

Plant Diagnostic Capacity and Needs at KEPHIS

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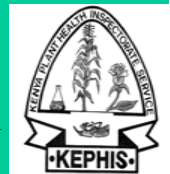
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Presented at Stakeholders meeting: Assessing Plant Disease Diagnostic Capacity and Needs in East Africa



Presentation outline

- **Agriculture in Kenya**
- **Horticulture in Kenya**
- **KEPHIS**
- **Mandate**
- **Activities**
- **Laboratory capabilities and Needs**

Agriculture in Kenya

- Kenya has an area of 583, 000 square km
- Population= 32 million people
- 83% of the land area either arid or semi arid
- 17% of high and medium potential for farming
- In Kenya the agricultural sector plays a significant role in the economy
- Accounts for 26% of gross domestic product
- Largest employer absorbing 75% of the population, major foreign exchange earner, means of livelihood for majority of Kenyans either directly or indirectly.
- Coffee, tea, maize, wheat, milk, beef and horticulture are the backbone of Kenya's economy

Horticulture in Kenya

- Within Agriculture horticulture sub sector is the fastest growing
- Horticulture in Kenya comprise of commodities categorized in four broad groups; fruits, vegetables, cutflower, herbs and spices
- Vegetables dominate horticulture sub sector
- Flowers dominate export market accounting for 51%. Vegetables account for 38%, the rest is fruits, herbs and spices
- The horticulture industry has grown at an average rate of 20% per annum. In 2005, the country exported 162,176 tons including 82,056 tons flowers, 61220 tons of vegetables, 398 tons of herbs, 11522 tons of flowers, 61,220 tons of vegetables, 398 tons of herbs, 18,552 tons of fruits and 123,787 tons of processed products

- **The total volume of exported produce accounts for 4% of the total produce.96% is marketed in domestic market**
- **EU and middle east are the main export market. Emerging new markets,America, Japan and China take relatively smaller quantities of cut flower and minimal fruits and vegetables if any. EU account 90% of our exports.**
- **Large scale farmers dominate commercial horticulture, while the majority of horticultural growers are small scale farmers**
- **Contribution of small scale farmers has declined from 60% to 55% within the last few years due to technological and financial constraints. This situation has been aggravated by unpredictable weather, pests and diseases and strict export conditions.**
- **The progressive liberalization of the world trade has created opportunities for market access.The risks of introduction and spread of new pest is even higher today than ever**

Major challenges of horticulture industries

- **Stringent EU regulations, market standards and international agreements. Examples are EU directives, EurepGap, Nature choice, and application of SPS regulations among others. Some EU directives include:**
 - **Council directive 2000,895/EEC of 23rd November 1976 relating to fixing of maximum levels for pesticide residues in fruits and vegetables amended to regulation (EC) No.396/2005 of 23rd February, 2005.**
 - **Council directive 2000/29/EC of 8th may 2000 of the protective measures against the introduction into the community of organisms harmful to plants and plant products and against their spread within the community**
 - **Regulation EC No. 1148/2001 of 12th June 2001 on conformity checks to the marketing standards applicable to fresh fruit and vegetables among others**

Kenya plant Health Inspectorate Service (KEPHIS)

- **KEPHIS is a state corporation**
- **Vigilates for the government, business sector, scientists, farmers on matters of plant health and quality control of agricultural inputs and produce**
- **MISSION: To provide dependable, effective, efficient and competitive regulatory service for ensuring quality of agricultural inputs and produce, thereby promoting sustainable agricultural and economic growth**

LEGAL BASIS

- **Legislations –**

- **Chapters of Kenyan laws:**

- CAP 324- Plant protection Act-revised last 1979,**

- CAP 318- The Agriculture Act (as amended 11 of 1993 and 2 of 2002)**

- CAP 319- The Agricultural Produce (Export) Act**

- CAP 325-The Suppression of Noxious Weeds Act**

- CAP 326- The seeds and Plant varieties Act-revised 1991 and amended by 2 of 2002**

- Others are regulation and guidelines on GMOs, CAPs 446, 346,345**

- **(International treaties/ Conventions IPPC, WTO – SPS, CBD, Cartagena protocol on biodiversity, EAC harmonized SPS standards, CITES)**

- **Specific markets standards**

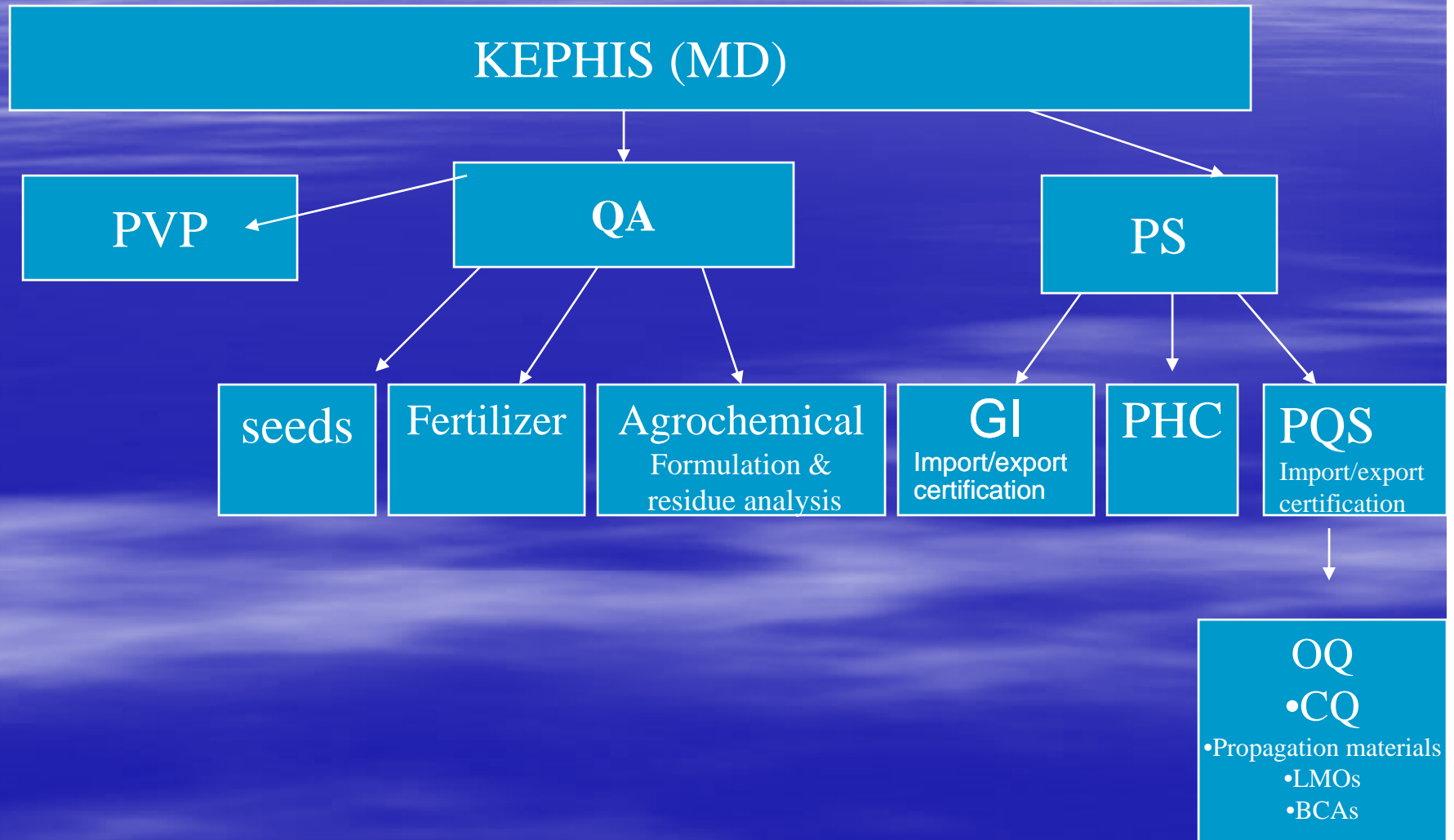
- **National standards**

Mandate of KEPHIS

KEPHIS mandate include:

- Administer plant breeders rights (PBR)
- Advise the director of Agriculture on appropriate seeds and plant materials for export and import
- Undertake inspection, testing, certification, quarantine control, variety testing and description of seeds and planting materials
- Monitor quality of agro-inputs as well as levels of toxic residues including environmental monitoring
- Undertake grading and inspection of plants and plant produce at port of entry and exit
- Implement the national policy on the introduction and use of GMOs in Kenya
- Establish linkages for collaboration with various local and international government and non governmental organizations so as to execute its tasks more professionally

KEPHIS ACTIVITIES



- **(15) Distributed in major entry points and production areas. Institution has laboratories for Chemical analysis(pesticides, fertilizers, water), soil analysis, seed quality testing and pest diagnosis and tissue culture**
 - **Headquarters- Karen**
 - **Muguga Plant Quarantine station**
 - **Jomo kenyatta International Airport (Namanga, Itoitok)**
 - **Kitale Regional office (Eldoret, Malaba, Busia, Kisumu office)**
 - **Nakuru Regional office (Nakuru, Isebania)**
 - **Mombasa regional offices (Msa, Taveta, Lungalunga)**
 - **EMBU- New regional station**
 - **(inspection and lab testing carried by staff 5 Phd, 29 Msc, 36Bsc, 47 Dip. and 36 cert. KEPHIS continues to employ highly trained staff.**
- All Phytosanitary decisions must be scientifically justified)**

Pests dispersal, spread and lessons learnt

- **Man** has carried many worlds' most serious Pests across deserts and oceans. With increased trade across nations, the risk is even high. Some of the notable examples include the following:
- 1845- *Phytophthora infestans* (late blight) on Irish potato from South America to Europe
- 1869- *Hemileia vastatrix* (coffee leaf rust) from Africa to Sri Lanka
- 1983- *Prostephanus truncatus* (Lager grain borer) from South America to East Africa through maize imports
- 1989- *Eichhornia crassipes* (Water hyacinth) from South America.
- 1990- Cypress aphid (*Cinara cupressi*)

Phytosanitary deals with Prevention of introduction into the country of harmful foreign weeds, pests and diseases

Phytosanitary Measures Applied

- Plant import regulations in Kenya fall into two broad categories.
 1. Imports under permit-Low risk materials
 2. Imports through quarantine -Plant materials with high risk of transmitting pests including latent infection e.g viruses (Clonally propagated, seed)
 - Open quarantine
 - Closed quarantine

Activities in Application of Phytosanitary measures on plants and plant products

1. Import permit (**Q label**)
2. Phytosanitary certificate for imported consignment
3. Inspection at entry/Exit points (undertaken in accordance to international standards for phytosanitary measures)
4. Holding of plants in isolation (**OQ, CQ**)
5. Active growth inspection of plants
6. Cleaning of plant germplasm
7. Farmers Advisory Services
8. Monitoring of disease outbreaks
9. Monitor introduction of biocontrol agents
10. PRA information for exporting country (country of origin)

Pest identification and disease diagnoses an important component - (Bacteria, fungi, nematodes and viruses)

Seed Certification

- **Seed propagation done by selected farmers in accordance to specific guidelines**
- **Field inspection undertaken to ensure variety remain true to type and not contaminated**
- **Laboratory tests conducted to determine purity, germination capacity, moisture content and health status**
- **Only seeds meeting minimum set standards are approved for sale**

Major pests of concern

- Bollworms (*Helicoverpa* spp.) - 33 % of interceptions
 - Leafminer – 27% of interceptions
 - White flies
 - Fruit flies
 - Thrips
 - Spidermites
 - Weeds (*Veronica spicata*)
 - *Agrobacterium*
 - *Ralstonia solanacearum*
 - *Potato viruses, Erwinia*
 - *Threats include spread of Banana xanthomonas wilt*
- (all these and many others affect production and market access)*

Laboratory Capabilities at KEPHIS

High quality laboratory performance is essential for quality and plant health assurance

ACL

- **KEPHIS Analytical chemistry laboratory analyses pesticide formulations and residues in a wide range**
- **The facility is also used in determination of environmental contaminant.**
- **The laboratory is accredited to ISO 17025 by the South Africa National Accreditation System (SANAS)**

Seed testing laboratory

- **The seed testing laboratory is accredited to the International Seed Testing Association (ISTA) under the ISO 17025. The laboratory participates in proficiency testing.**
- **The laboratory is not yet accredited for seed health testing but hopes to be accredited next year**

Quarantine Services

- **KEPHIS has diagnostic laboratories at the Port of Mombasa, Eldoret Airport and Jomo Kenyatta International airport but minimal diagnosis are done at these stations**
- **Most of the diagnostic work is done at the plant Quarantine Station Muguga.**
- **The main objective for the diagnostic work is for prevention of introduction and spread of plant pests, diseases and noxious weeds.**

Q cont'

- Realizing that plant pathogens, insect pests and weeds introduced into a new area in which they did not exist are more likely to cause catastrophic epidemics than do the existing ones, maximum care is taken when handling newly introduced plant material and in general imported plant materials and regulated articles that can harbour plant pathogens and insect pests

Q cont'

- The Plant Quarantine station is a section in the department of Plant protection Services at KEPHIS.
- The station stands on an isolated 4 acre land, 30 Km west of Nairobi and 6Km off Zambezi junction along Nairobi- Nakuru High Way.
- The station has Plant containment facilities that include 40 greenhouses, 5 screenhouses and laboratory facilities.

- The station has 3 technical units
 - Seed health testing laboratory
 - Virology section
 - Plant Health clinics

- Staff
 - 1 PhD, 4 Msc, 3 Bsc, 3 diploma, 6 certificate holders and 22 support staff working in administration and management of the greenhouses and tissue culture laboratory

- The laboratories at plant quarantine station have basic equipment necessary for diagnosis of plant diseases. The laboratories are mainly used in the analysis of bacterial diseases, viral, nematode and fungal diseases. Equipments in these labs include 2 laminar flows, 1 shaker, 2 fridges, centrifuge, ELISA reader, microscopes (2 Stereo and 2 compound), 1 water bath, 1 analytical balance, autoclaves, 2 ovens, and 1 vortex mixture.

Constraints

- 1.** Laboratory space is limited and some of the equipments are old and requires replacements. There is need to upgrade the laboratories and to acquire modern diagnostic equipments
- 2.** The labs are only able to test *Ralstonia solanacearum* and *Xanthomonas campestris* pv. *campestris* using selective media, Elisa techniques for *Ralstonia* and pathogenicity.
 - a.** There is need to develop capacity for diagnosis of other bacteria especially *Erwinia*, *Agrobacterium*, other *Xanthomonas*, *Pseudomonas*, *Clavibacter*, *Curtobacteria* etc.
 - b.** There is also need to acquire molecular equipment, chemicals and to development capacity in molecular techniques.
 - c.** There is need to purchase antibodies and chemical for selective media

Constraints (Needs)

- 1.** The virology lab is able to some viruses in Irish potato, sweet potato, and cassava using ELISA techniques. Most of the viruses are tested using mechanical inoculation and grafting. These methods take along time and are not reliable as the do not indicate the specific viruses. There is need for molecular diagnosis equipments, antibodies for different virus and quick diagnostic kits. There is need for training in virus identification using molecular techniques.
- 2.** Nematode isolation and identification equipments are missing in the laboratory. There is also need for training in Nematode Identification
- 3.** Training on fungal identification is necessary at the station. The training for quarantine fungal pests is particularly important. Identification manual, and reference material are missing.

Areas of Collaboration and capacity building

- 1. Training in diagnosis of bacteria, fungi, nematode and viruses.**
- 2. Linkages with other laboratories for analysis result verification**
- 3. Training on molecular based diagnosis in identification of plant diseases**
- 4. Training in quality management systems and accreditation process**
- 5. Upgrading of laboratories and greenhouse facilities.**
- 6. Improvement of communication linkages and ability for data and information exchange with collaborators for efficient service delivery and decision making**

Screenhouses for holding germplasm



GREENHOUSES (CQ) AT PQS-Muguga



Virus testing



Cleaning germplasm through tissue culture



SEED PATHOLOGY





For more information

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THANK YOU FOR YOUR
ATTENTION