Km off Zambezi junction along Nairobi- Nakuru Highway



Roles and Functions of The PQBS

- The station offers **diagnostic** and **advisory** services related to **plant pests** and **diseases**
- The main objective is the **prevention of introduction and spread** of plant pests, diseases and noxious weeds.
- **Facilitates trade** by delaying or totally preventing spread of pests and diseases
- **Supports Phytosanitary decision making** (e.g. risk analysis)
- Offers **advisory services** to farmers and growers



Diagnostic Capacity

- The station had Plant containment facilities that include 27 greenhouses, 6 screen-houses and laboratory containment facilities
- This has greatly improved with the modernization of both the screen-houses and green-houses
- Lab containment facilities include insect culture and thermotherapy chambers

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Diagnostic Capacity in the past

- In **the past** the station had only **three** technical units viz; **Seed health, Virology and Tissue culture.**
- The seed health and virology sections were responsible for testing of materials to ensure freedom from seed borne diseases and pests.
- The tissue culture section was responsible for virus clean up and multiplication of high value crops.



Diagnostic Capacity

- The station now has well equipped labs (with modern equipment, reagents and methods)
- By 2008 we could do most basic diagnostic tests for **all** pathogen types
- This has been enhanced by the acquisition of modern equipment and the use of modern techniques

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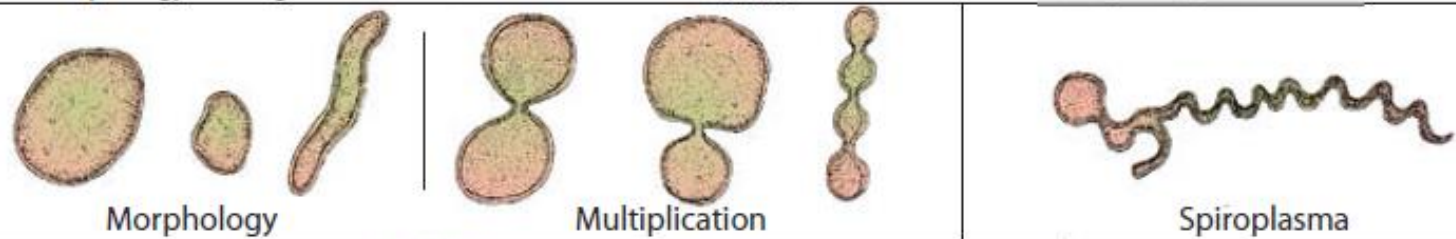
Fungi



Bacteria



Mollicutes



Parasitic higher plants



Viruses



Nematodes



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Current Diagnostic Capacity

Capacity has now **expanded from 3 to 7** fully functional and equipped laboratories namely

1. Nematology,
2. Entomology,
3. Bacteriology,
4. Mycology
5. Virology,
6. Molecular biology and
7. Tissue culture





Mycology Lab

- The lab diagnoses fungal pathogens affecting plants
- Samples include all plant parts as well as soil and other media
- Techniques include moist chamber and media isolation followed by identification by morphological means
- Published protocols and literature are used as references

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Common Smut caused by *Ustilago maydis*



Maize infected with *Aspergillus* spp.



Late Blight caused by *Phytophthora infestans*



Powdery mildew on wheat, grapes, lilac and azalea



Sporulation of fungi under NUV light (300-380 nm)

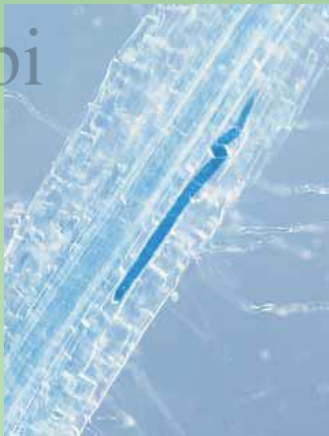
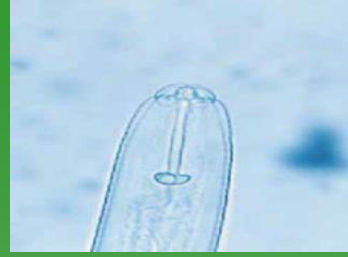
Nematology Lab

This lab detects and identifies **plant parasitic** nematodes from samples

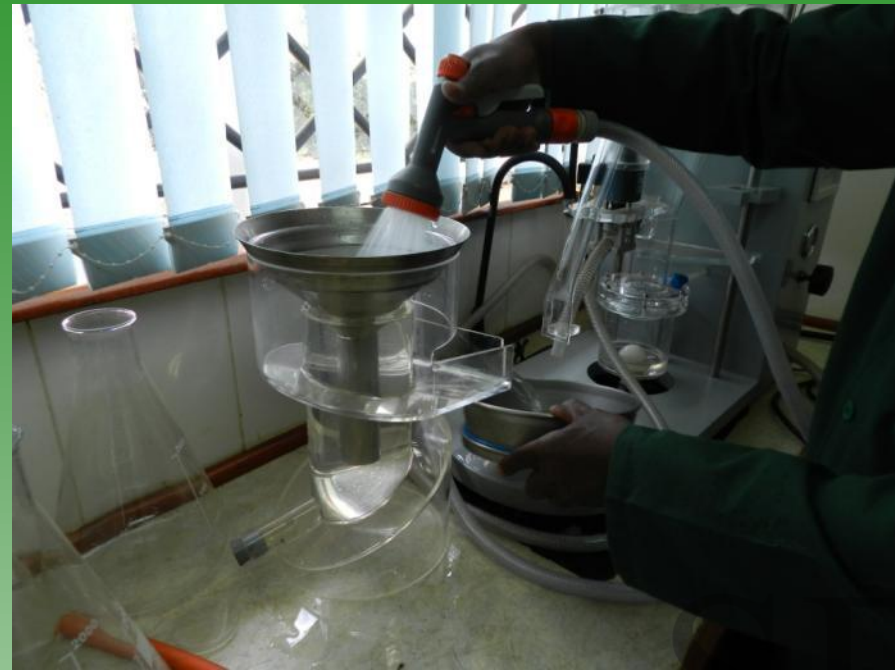
- Soil and other growth media
- Water for irrigation
- Plant tissues (roots, seeds etc)
- Processed plant products e.g. coco-peat

Process involves **sample extraction** followed by **nematode identification** and counting.

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Nematology Lab



Cyst extraction by
Fenwick can

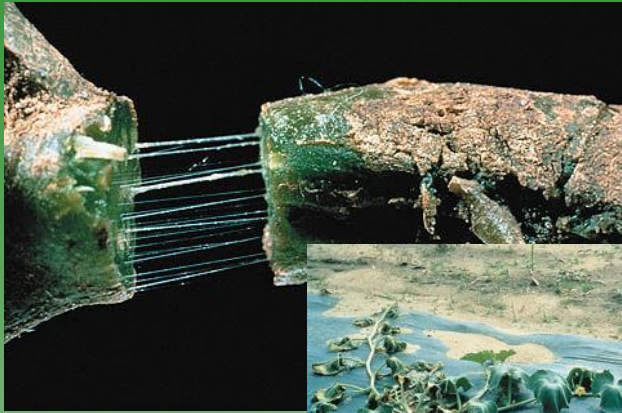


Cyst extraction by
Elutriator



Identification under
microscope

Bacteriology Lab



Bacterial wilt in cucumber -
Erwinia spp.



Crown gall in roses –
Agrobacterium spp.



Bacterial wilt in Potato –
Ralstonia solanacearum



Banana bacterial wilt
Xanthomonas spp.

Entomology Lab



Insect Specimen Collection

Insects are vectors of important diseases



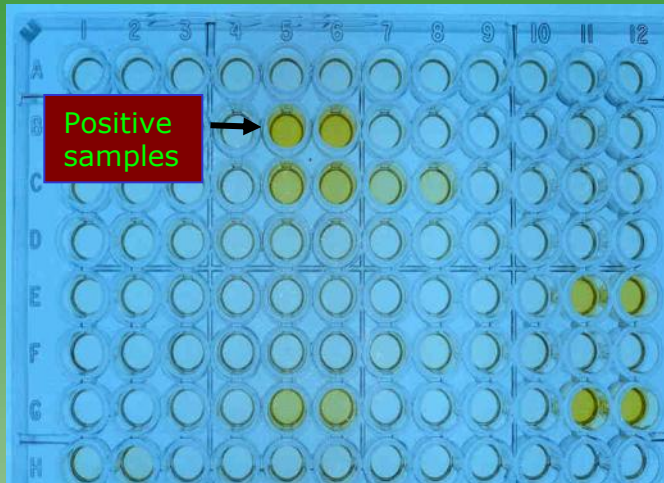
Damage by leafminers



X Ray imaging equipment

Virology Lab

DAS ELISA

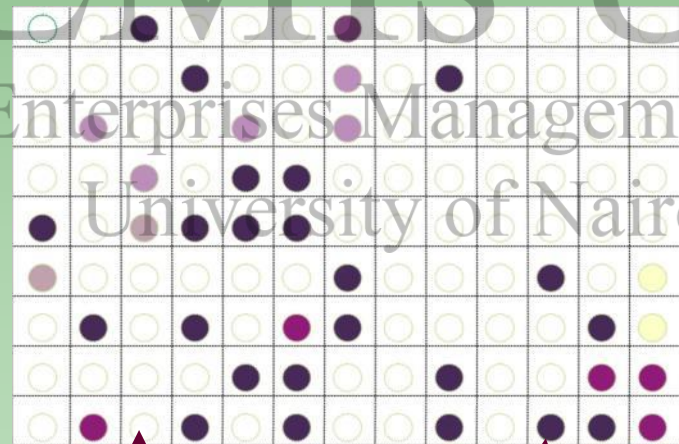


- ← Healthy
- ← +ve control
- ← Buffer

Observation of particular Symptoms



NCM ELISA



Healthy control

Buffer

+ control

Negative Reaction

Positive reaction



Molecular Biology Lab

- Diagnosis using both conventional and realtime PCR
- Currently used for diagnosis of Cassava brown streak, *Cassava mosaic virus*, MLND, *Ralstonia* spp., Citrus Greening, Tomato spotted wilt and Passion fruit woodiness



Tissue Culture Lab

Virus cleanup through the use of chemotherapy combined with meristem tip culture ensures production of pathogen free plant material



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Some Advances in Diagnostic Capacity

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Enhanced sample preparation and extraction

Before
Manual!



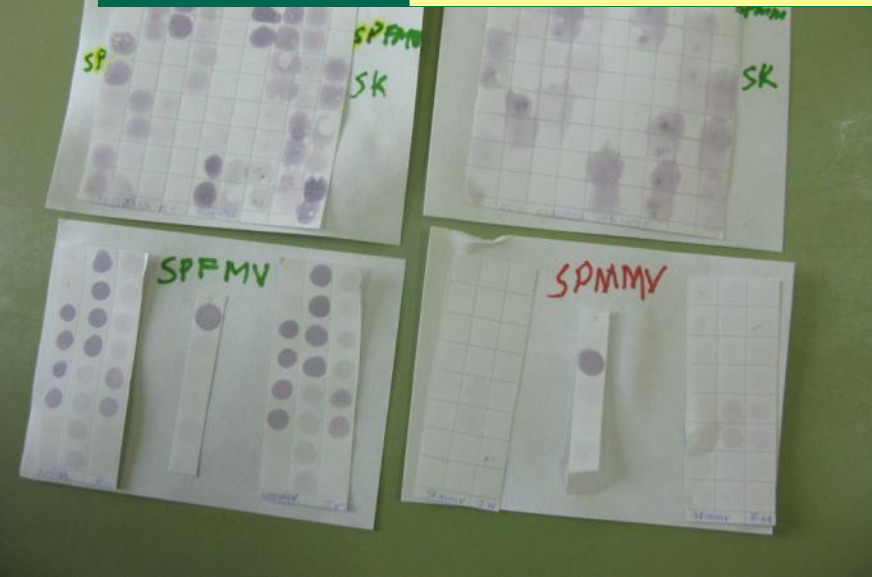
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Now
Automated



Enhanced diagnostic capacity



Method validation



Germination chamber used in plant diagnostics



Fluorescence imaging



Incubated shakers

Automated and more precise ELISA plate readers



Before
Manual!



Now
Automated

Enhanced diagnostic capacity



X Ray imaging equipment



Barcoding



Reference collection



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Automated nematode extraction



Lyophilizer for enhanced sample storage



Collections of indicator plants



BSL ii cabinets – for enhanced safety

Enhanced virus cleanup



Old thermotherapy chamber

New thermotherapy chamber



Enhanced Collaboration – CIP, PBK, IITA and Others.



Production of pasteurised soil for crop research and production



Production of pathogen free cassava



Production of pathogen free Pyrethrum



Production of pathogen free Potato



Future Outlook

- PQBS has been designated as a Regional Reference Laboratory for COMESA for Plant Health
- Proposed function include:
 - Monitoring compliance with regional and international disease and pest control
 - Standardizing and Validating diagnostic procedures and on behalf of satellite and national laboratories

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Thank you

For more information
Contact:

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(KEPHIS)
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Fax: 254-020-3536175

e.mail: director@kephis.org; kephisinfo@kephis.org

