International Phytosanitary Conference 2016

Theme: "Phytosanitary Regulation for Improved Trade Facilitation and Food Security"

Date: 12th to 16th September 2016

Venue: KEPHIS Headquarters, Oloolua Ridge-Karen, Nairobi, Kenya

BOOK OF ABSTRACTS

HARAMBEE

KENYA PLANT HEALTH INSPECTORATE SERVICE

•KEPHIS•

COPE

The venue of the conference is KEPHIS Headquarters, Oloolua Ridge, off Ngong Road, past Karen Shopping Centre, before KCB Training School, Karen, Nairobi. KEPHIS is located approximately 20 kilometres from the Nairobi Central Business District and 35 kilometres from the Jomo Kenyatta International Airport (JKIA).

The conference will commence at 8.30 a.m. on Monday, 12th September 2016 and conclude at 5.00 p.m. on Friday, 16th September 2016.

For more information, please contact:
The Managing Director
Kenya Plant Health Inspectorate Service (KEPHIS)
P. O. Bo 49592-00100, Nairobi, Kenya
Tel: +2542066188000 & +254709891000
Email: phytosanitaryconference2016@kephis.org & director@kephis.org
Website: www.phytosanitaryconference2016.com & *www.kephis.org*

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LIST OF ACRONYMS AND ABBREVIATIONS

AATF	African Agricultural Technology Foundation
AFFA	Agriculture, Fisheries and Food Authority (AFFA)
BecA	Biosciences Eastern and Central Africa
BGC	Blue Gum Chalcid
BLAST	Basic Local Alignment Search Tool
BOLD	Barcode of life database
CABI	Centre for Agriculture and Biosciences International
CABMV	Cowpea aphid-borne mosaic virus
CAVS	College of Agriculture and Veterinary Sciences
CBD	Convention on Biological Diversity
CBSV	Cassava Brown Streak Virus
CIP	International Potato Center
COMESA	Common Market for Eastern and Southern Africa
COPE	Centre of Phytosanitary Excellence
CS	Cabinet Secretary
CTAB	Cetyltrimethylammonium bromide
DCP	Department of Crop Protection
DNA	Deoxyribonucleic acid
EAC	East African Community
ELISA	Enzyme-linked immunosorbent assay
EMC	Elgeyo Marakwet County
EPPO	European and Mediterranean Plant Protection Organization (
ETG	Export Trading Group
EU	European Union
SMAP	Standard and Market Access Programme
FAO	Food and Agriculture Organisation
FTD	fly/trapday
GDP	Gross Domestic Product
GMFA	General Manager Finance and Administration
GMPS	General Manager Phytosanitary Services
H.E.	His Excellency
HCD	Horticulture Crops Directorate
HQ	Headquarters
ICARDA	International Center for Agricultural Research in the Dry Areas
ICIPE	International Centre of Insect Physiology and Ecology
ICRAF	World Agroforestry Centre
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
ICT	Information Communication Technologies
IITA	International Institute of Tropical Agriculture
IPC	International Phytosanitary Conference
IPPC	International Plant Protection Convention
ISPMs	international standards for phytosanitary measures
ISTA	International Seed Testing Association
IYPH	International Year of Plant Health
JKIA	Jomo Kenyatta International Airport
KALRO	Kenya Agricultural & Livestock Research Organization
KCB	Kenya Commercial Bank
KEFRI	Kenya Forestry Research Institute
KES	Kenya Shilling
KHC	Kenya Horticulture Council
KMFRI	Kenya Marine and Fisheries Research Institute
KEPHIS	Kenya Plant Health Inspectorate Service
KSTCIE	Kenya Standing Technical Committee on Imports & Exports

LAMP	loop-mediated isothermal amplification
MAT	male annihilation technique
MCMV	Maize Chlorotic Mottle Virus
MD	Managing Director
ME	Methyl Eugenol
MLND	Maize lethal necrosis disease
MoALF	Ministry of Agriculture Livestock and Fisheries
MSc	Master of Science
NCBI	National Centre for Biotechnology Information, USA
NIC	National Industrial Credit
NPPOs	National Plant Protection Organizations
OECD	Organization for Economic Cooperation and Development
OIE	World Organization for Animal Health
PCN	Potato Cyst Nematode
PCPB	Pest Control Products Board
PCR	Polymerase Chain Reaction
PhD	Doctor of Philosophy
PHIs	Plant Health Inspectors
PSS	Positively Selected Seed
PVY	Potato Virus Y
PVY-NTN	Potato Virus Y *strain* N - Tuber Necrotic
PVY-O	Potato Virus Y *strain* Ordinary
QDS	Quality Declared Seed
QMS	Quality Management Systems
RCBD	Randomized Complete Block Design
RECs	Regional Economic Communities
RIIP	Regional Integration Implementation Program
RT-PCR	Real-time Polymerase Chain Reaction
SADC	Southern African Development Community
SASHA	Sweetpotato Action for Security and Health in Africa
SCMV	Sugarcane Mosaic Virus
SGS	Société Générale de Surveillance
SOPs	Standard Operating Procedures
SPS	sanitary and phytosanitary
SSA	Sub-Saharan Africa
STDF	Standards and Trade Development Facility
TBT	Technical Barriers to Trade
TICAD	Tokyo International Conference on African Development
TML	Trimed lure
TSWV	Tomato spotted wilt virus
TTT	Technical Task Team
UFEA	Uganda Flower Exporters Association
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UPOV	International Union for the Protection of New Varieties of Plant
UPV	Ugandan Passiflora Virus
USAID- KAVES	United States Agency for International Development - Kenya Agricultural Value Chain Enterprises
WHO	World Health Organization
WTO	World Trade Organization
ZARI	Zambia Agriculture Research Institute

1. INTRODUCTION

The international standards for plant health (phytosanitary measures) i.e. ISPMs are provided for in the International Plant Protection Convention (IPPC).The convention makes provision for application of phytosanitary measures by governments to protect their plant resources from harmful pests which may be introduced through international trade. Phytosanitary measures include any legislation, regulations or official procedure aimed at preventing the introduction and spread of harmful pests. Phytosanitary measures play an important role in trade facilitation, protection of plant resources and environment. Non-compliance to these measures may lead to introduction of harmful or quarantine pests which not only leads to restriction in market access but can adversely affect agricultural production and the environment. Moreover, if not correctly applied, they can constitute unnecessary barriers to trade and therefore, should be science based and applied justifiably. The phytosanitary measures in developing countries especially in Africa are characterized by inadequate or weak systems that hinder facilitation of trade. Centre of Phytosanitary Excellence (COPE) was established with the rationale that African countries lack effective systems for managing phytosanitary measures at the national level and also lack good regional co-ordination of the implementation of the phytosanitary measures; hence the need to build phytosanitary capacity of African countries. Efforts have been made by COPE and other regional and international organizations to meet aspirations of the region through capacity building and undertaking actual pest risk analysis (PRA) for various crops. KEPHIS/COPE will hold the International Phytosanitary Conference in Africa from 12thto 16thSeptember 2016 in Nairobi whose theme is "Phytosanitary regulation for improved trade facilitation and food security". The conference will create an opportunity for participants from the NPPOs and those in agricultural trade to share their success as well as challenges encountered. The conference will also offer the participants an opportunity to discuss emerging issues such as invasive species and pest outbreaks. Kenya will for the first time host this International Plant Health Conference, where about 100 delegates from 40 countries across the world will gather in Nairobi to discuss matters pertinent and emerging in plant health.

1.1 Objectives

a. To provide a forum to share achievements, challenges and opportunities in application of phytosanitary measures towards assuring food security.
b. To provide NPPOs with an opportunity to create linkages and promote market access regionally and internationally.
c. To identify potential areas of collaboration on phytosanitary regulations at regional and international levels in trade facilitation.
d. To share and develop solutions on phytosanitary issues with the industry.

1.2 Conference Themes

a. Phytosanitary Systems;
b. Import Control and Quarantine Regulations;
c. Pest Surveillance in Phytosanitary Systems;
d. Pest Diagnostics in Phytosanitary Systems;
e. Export Control in Phytosanitary Systems;
f. Industry views on Phytosanitary Systems
g. Technologies and Innovation in Phytosanitary Systems;
h. Communication, Governance and Legal Systems in Phytosanitary Systems;
i. Emerging Phytosanitary Issues.

2. ACKNOWLEDGEMENTS

We would like to acknowledge the following persons in the various committees for their contribution towards the success of the conference:

Steering Committee
Managing Director, KEPHIS; Director of Agriculture (MoALF), Kenya; MD-HCD; MD-PCPB; MD-KHC; Director General-KALRO; Principal CAVS, University of Nairobi; CABI; The Netherlands Embassy; The EU; USAID-KAVES, Director General-AFFA.

Planning Committee
Mr. James Wahome (GMPS-KEPHIS), Bartonjo Cheptarus (GMFA-KEPHIS), Simon Kibet (GMQA-KEPHIS), Dr. Isaac Macharia (KEPHIS), Joseph Kigamwa (KEPHIS), Pamela Kipyab (KEPHIS), Christine Ruoro (KEPHIS), Catherine Muraguri (KEPHIS), Hellen Mwarey (KEPHIS), Stephen Kariuki (KEPHIS), Charles Kamau (KEPHIS), Simon Maina (KEPHIS), Winnie Njuki (KEPHIS).

Technical Committee
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Development partners that have supported with finances towards various activities i.e. RIIP, Monsanto, Sygenta Foundation, EU-SMAP, CABI/AAPBP (Australia Aid); exhibitors i.e. Koppert Biologicals, IITA, CABI, ETG, CIP, Elgeyo Marakwet county, Dudutech, SGS, NIC Bank, Crop Nuts, Seed Co., Elgon Kenya, Monsanto, Uasin Gishu County, Bomet County, Muddy Boots, GTIL, Agdia biofords, Kericho County, FPEAK and Kenya Flower Council.

3. PREFACE BY H.E. WILLIAM S. RUTO, DEPUTY PRESIDENT OF THE REPUBLIC OF KENYA

It is indeed a pleasure to be at this conference which is the first of its kind to be held in the world. This comes in the backdrop of other conferences that have been held in Kenya in 2016 such as the Fourteenth session of the United Nations Conference on Trade and Development (UNCTAD 14) and Sixth Tokyo International Conference on African Development (TICAD VI) Summit. This shows that Kenya is an important strategic partner globally in matters of trade and development.

As you are aware, agriculture is the backbone of many economies, especially in developing countries, hence the importance of this conference cannot be gainsaid. However, fluctuating weather patterns, the high cost of agricultural inputs, pests and diseases, imbalances of trade, increasing human populations that have taken up areas of farming and wildlife conflicts make food availability and security a challenge that must be overcome. May I also hasten to add that these challenges compromise the quality of food.

I am glad to note that this forum has experts from different organizations from all over the world who will deliberate and come up with the way forward for phytosanitary matters. We must address these challenges with a view of solving the problems of food availability and security, especially in developing countries. Secondly, plant trade is many times affected by quality standards and requirements of importing countries, which changes from time to time. This is especially so for countries whose main exports are plant based.

I am proud to note that KEPHIS, the venue of this conference, and Kenya's National Plant Protection Organization has built a state of the art laboratory that assures the quality of agricultural produce that is exported to key export markets. This has built confidence in our trading partners.

Lastly, I urge the countries represented here to support regional and international sanitary and phytosanitary standards to the betterment of our economies.

H. E. William S. Ruto
Deputy President of the Republic of Kenya

4. FOREWARD BY MR. WILLY BETT, CABINET SECRETARY, MINISTRY OF AGRICULTURE, LIVESTOCK AND FISHERIES, KENYA

It is my pride to be at this first ever International Phytosanitary Conference that is being held for the first time not only in Africa, but specifically in Kenya. It is a proud moment for our country to host the over 100 delegates from 40 countries who will for one week deliberate on pertinent issues that touch on the health of plants, plant products and regulated articles.

Kenya takes phytosanitary or plant health matters very seriously. This is because Kenya and many other countries, especially developing countries, are dependent on agriculture as a source of livelihood, a source of income and employment creation. Kenya, for instance earns approximately KES 100 billion in foreign exchange every year from the export of horticultural produce i.e. flowers, fruits and vegetables. These are monies that go towards funding infrastructure, free education, medical facilities, among others. In Africa, agriculture contributes over 30% of the Gross Domestic Product and provides 60%of all employment creation in the continent. Phytosanitary matters have taken centre stage in global discussions and trade in recent years. This is because of the effects of pests on agricultural production and national growth and development. Between 1900 till now, many new pests have come to Africa from other countries. Over 233 new pests have been recorded to have been introduced from outside Africa – approximately 30% of these were new insects and mites while 70% of these were new plant diseases. Pests have no borders and can travel thousands of kilometers, destroying crops in their path. Globally, pests and diseases affect the quality of crops and reduce crop production by 33% resulting in loss of income and disruptions of international markets, thus affecting trade between countries.

Indeed, the challenges of ensuring pests do not destroy crops in the farm and in storage lies with all of us. The Government of Kenya recognizes that there is increased need for inter-regional cooperation for promotion of harmonized phytosanitary measures for prevention of the spread and introduction of pests into Africa. This is more than ever before, a critical issue in view of the increased international trade, exchange of germplasm and the need to eliminate restrictions to trade both at the regional and international level. Hence, the theme of the conference, *Phytosanitary Regulation for Improved Food Security and Trade Facilitation* could not have come at a better time, when we are addressing challenges related to phytosanitary matters.

I urge all delegates to come up with tangible solutions to address these challenges.

Once again, *karibuni* Kenya! Thank you.

Mr. Willy Bett
Cabinet Secretary, Ministry of Agriculture, Livestock and Fisheries

5. REMARKS DR. RICHARD LESIYAMPE, PRINCIPAL SECRETARY, STATE DEPARTMENT OF AGRICULTURE

The 2016 International Phytosanitary Conference has come at an opportune time to discuss issues that affect plant and plant materials around the world. This is in line with the Kenya Vision 2030, the Agriculture Sector development Strategy and other instruments that guide the focus of agriculture in the region and the world. I am glad to note that the topics that will be deliberated upon are those that concern many countries around the world. The topics include import controls and quarantine regulations, pest surveillance in phytosanitary systems, pest diagnostics in phytosanitary systems, export controls, technologies and innovations in phytosanitary systems, communication, governance and legal systems in phytosanitary systems and emerging phytosanitary issues. I urge you to come up with practical solutions to tackle these problems.

I am glad to note that we have representatives from the International Plant Protection Convention (IPPC), the World Trade Organization and the National Plant Protection Organizations of Africa and the world at the conference, hence we have a rich representation at this gathering. Discussions will provide an opportunity for African National Plant Protection Organizations (NPPOs) to share achievements and challenges, provide the NPPOs with opportunities to create linkages and promote market access within Africa and international levels. These are worthy objectives for this conference.

Once again, welcome to Kenya and I wish you fruitful deliberations.

Dr. Richard Lesiyampe
Principal Secretary, State Department of Agriculture

6. REMARKS BY MR. WYCLIFFE O. MURWAYI, CHAIRPERSON, BOARD OF DIRECTORS, KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)

It is my pleasure to welcome you to KEPHIS for the first International Phytosanitary Conference where over 100 delegates from close to 40 countries are in attendance. The conference is in line with the Organization's mandate of facilitating trade in the agricultural sector.

Kenya's and many African countries economies have continued to rely on agriculture which contributes the largest to the Gross Domestic Product (GDP) and employment. The sector is also a major driver in both domestic and local trade hence important in providing incomes for farmers and forex earnings for the country. This scenario is replicated by many African and developing countries. During the year 2015, the country made in-roads in ensuring markets for our horticultural produce were sustained and the Organization has continued to spear head penetration into newer ones. Results are there for all to see with KES 220 billion valued export earnings from tea and horticulture realized for the year 2015.

Capacity building and awareness on new issues is one of the key objectives of the Corporation and this conference is being held in line with that. In view of this, the Corporation continues to invest in technology to facilitate trade; some of the presentations during the conference will focus on sharing experiences in using these technologies. Efforts have been made to ensure more exporters are using the KEPHIS Electronic Certification System (ECS). The Corporation also launched the Plant Import Quarantine and Regulatory system which will facilitate online application of the processing of Plant Import Permits. We all agree that modernizing our operations is the way to go and I urge delegates to discuss on how best we can use technology to solve market access challenges.

On behalf of the KEPHIS Board, I take this opportunity to welcome you all to KEPHIS and thank you all for making time to this important international conference.

Wycliffe O. Murwayi
Chairman, Board of Directors
Kenya Plant Health Inspectorate Service (KEPHIS)

7. REMARKS DR. ESTHER KIMANI, MANAGING DIRECTOR, KENYA PLANT HEALTH INSPECTORATE SERVICE (KEPHIS)

Kenya Plant Health Inspectorate Service (KEPHIS) welcomes all delegates to the first ever International Phytosanitary Conference here at KEPHIS headquarters. We are extremely honoured to have you all here where for the next one week we will deliberate on pertinent phytosanitary matters.

As Kenya's National Plant Protection Organization, our mandate is to assure the quality of agricultural inputs and produce to promote national growth and development. Indeed, our vision is *The Lead Regulator and Facilitator of Globally Competitive Agriculture* while our Mission is *To Provide a Science Based Regulatory Service by Assuring the Quality of Agricultural Inputs and Produce to Promote Food Security and Sustainable development.* Kenya is able to undertake its operations as per the set international standards, rules and regulations. This has been possible because the country has joined/acceded to and is a member of international bodies/organizations such as:

- International Plant Protection Convention (IPPC)
- Convention on Biological Diversity (CBD)
- World Trade Organization (WTO)
- Organization for Economic Cooperation and Development (OECD) – Seed Schemes, Fruits and Vegetables Scheme & Forest Scheme
- International Seed Testing Association (ISTA)
- International Union for the Protection of New Varieties of Plant (UPOV)

KEPHIS is the host of Centre of Phytosanitary Excellence (COPE) which aims at building capacity on sanitary and phytosanitary (SPS) for National Plant Protection Organizations, other government agencies and private sector from within and outside Kenya.

The execution of our mandate has not been without its challenges and I am glad that we will deliberate on them for the next one week and that we will come up with the way forward to further the trade of plant and plant materials and to come up with solutions to managing pests and diseases.

Once again, welcome to Kenya and to KEPHIS and I wish you a fruit one week stay.

Dr. Esther Kimani
Managing Director, Kenya Plant Health Inspectorate Service (KEPHIS)

8. PROGRAM

Sunday, 11th September 2016		
Arrival of participants at KEPHIS Headquarters, Karen, Nairobi		IPC secretariat
Day One: Monday, 12th September 2016		
8.30 a.m.	Registration	IPC secretariat
9.00 a.m.	**Official Opening Session**	
	Ongoing entertainment	Kayamba roots and traditional dancers
	Guests	Tour of exhibition area and the Analytical Chemistry Laboratory
	Chief Guest & other guests	plants commemorative tree
	▪ All guests are seated in the Conference Hall/Tents ▪ One song from Kayamba Roots	
	Introductions and Welcome	Chairperson / Managing Director, KEPHIS
	Remarks	Principal Secretary, State Department of Agriculture
	Remarks	Ambassador, EU Delegation in Kenya
	Remarks	Mission Director, USAID/Kenya and East Africa
	Remarks	Principal Secretary, State Department of Trade
	Remarks	Principal Secretary, Foreign Affairs
	Remarks	Cabinet Secretary, Ministry of Agriculture, Livestock and Fisheries
	Official opening	Deputy President
	Group Photograph	ALL
	Media briefing	CS, MOALF and MD, KEPHIS
12.30 p.m.	**Lunch break**	
Session 1: Import control and Quarantine Regulations Chair: Dr. Roger Day, CABI		
1.30 p.m.	**Key note address:** The initiative to declare 2020 as the International Year of Plant Health: Impacts and opportunities for authorities, private enterprises and phytosanitary research	Ralf Lopian, Finland NPPO
2.00 p.m.	Import controls and quarantine regulations in Ghana	Jennifer Addo, Plant quarantine Ghana
2:15 p.m.	Enhancing plant biosecurity in Zambia: imminent threats from plant pests	Dr. Msiska K., Ministry of Agriculture Zambia
2.30 p.m.	Phytosanitary Concern in International Movement of Sea Containers	James Wahome KEPHIS Kenya
2:45 p.m.	National seed certification standards as phytosanitary risk and technical barriers to international seed trade: case in Kenya	Ephraim Wachira KEPHIS Kenya
3.00 p.m.	Monitoring of Imported Seaweed (*Kappaphycus Alvarezii*) in Kwale County in Kenya	Thomas Kosiom KEPHIS Kenya
3.15 p.m.	Seed certification as a means of curbing emerging diseases: a case study of maize lethal necrosis disease in Kenya	Peter Shango, KEPHIS Kenya
3.30 p.m.	Tea Break	
4.00 p.m.	Country phytosanitary status	Countries present
4.30 p.m.	Plenary discussions	Chair of session
5.00 p.m.	***End of Day's Program***	
6.30 p.m.	COCKTAIL – KEPHIS HQ	
Day Two: Tuesday, 13th September 2016		
Special section on Challenges to international exchange of germplasm Chair: Zambia NPPO		
8.15 a.m.	Introduction to session theme	Dr. P Lava Kumar and Dr. Charity Mutegi (IITA)

8.30 a.m.	Managing sanitary barriers to trade: Controlling aflatoxin producing *Aspergillus flavus* S-strain in lower Eastern using atoxigenic A. flavus L-strain (Aflasafe KE01)	Dr. Asha Bakari Mohamed (IITA)
8.50 a.m.	Emerging phytosanitary challenges to international exchange of germplasm	Dr. P Lava Kumar (IITA)
9.10 a.m.	Phytosanitary challenges in tree germplasm exchanges within and among East African countries	Dr. J. Njuguna (KEFRI)
9.30 a.m.	Safe movement of food and forage crops germplasm at ICARDA	Dr. SG Kumari (ICARDA)
9.50 a.m.	Policy gaps in restricting transboundary movement of pests through plant germplasm exchange	Dr. RK Khetarpal (CABI)
10.20 a.m.	Role of Kenyan NPPO in Germplasm exchange and Distribution	George Ngundo KEPHIS Kenya
10.30 a.m.	General discussion	
10.45 a.m.	**Tea Break**	
Session 2: Pest Surveillance in Phytosanitary Systems		
11.00 a.m.	**Key note address**: Pest surveillance in phytosanitary systems	Ms. Marjan Folkers, Netherlands
11.30 a.m.	Oriental fruit fly pilot suppression study in Botswana	Keabetswe Ntlogelang Division of plant protection Gaborone, Botswana
11.45 a.m.	Towards the creation of a pest free area in Chemurgui area in EMC	George Momanyi KEPHIS Kenya
12.00 p.m.	Surveillance to establish the fruit fly pest status in Zimbabwe.	Jeremiah Masoka Ministry of Agriculture Zimbabwe
12.15 p.m.	Pest surveillance and pesticide risk reduction - the role of Plantwise, an interactive system for agricultural advisory service	Dr. Lorna Migiro & Dr. Washington Otieno, CABI Kenya
12.30 p.m.	Presence and Distribution of Tuta absoluta (Meyrick 1917) (Lepidoptera: Gelechiidae) Affecting Tomato Plants in Rwanda	B. Uzayisenga, Rwanda
12.45 p.m.	Country phytosanitary status	Countries present
1.00 p.m.	Plenary discussions	Chair of session
1.30 p.m.	Lunch break	
Session 3: Pest diagnostics in phytosanitary systems (Chair: Ghana NPPO)		
2.30 p.m.	**Key note**: Pest diagnostics in phytosanitary systems	Prof. James Muthomi University of Nairobi
3.00 p.m.	Challenges in diagnostic system NPPOs in Africa; a case study of KEPHIS as NPPO in Kenya	Dr. Isaac Macharia KEPHIS Kenya
3.15 p.m.	The importance of diagnostics in phytosanitary systems. A perspective from the private sector	Marcos Amato, agdia-biofords.com, France
3.30 p.m.	Adopting loop-mediated isothermal amplification (LAMP) as a diagnostic tool in support of passion fruit nursery certification	Florence Munguti, KEPHIS, Kenya
3.45 p.m.	DNA barcoding a new molecular tool for identification of insect pest and virus vectors in phytosanitary system	Dr. Isaac Macharia KEPHIS Kenya
4.00 p.m.	Tea break	
4.15 p.m.	Evaluation of reaction of imported potato germplasms (potato seeds) to late blight under field conditions in Kenya	Loise Kamuyu, UoN, Kenya
4.30 p.m.	Use of next generation sequencing to identify viruses associated with passionfruit woodiness disease in Kenya	Florence Munguti, KEPHIS, Kenya
4.45 p.m.	Occurrence of potato virus Y (PVY) in major potato cultivars in Kenya	Onditi, J. O, Nyongesa W.M and van der Vlugt, R.A.A (KALRO Tigoni, Kenya)
5.00 p.m.	Country phytosanitary status	Countries present
5.15 p.m.	Plenary discussions	Plenary discussion
5.30 p.m.	***End of Day's Program***	

Day Three: Wednesday, 14th September 2016		
Session 4: Export control in phytosanitary systems (Chair: Dr. Lava Kumar, IITA)		
8.30 a.m.	**Key note address:** Phytosanitary regulation in international trade	**Dr. Roger Day**
9.00 a.m.	Devitalisation of Cut Rose (*Rosa hybrida* L.) Flowers cv. 'Bellerose': Effects of Glyphogan® and Roundup® on Propagation Ability and Vaselife	Hilda Miranyi, KEPHIS, Kenya
9.15 a.m.	Measuring the trade effect of wood packaging standards on African exports: the case of ISPM 15	Prof. Luca Tasciotti, *Institute for Social Studies, Erasmus University Rotterdam,* Netherlands
9.30 am	Implementation of ISPM 15 in Kenya	Faith Ndunge KEPHIS Kenya
9.45 a.m	The role of agricultural trade logistic providers in phytosanitary compliance	Josiah Syanda KEPHIS Kenya
10.00 am	Towards Harmonized Potato Certification Standards in the Eastern African Region: What are the Options?	Simon Maina KEPHIS Kenya
10.15 am	Emerging Challenges In Meeting Export Market Requirements In The Fruits And Vegetable Sector, Experience Of A Phytosanitary Inspector, Uganda	Brenda Kisingiri, Uganda
10.30 am	Plenary discussions	Chair of session
11.00 a.m.	**Tea Break**	
Session 5: Technologies and Innovation in Phytosanitary Systems		
11.15 am	Bio-efficacy of some natural plants on the oil palm leaf miner *Coelaenomenodera lameensis* berti and mariau (coleoptera: chrysomelidae)	Raymonda Johnson, Sierra Leon
11.30 am	ICT4 Plant Health- a new frontier for Early Warning Systems	Dr. MaryLucy Oronje, CABI
11.45 am	Worldwide overview of Ephyto application and (ephyto) for enhanced phytosanitary compliance in Kenya	Shane Sela IPPC & Josiah Syanda, KEPHIS, Kenya
12.00 pm	Traceability system	HCD
12.15 pm	Monsanto Technologies for crop protection	Monsanto
12.30 pm	Electronic solutions for agricultural systems	David Lawrence-Brown, MuddyBoots
12.45 p.m.	Plenary discussions	Chair of session
1.00 pm	Lunch break	
Session 6: Industry views on phytosanitary systems Chair: Jane Ngige		
1.45 pm	**Keynote** Industry views on phytosanitary systems	Sylvie Mamias, Secretary General, Union Fleurs, International Flower Trade Association, Brussels
2.15 pm	Insurance as a Mitigation Tool against Crop Diseases	Rahab Kariuki and Benjamin Njenga, Acre Africa
2.30 pm	The role of bio-pesticides in management of Phytosanitary challenges	Dr. Henry Wainwright, Real IPM Kenya
2.45 pm	Improving access to niche European market for fresh vegetables through reduction of phytosanitary and pesticide residue constraints	G. M. W. Lengai, University of Nairobi
2.55 pm	Capacity building in early warning systems to enhance market access for small holder cut-flower growers in Kenya: public-private sector collaboration	Patrick Chege, Farmer
3.10 pm	Status of seed potato supply systems and phytosanitary issues in Kenya	Mumia I. Bornventure, University of Nairobi
3.20 pm	Maize and phytosanitary concerns – an industry view	Monsanto
3.35 pm	Enhancing competitiveness of French beans in the export market by	A. M. Fulano, University of

	overcoming phytosanitary and quality challenges	Nairobi, Kenya
3.45pm	Role of bio pesticides in pest management, food safety and phytosanitary compliance	Allan Mweke, ICIPE
4.00 pm	Industry Viewpoints Towards International Phytosanitary Standards Compliance	Gerald Nyumu, Flamingo horticulture Kenya
4.15 pm	Pesticides and phytosanitary concerns	PCPB
4.30 p.m.	**Tea Break**	
4.45 p.m.	Plenary discussions	Chair of session
5.00 p.m.	End of Day's Program	
Thursday, 15th September 2016		
Session 7: Field Visit		
9.00 a.m.	Visit to Kakuzi, FPEAK, Vegpro (naivasha) and Oserian (Naivasha), Dudutech (Naivasha) and Selecta (Thika)	Hilda Miranyi, Mary Githinji, Faith Ndunge, Alfayo Ombuya, Pamela Kibwage, Bernard Odanga, George Momanyi, Asenath Koech, George Nchari
1.00 p.m.	**Lunch**	
2.00 p.m.	Continue with visit	Hilda Miranyi, Mary Githinji, Faith Ndunge, Alfayo Ombuya, Pamela Kibwage, Bernard Odanga, George Momanyi, Asenath Koech, George Nchari
4.00 pm	Travel back to Nairobi	IPC 2016 Secretariat
6.30 p.m.	Official Dinner – DARI, Karen, Nairobi	IPC 2016 Secretariat
9.30 pm	End of Day's Program	
Day Five: Friday, 16th September 2016		
Session 8: Emerging Phytosanitary Issues, capacity building and communication Chair: Sierra Leon NPPO		
8.30 a.m.	**Keynote address:** Countering emerging crop pest risks in Africa for food security and export trade	**Dr. Julian Smith, FERA, UK**
9.00 a.m.	Capacity building under STDF for phytosanitary challenges	Dr. Roshan Khan, WTO-STDF
9.15 a.m.	Regional SPS frameworks: is Africa done enough?	Dr. Andrew Edewa, EU SMAP
9.30 am	Technical Assistance and Implementation of Sanitary and Phytosanitary Standards: Towards market compliant horticultural exports	Kigamwa J.N, KEPHIS, Kenya
9.45 am	Maize lethal necrosis disease: pest surveillance report from Zambia	Mable Mudenda, ZARI, Zambia
10.00 a.m	Overview of MLND in Kenya by KARLO with a view of prevalence of Maize Lethal Necrosis Disease in major maize seed production areas in Kenya	Dr. Anne Wangai, KARLO, Kenya & Joyce Waithera, KEPHIS, Kenya
10.15 a.m	**Tea Break**	
10.30 a.m.	First report of *Tuta absoluta* in Zambia	Abass M., ZARI, Zambia
10.45 a.m.	Incidence and Prevalence of Potato Cyst Nematode in major potato growing regions of Kenya	George Ngundo, KEPHIS, Kenya
11.00 am	Potato cyst nematodes *Globodera rostochiensis* in Kenya: The Way Forward.	Dr. G.M. Kariuki, Kenyatta University
11.15 am	Phytosanitary Control of genetically modified crops – Kenyan experience	Abed Kagundu, AATF
11.30 am	Plenary discussions	Chair of session
Closing Session		
11.45 am	Conference Evaluation	IPC secretariat
11.55 am	Way Forward and Next steps (publishing, date of next conference)	GMPS-KEPHIS

12.15 pm	Closing remarks	MD KEPHIS
12.30 p.m.	**Lunch Break** & End of Day's Program	
2.00 p.m.	Visit the Nairobi National Park (optional)	
Saturday, 17th September 2016		
8.00 a.m.	Departure	

8.1 Posters session

No.	Title	Author
1.	Distribution of *bemisia tabaci* and other whitefly species in major horticultural production areas in Kenya	Dr. Isaac Macharia and George Momanyi, KEPHIS
2.	Efficacy and safety of *Fusarium oxysporum,* a biological control agent of witchweed *Striga hermonthica* in maize in western Kenya	Edith Avedi, KEPHIS
3.	Emerging challenges and market requirements	Lucy Ngatia, KEPHIS
4.	Import control to prevent introduction and spread of quarantine pests	Tefania Nikuze, KEPHIS
5.	Incidence of passion fruit woodiness disease in passion fruit nurseries in central Kenya and Nairobi region	G. Momanyi, KEPHIS
6.	Promoting better rice yields through improvement of rice seed system in Kenya.	Yvonne Mutinda, UoN
7.	Status of the false codling moth (*Thaumatotibia leucotreta*) in avocado production farms in Kandara area of Muranga County	G. Momanyi, KEPHIS
8.	Strategies for the management of banana nematodes and evaluation of factors determining their diversity and structure in Embu county	Augustus Kivi, KEPHIS
9.	Promoting availability of Quality Seed Potato through innovative seed delivery strategies	Moses Nyongesa, KALRO
10.	Empowering children on phytosanitary measures and management of pest through children science center Kenya	Ken Monjero, KALRO
11.	Countries collaborate to break SPS related barriers to facilitate trade in the COMESA Region	Florence Chege,CABI
12.	Strengthening the Phytosanitary Capacity of the Floriculture Sector in Uganda	Florence Chege, CABI
13.	Survival of viruses causing Maize lethal necrosis disease in crop debris and soil	Rose Kemunto Nyakundi, CropNut
14.	Barcoding of Thrips in tomato production	Isaac Macharia, KEPHIS

8.2 Keynote speakers

Ralf Lopian
Ministry of Agriculture and Forestry of Finland

Key note speaker: The initiative to declare 2020 as the International Year of Plant Health: Impacts and opportunities for authorities, private enterprises and phytosanitary research

Mr Ralf Lopian holds a degree as an Agricultural Engineer. He has held various positions with the Plant Pathology Department at the University of Helsinki, the National Plant Protection Service of Finland and the Secretariats of the European and Mediterranean Plant Protection Organization and the International Plant Protection Convention. Mr Ralf Lopian joined the Ministry of Agriculture and Forestry of Finland in 1994 and was head of its Plant Protection Section until 2001. Since 2001 he has taken on the responsibilities for the coordination of international affairs in phytosanitary matters of his ministry. In addition, he was the chairman of the Interim Commission on Phytosanitary Measures of the IPPC as well as its vice-chair for several election periods. Mr Ralf Lopian is also a member of the Council of EPPO as well as a long-serving Finnish representative to the IPPC and the SPS Committee. Mr Lopian is leading international efforts to declare the year 2020 as the International Year of Plant Health.

Dr P Lava Kumar
Head, Germplasm Health Unit/Virologist
International Institute of Tropical Agriculture (IITA), Nigeria

Key convenor, Special Session on challenges to germplasm exchange

He obtained in 2000 PhD in virology from Sri Venkateswara University, India. He joined IITA in 2007 and his work is focused on characterization, diagnosis, surveillance and control of plant viruses affecting important food staple crops such as cassava, yam, maize, soybean, cowpea, banana, in sub-Saharan Africa. His is also involved in the production of disease-free planting materials, surveillance of invasive transboundary pathogens, and development of diagnostic tools, dissemination of technology and capacity development through training courses and workshops in plant disease diagnostics and control, including supervision of MSc and PhD students. On-going research projects are on epidemiology and management of banana bunchy top disease, viruses of yam and cassava, maize lethal necrosis and others. He has also worked as a Scientist (virology) at ICRISAT, Patancheru, India.

Ms. Marjan Folkers Senior officer International Phytosanitary Affairs The Netherlands National Plant Protection Organisation (NPPO) **Keynote Speaker: Pest surveillance in phytosanitary systems** Has graduated from Wageningen University and has a Master of Science degree in Plant Pathology. She started her career as a policy advisor at the Dutch Association for the Seed Industry and Plant Breeding and later on at the Dutch Farmers' Union. In 2003, she became senior officer International Phytosanitary Affairs at the NPPO of the Netherlands and is now a specialist in phytosanitary policy for both import and export issues. Ms. Folkers has a long standing experience in bilateral co-operation on phytosanitary issues with several countries, including African countries. She also acts as a specialist on Plant Health in EU working groups.	
Prof. James W. Muthomi Department of Plant Science and Crop Protection, Faculty of Agriculture, University of Nairobi **Key note Speaker: Pest diagnostics in phytosanitary systems** He is an Associate Professor of Plant Pathology in the Department of Plant Science and Crop Protection, University of Nairobi, Kenya. He has 23 years research and teaching experience at the University of Nairobi and agricultural extension with the Ministry of Agriculture. His research interests include management of mycotoxins in cereals, legume diseases and plant disease management. He has attracted research funding and successfully managed 15 research projects in the field of crop protection and plant disease management. He has published over 55 papers in international peer reviewed scientific journals and in over 57 papers in conference proceedings. He has supervised over 40 Masters and five Ph.D students in the field of agriculture. Currently, Prof. Muthomi is the head of Crop Protection section in the Department of Plant Science and Crop Protection, has chaired various committees in the Faculty of Agriculture, coordinator of Open and Distance Learning for MSc Crop Protection and championed development of curricula in Crop Protection, Phytosanitary Measures and Seed Technology.	
Dr. Roger Day SPS Coordinator CABI, Kenya **Keynote Speaker**: Phytosanitary regulation in international trade Roger's career in tropical agriculture began in East Malaysia, where he did PhD research on the cocoa pod borer. After post-docs with Imperial College, London, for over 20 years he lived in Kenya working for CAB International. His experience covers research, development and capacity building in CABI's three themes: Invasive Species, Trade & Commodities, and Development, Communication & Extension. In recent years he has worked particularly in SPS and biosecurity capacity development, and he is now CABI's SPS coordinator.	

Sylvie Mamias
Secretary General
Union Fleurs, The International Flower Trade Association

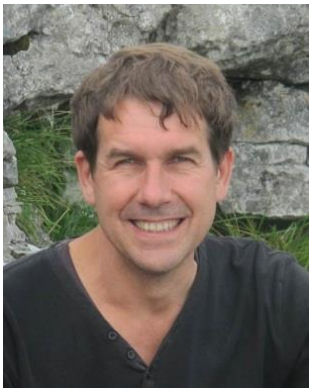
Keynote Speaker: Industry views on phytosanitary systems

Sylvie Mamias heads the office of Union Fleurs, as Secretary General since 2011. She manages the association, coordinates its various activities and liaises with its network of international members; engages in advocacy and lobbying activities in Brussels and beyond to promote and defend the various sizeable interests of private operators involved in the international floriculture trade. Specialised in European affairs and agri-trade law & economics, Sylvie Mamias has over ten years of first-hand expertise in the EU approach to international trade, preferential trade schemes, agri-food and SPS issues. Working since 2003 for the international floriculture sector and for other agri-trade business organisations in Brussels, she has extensive experience in monitoring, analysing and disseminating complex regulatory developments in the field of agri-trade matters at EU and international levels. Sylvie Mamias is a graduate of the Institut d'Etudes Politiques, in France, where she studied law, economics and international relations; she holds a MA in European Studies from the University of Birmingham (UK) and graduate certificates in European Law from the Friedrich-Schiller-Universität in Jena (Germany) and in Agriculture, Development & International Trade from the World Trade Institute in Bern (Switzerland). **Union Fleurs – International Flower Trade Association** is the international umbrella organization representing and promoting the worldwide interests of national associations and companies active in the floricultural trade (cut flowers, foliage and pot plants); it gathers over 3000 companies active in the trade of cut flowers and pot plants worldwide; that account for more than 80% of the total value of the worldwide trade.

Dr. Julian Smith
FERA Science Ltd, UK
Lead, International Partnership

Keynote Speaker: Countering emerging crop pest risks in Africa for food security and export trade

Julian Smith has 20 years' experience in agriculture, focused on developing countries, and in forging partnerships in crop health between north and south institutions. Trained as a plant bacteriologist and molecular biologist, he has worked with crops as varied as potato, banana, coconut and cassava, and in countries of East Africa, South America and Asia. He has particular interest in promoting investment with developing countries in addressing the threat of crop pest and disease epidemics and building early outbreak response capabilities (that build towards a one-world outcome for food security). Julian works for Fera Science Ltd, UK a lead organization for sustainable agriculture and food safety, which works with governments, academia and industry across the food chain. Fera is the main evidence provider to the UK government on agriculture and retains one the largest critical mass of agricultural and regulatory expertise in the UK. At Fera Julian has primary responsibility for development and oversight of Fera's activity in overseas countries, notably in Africa and Middle East, and in areas of plant health. In his early career Julian did his PhD at Aberystwyth University and worked with CAB international.



9. ABSTRACTS

The initiative to declare 2020 as the International Year of Plant Health: Impacts and opportunities for authorities, private enterprises and phytosanitary research

Ralf Lopian

Ministry of Agriculture and Forestry of Finland
Email: Ralf.Lopian@mmm.fi

Plant health is usually considered the discipline that uses a range of measures to control and prevent pests, weeds and disease causing organisms to spread into new areas, especially through human interaction such as international trade. The vast increase in the international trade of agricultural commodities as well as the effects of climate change epitomizes a dramatic increase in the risk of pest introductions and presents formidable new challenges to plant health. To address these concerns Finland officially requested FAO to pursue the declaration of an International Year of Plant Health in the year 2020 (IYPH). The IYPH is intended to raise the awareness of the importance and impacts of plant health in addressing issues of global importance, including hunger, poverty, threats to the environment and economic development. It especially aims at addressing new plant health challenges, such as climate change impacts, significant increase in international trade and the rapid deterioration of biological diversity by developing more efficient national, regional and global policies, structures and mechanisms. The observance of an IYPH will have profound impacts on the linkages between national plant health authorities and academia, research institutions and other professional stakeholders. Private – public partnerships on national, regional and global levels will proliferate leading to a greater reflection of plant health issues in national educational curricula. Ideally it would also lead to greater stakeholder involvement in the development of plant health policies and their integration into phytosanitary actions. It is anticipated that the observance of the IYPY will lead to better trade opportunities. More plant health related research activities are needed to address new challenges in plant health. It is wished that the decline in plant health research of the past years is turned around and that the IYPH will cause improved national, regional and international research coordination and a stronger prominence of plant health related research projects in national research budgets.

Pest surveillance in phytosanitary systems

Marjan Folkers

NPPO Netherlands
Email: m.j.folkers@nvwa.nl

National Plant Protection Organizations are responsible for the surveillance of plants. It is an obligation within IPPC for NPPO's to collect data on pest occurrences, within the purpose of reporting the occurrence, outbreak and spread of pests. It follows from the basic principles of IPPC on transparency, technical justification, non-discrimination, etc. At the same time it will be explained how NPPO's can benefit from knowledge on the presence and spread of pests in their country. Pest surveillance is an important tool to create awareness to local farmers and to develop domestic control systems to protect agriculture and to ensure food security. It will help NPPO's to eradicate new introductions of pests in time. Official reports on confirmed absence of pests will help NPPO's to justify import requirements. And to be able to export agricultural products with the correct phytosanitary guarantees for the country of final destination, it is necessary to have official reports on the spread of pests in the country. As such, the surveillance system will contribute to the increase of export possibilities. The national economy will benefit as such from the efforts of NPPO's to keep records on pest occurrences or absences. Examples will be given to illustrate how the surveillance programme will contribute to the development of a sound phytosanitary system, and why you need to conduct surveys in your own interest. The presentation will include information on the IPPC standards that are relevant in this respect. A detailed Surveillance Program Design will be outlined step by step on the base of the very helpful guidelines developed by the Australian NPPO. The Netherlands surveillance plan will be used to show how it can work in practice, but also practical suggestions will be given to conduct surveys even with limited resources.

Pest diagnostics in phytosanitary systems

James Muthomi

Department of Plant Science and Crop Protection, University of Nairobi, Kenya
E-mail: james_wanjohi@yahoo.com; james.muthomi@uonbi.ac.ke

Implementation of phytosanitary measures requires proper diagnosis of crop pests. Diagnosis is the basis of decision making in designing pest management strategies through timely detection and response to prevent introduction and spread of pests. Accurate diagnosis involves knowledge of the host crops, the pest, and the environmental factors that impact on the host plant. This requires accurate knowledge of the symptoms, signs and damage caused by the pest, as well as the cultural practices. Further laboratory tests are required for difficult cases. Therefore, a fully functional diagnostic system depends on the availability of trained human capacity, well equipped and accredited laboratories and resources. However, in many African countries the main challenge facing the functioning of diagnostic services include limited infrastructure, limited human capacity; few or non-existent reference laboratories, weak or lack of relevant institutional and national policies to guide diagnostic services. This calls for creation of national, regional and international diagnostic networks and collaboration among government agencies in order to enhance the diagnostic capacity in African countries.

Key Words: Diagnosis, pests, phytosanitary systems, pest detection, pest surveillance

Phytosanitary Regulation in International Trade

Roger Day

CABI, Canary Bird, 673 Limuru Road, Muthaiga, PO Box 633-00621, Nairobi, Kenya

Email: r.day@cabi.org

The International Plant Protection Convention (IPPC) aims to prevent the spread and introduction of plant pests and to promote appropriate measures for their control. The World Trade Organisation's Agreement on the Application of Sanitary and Phytosanitary Measures names the IPPC as the body responsible for setting international phytosanitary standards. But the primary aim of the SPS agreement is to prevent phytosanitary regulation unjustifiably restricting trade. As a result, phytosanitary capacity development in developing countries is often associated more with gaining and maintaining market access, than with protecting plant resources from new pests. However, phytosanitary capacity to support trade can also be deployed to manage biosecurity risks, so meeting phytosanitary requirements for export agriculture is a useful entry point. According to the IPPC's definition, national phytosanitary capacity has elements at individual, organisational and system levels. Some experiences of capacity development are described for each of these levels, and suggestions made on possible areas for further phytosanitary capacity development in Africa. These areas include risk based approaches to regulation; regulation of biological control agents and beneficial organisms; phytosanitary regulation in the context of trade facilitation. In each case improved regulation can benefit a country's trade as well as its biosecurity, contributing to food security and economic development.

Countering emerging crop pest risks in Africa for food security and export trade

Julian Smith

Fera Science Ltd UK.

Email: Julian.Smith@fera.co.uk

Africa is beset by a track record of big pests and diseases. Diseases, such as Banana Xanthomonas Wilt, Maize Lethal Necrosis Disease, Cassava Brown Streak Disease and Coconut Lethal Yellow Disease, have had catastrophic consequences. Whereas, pests, such as fruit fly and false codling moth, have also been significant with export opportunities. A common factor to these 'big' pests and diseases has been their 'small' origins; either as new entry events or acquisition of new capabilities that evade control. Increasingly the need for early intervention in mitigating emerging pest risks is recognized, yet the capability to transform words into timely action remains with substantial challenges. Whilst, in the face of climate change, increased globalization of trade and the intensification of agricultural practices, the possibility of such future events remains high, investment in African agriculture runs with significant risk. In this presentation I will discuss some of the underlying challenges and opportunities for mitigating risks from emerging crop pests that, unless addressed, will continue to undermine the potential of African agriculture and related sectors.

9.1 Session 1: Import control and Quarantine Regulations

Import Controls and Quarantine Regulations in Ghana

Ebenezer Aboagye and **Jennifer Addo**
Plant Protection and Regulatory Services Directorate, Ghana

Plant Protection and Regulatory Services Directorate of the Ministry of Food and Agriculture is the National Plant Protection Organization (NPPO) of Ghana. The NPPO has national legislative laws that provide the legal basis to prevent the introduction and spread of harmful pest and management of introduced plant pest. The organization is also mandated to regulate the import and facilitate the export of plants, plant products and regulated articles. Ghana imports partially processed and fresh commodities such as fresh fruits and vegetables, polished rice, and wheat/flour. Planting materials including cuttings, seeds, bulb, in vitro banana plantlets, seedlings, mango scions, potted plants, bud wood and among other planting materials are also imported to be planted. During importations, the registered importers are required to apply to NPPO for an import permit at least seven (7) days before the importation of plants, plant products and regulated articles. Pest Risk Analysis is conducted to determine the likelihood of establishment and consequence potentials of pest associated with these commodities if introduced into the country. Upon importation, the commodity shall undergo the procedure for inspections of plants, plant products and regulated articles which include document verification, product conformity, identity of plants, plant products and regulated articles checking and phytosanitary inspection. Although there are challenges associated with the importation of plants, plant products and regulated articles that pose risk to agriculture in Ghana, mitigation measures are put in place to reduce risks to acceptable levels. Ghana has committed financial and equipment resources for pest identification and surveillance, risk-based inspection and phytosanitary certification thereby ensuring phytosanitary requirements are adhered to.

Keywords: Pest, Import, Export, Risk, Likelihood, Consequence, Phytosanitary, Mitigation, Surveillance.

Enhancing plant biosecurity in Zambia: imminent threats from plant pests

[1]Msiska K.K, **[1]Lupapula M.**

Presenter: marian.lmwanza@gmail.com.

[1]Zambia Agriculture Research Institute, Plant Quarantine and Phytosanitary Service P/B 7, Chilanga, Zambia

A strengthened plant biosecurity system is vital for Zambia. Such a system has potential to save the agriculture industry and economy huge cost sums in the event of introduction of quarantine pests such as the Maize Lethal Necrosis (MLN) Disease. Maize is a staple food and source of livelihood for a large part of the Zambian population. MLN can cause significant negative impact on food security as well as market access for exports of the crop. The Plant Quarantine and Phytosanitary Service (PQPS), which is the Zambian National Plant Protection Organization (NPPO) has embarked on strengthening its plant biosecurity capacity at, border and post border frontiers. In its approach, PQPS through its development partners has identified capacity building and sensitization as essential. Furthermore, the NPPO has prioritized information gathering of plant pests through targeted pest surveillance. . This information is a useful database which will support the NPPO to revise Zambia's phytosanitary import requirements. The results are tangible, PQPS has facilitated professional training of all its 33 Plant Health Inspectors (PHIs) in plant health. Staff from other border agencies has also been trained in plant health to enhance biosecurity at borders. A pest database has been created in order to determine high risk routes and entry points. Standard operating procedures and import requirements have also been reviewed. The private sector as key players has been engaged at different levels to enhance phytosanitary compliance. Media sensitization campaigns have been conducted to disseminate information to farmers, general public, traders, border agencies and other partners in plant biosecurity.

Key words: Plant biosecurity, imminent pests, food security, market access, surveillance, capacity building, sensitization, risk analysis

Phytosanitary Concern in International Movement of Sea Containers

James Wahome, I. Macharia, T. Kosiom & F. Koome

Kenya Plant Health Inspectorate Service (KEPHIS)

P.O. Box 49592-00100, Nairobi, Kenya

Email: jwahome@kephis.org

Sea containers in the form of 20- and 40-foot intermodal freight or shipping containers, play an increasingly important role in the transport of internationally traded goods. Container flows are complex and may involve multiple border crossings, handover of control and transport modes. The volumes of these containers have been increasing at an unprecedented rate due to the increasing preference of containers to transfer internationally traded goods and moving personal effects. This is evident by the number of TEU received at the port of Mombasa which last year reached one million annually However, there is substantial evidence that sea containers represent a significant pathway for the potential entry of pests, as insects, snails, other invertebrates and vertebrates may contaminate containers during storage or packing. Micro-organisms, seeds and other plant parts and plant debris may be present in contaminating soil, birds' excrement on or inside containers. It also offers an opportunity for quarantine pests to multiply during transit. Sea containers are therefore a well-recognized pathway for a wide range of species that present a biosecurity risk to productive sectors and natural ecosystems. Of concern to KEPHIS, are pests such as Khapra beetle (*Trogoderma granarium*), Asian Gypsy moth (*Lymantriadis parasiatica*), mollusks (Mollusca), weed seeds, and fruit fly larvae (Tephritidae), among other quarantine pests which may be introduced into the country through containers that are not normally targeted by the inspection protocol. The threat of these quarantine pests spread via the sea container pathway is really a great concern to Kenya. Majority of goods arrive in containers transported by sea, which constitute a pathway by which unwanted organisms can travel to Kenya. Nevertheless, there is need for appropriate strategies to ensure inspection of empty containers since they have been reported as carriers of quarantine pests and other hikers. The proposed International Standard for Phytosanitary Measures "Minimizing Pest Movement by Sea Containers" is likely to provide economic net benefits as a result of avoided "damages" caused by invasive species that are moved with sea containers.

Key words: Sea containers, Quarantine pests, Trade, movement, standards

National Seed Certification Standards as Phytosanitary Risk and Technical Barriers to International Seed Trade: The Case of Kenya

Ephraim Wachira[1] and Charles Owino[1]

[1]Kenya Plant Health Inspectorate Service (KEPHIS)

Email: ewachira@kephis.org

Seed is an important input for improving agricultural productivity and ensuring food security in any arable agricultural system. Because of this significant role of seed in agriculture, seed trade is a billion dollar industry worldwide. International seed trade is important in the transfer of new technology especially to developing economies. Kenya exported seed worth 9 million dollars in the year 2012 and imported seed worth 25 million dollars. If not regulated well, international seed trade is an easy pathway for movement of pests among countries which may lead to global food insecurity. The role of seed in dispersing pests and the resulting disasters has been documented. Seed certification assures seed quality standards, including freedom from seed borne diseases. There are various international organizations that regulate seed trade. However, not all countries are members of these organizations and there is need for common global approach to sanitary and phytosanitary measures in international seed trade. In Kenya importation of seed is regulated by KEPHIS through the Seed and Plant Varieties Act CAP 326 and the Plant Protection Act CAP 324. The IPPC through the ISPM on the International Movement of Seeds is currently in the consultation stage with a view of providing inclusive guidelines on sanitary and phytosanitary measures to be taken to minimize phytosanitary risks in seed trade. The IPPC provides for regulation against quarantine pests and regulated non-quarantine pests with seeds imported into the country being required to be free from quarantine seed borne diseases and be treated with appropriate seed dressing. With rapid advances in science, it is necessary for NPPOs to adopt more sensitive and accurate pest detection and identification techniques. Countries should embrace harmonized certification standards and, build capacity in seed testing laboratory to be able to accurately diagnose seed borne diseases so as to reduce risk of disease spread among countries through international seed trade.

Key Words: Certification, Phytosanitary risk, Seed, Standards, Technical barrier, Trade

Monitoring of Imported Seaweed (*Kappaphycusalvarezii*) in Kwale County in Kenya

Kosiom T[1], Mbae C.[1], M. Kabole[1] and Macharia I[1]

[1]Kenya Plant Health Inspectorate Service (KEPHIS), P. O. Box 49592-00100, Nairobi, Kenya

Seaweed farming is viewed as a suitable form of aquaculture but suspected habitat alteration and invasiveness of the algae has led to limited utilization and introduction. Several species of seaweed such as *Eucheuma denticulatum* and *Kappaphycus alvarezii* have been introduced in various countries including Tanzania and Madagascar with various levels of success. The Kenya Marine and Fisheries Research Institute (KMFRI) sought permission to introduce *K. alvarezii* for seaweed farming in the Kenya coastal area in 2010. A risk assessment was conducted by Kenya Standing Technical Committee on Imports & Exports (KSTCIE) and Environmental Impact Assessment was undertaken before the seaweed was introduced in Kwale County, Kibuyuni site in 2011 under quarantine regulation. Monitoring of the sea weed was undertaken for 2 years jointly between Kenya Plant Health Inspectorate Service, KMFRI and the country government where the rate of establishment, invasiveness as well as it adaptability was recorded. During the monitoring period, it was observed that the seaweed was susceptible to fluctuations in environmental conditions which limited its establishment and invasiveness and hence it was concluded that the weed has no potential threat to marine environment. This was consistent with evaluation carried out in Tanzania and Madagascar where the seaweed farming is well established. However, since invasiveness can result with the change of environment condition further monitoring is required to fully confirm its invasiveness under Kenyan condition. Early detection of invasiveness and emergence response measures are required in case of invasiveness. There is also need to build capacity on seaweed monitoring due to the nature of the marine environment, and different seaweeds species in the ecosystem.

Key words: Seaweed, *invasive* species, monitoring, international trade

Seed certification as a means of curbing emerging diseases: A case study of Maize Lethal Necrosis Disease in Kenya

Peter Shango[1] and Charles Onyango Owino[1]

[1]KEPHIS

Email: pshango@kephis.org

Maize lethal necrosis disease (MLND) is an emerging constraint in maize production in sub-Sahara Africa that threatens food security and poses challenge in trade. It was first reported in Kenya in 2011 and has since spread to other countries in the region. The disease is caused by a combination of Sugarcane Mosaic Virus (SCMV) and Maize Chlorotic Mottle Virus (MCMV), which are transmitted by aphids and thrips as vectors, respectively. Maize is the main staple food in Kenya; hence the emergence of MLND necessitated establishment of mechanisms for combating the spread of the disease through seed. This resulted in the amendment of seed certification protocol which included testing of seed. In consultation with seed stakeholders, KEPHIS incorporated guidelines for MLND inspection in maize seed certification program where all maize seed crops are inspected three times including preliminary, first, second and third inspections. A seed sample is taken as per International Seed Testing Association (ISTA) Rules just before seed dressing for laboratory test to ascertain freedom from MLND. In KEPHIS Nakuru Molecular testing laboratory, 3% of submitted seed maize samples tested in 2015 using real time PCR were confirmed positive for MLND. In parallel, imported seeds are also sampled and tested for MLND before being accepted into the country. Furthermore, there have been concerted efforts by breeders and researchers to develop and screen maize lines for resistance to MLND. Amendments in seed certification program have led to drastic reduction of MLND. It is further hoped that resistant maize lines from the breeding program will further support the effort to manage the disease.

Keywords: Maize, Maize Chlorotic Mottle Virus, Maize Lethal Necrosis Disease, Sugarcane Mosaic Virus, Resistance, Screening, Vectors

9.2 Special section on Challenges to international exchange of germplasm

Managing sanitary barriers to trade: Controlling aflatoxin producing *Aspergillus flavus* S-strain in lower Eastern Kenya using atoxigenic *A. flavus* L-strain (Aflasafe KE01)

Asha Bakari Mohamed[1,2], **Charity Mutegi[2]**, Maina Wagacha[1] James Muthomi[1], Ranajit Bandyopadhyay[3], Peter J. Cotty[4]

[1]University of Nairobi, Nairobi, Kenya
[2]International Institute of Tropical Agriculture (IITA), Nairobi, Kenya
[3]IITA, PMB 5320, Oyo Road, Ibadan, Nigeria
[4]USDA, ARS, University of Arizona, Tucson, USA
E-mail: c.mutegi@cgiar.org

Aspergillus flavus S-strain has been implicated as the causative agent of lethal aflatoxicosis in lower Eastern Kenya producing copious amounts of aflatoxin B1 in maize. This study was carried out to determine the extent of *A. flavus* S-strain contamination of maize and its possible management through the use of atoxigenic *A. flavus* L-strain isolate (Aflasafe KE01). Maize grain samples were collected from Kitui, Makueni and Machakos Counties and *Aspergillus flavus* S-strain isolated by agar plate method. The ability of the isolated *A. flavus* S-strain isolates to produce aflatoxins was determined by inoculation on aflatoxin free maize incubated at 31℃ for seven days and toxins quantified by thin layer chromatography. Efficacy of atoxigenic *Aspergillus flavus* L-strain to manage aflatoxin production was determined by application of impregnated sorghum seeds in maize fields at seventh leaf growth stage and maize grains sampled at harvest. Maize samples had high levels (61.8%) of *A. flavus* S-strain than other *Aspergillus* species. The *A. flavus* S-strain isolates produced high levels of aflatoxin B1 of up to 22,000 ng/g in maize *in vitro*. However, field application of atoxigenic *A. flavus* L-strain competitively excluded the aflatoxin producing *A. flavus* S-strain by up to 77% and reduced aflatoxin level in the harvested maize grains by 47%. The study showed that Aflasafe KE01 is a promising biocontrol product in shifting the population of toxigenic strains of *Aspergillus* section *Flavi* and subsequently reducing aflatoxin levels in maize.

Keywords: aflatoxin, *Aspergillus flavus* S-strain, *A. flavus* L-strain (Aflasafe KE01)

Emerging phytosanitary challenges to international exchange of germplasm

P. Lava Kumar[1] and M. Abberton[1]

[1]International Institute of Tropical Agriculture (IITA), Oyo Road PMB 5320, Ibadan, Nigeria

E-mail: L.kumar@cgiar.org

Crop germplasm (landraces, wild relatives, breeder lines) is frequently exchanged as true seed or vegetative propagules between countries for use in agricultural research and also to enrich national and international germplasm repositories. This activity however has an inherent risk of introducing exotic and endemic pests and pathogens, particularly viruses, associated with the germplasm. Procedures, including methods for generating pest and pathogen-free germplasm and diagnostic for assessing germplasm health and certification have been established for safe international exchange of germplasm between countries. These procedures depend on knowledge of the occurrence of pathogens or pests in a given species and geographic region and availability of reliable diagnostic tools. Emerging knowledge shows the dynamic state of pests and pathogens, with increasing new reports of their occurrence in previously unreported geographies or hosts hitherto. In addition, the discovery of several new virus species or new strains of existing species from known as well as in new hosts, including in plants thought to be healthy, by next-generation sequencing technologies is exposing the limitations of current germplasm screening procedures in eliminating known and unknown risks. This scenario poses daunting challenges to international genebanks, like those of CGIAR centres that collect and conserves germplasm from countries around the world following the best phytosanitary procedures applicable at the time of conservation. The new scenarios cast doubt on the health status of germplasm held in the past and necessitate retesting to establish pest-free germplasm for conservation and distribution. This is not only an expensive process but delays germplasm distribution plans. This presentation outlines IITA perspectives on the strengths and limitations of current screening procedures for testing staple crop germplasm, especially banana, cassava, cowpea, maize, soybean and yam. It describes new challenges due to emerging knowledge of pest occurrence in these crops and outlines some solutions to overcome these challenges.

Keywords: germplasm, virus, screening procedures

Phytosanitary challenges in tree germplasm exchanges within and among East African countries

J. Njuguna[a], **A. Muchugi[b]**, W. Omondi[a] and Z. Kinyanjui[b].

[a]Kenya Forestry Research Institute (KEFRI), PO Box 20412 - 00200, Nairobi Kenya
[b]World Agroforestry Centre (ICRAF), PO Box 30677-00100 Nairobi Kenya
E-mail: a.muchugi@cgiar.org

The sale and distribution of tree germplasm have several challenges that limit adherence to laid out phytosanitary protocols generally observed in germplasm exchange. Unlike many annual crops, trees are mostly propagated using various plant parts such as buds (grafting scions) and cutting and the main material sold and distributed for planting are seedlings, rooted cuttings, marcotts or grafted propagules. These planting materials are generally raised by private nurseries and national tree seed centres across the eastern Africa from where they are purchased and transported to various locations within and across the eastern Africa countries. Without proper phytosanitary measures, these germplasm exchanges is a good medium of disease and pest distribution in the region. For example in Kenya the Blue Gum Chalcid (BGC) was spread from Western Kenya to the coastal region by one farmer in 2004. Major challenges to implementing phytosanitary regulations on tree germplasm exchange include; lack of tree seeds trade control, lack of tree seed/seedling quality stands legislations especially for tree indigenous tree species, ignorance of stakeholders on trees seedlings health, weak enforcement of phytosanitary measures and use of porous borders in cross border distribution. Tree logs transported across the region for timber production can also transfer tree disease and pests. It is also evident that farmers sometimes raise seedlings from seeds of imported fruits from other regions e.g. citruses from South Africa. This paper presents the potential phytosanitary challenges in the movement of tree germplasm within and across east Africa and proposes possible ways in which the challenges can be addressed.

Key words: tree germplasm, phytosanitary regulations**,** phytosanitary challenges

Safe movement of food and forage crops germplasm at ICARDA

Safaa G. Kumari[1], Abdoul Aziz Niane[2] and *Abdul Rahman Moukahel*[1]

[1]*Seed Health Laboratory &* [2]*Seed Section, International Center for Agricultural Research in the Dry Areas (ICARDA), Terbol Station, Beka'a valley, Lebanon*
Email: s.kumari@cgiar.org

As a crop breeding research centre, ICARDA has a large collections of food and forage legumes, wheat and barley and breeding lines to be used in variety development to increase the productivity and quality of crops grown by small holder farmers. Germplasm accessions and breeding lines are shared with national programs through international nurseries platforms. To protect the collaborating countries from quarantine pest risks (insect pests, pathogens and weeds) associated with germplasm movement, ICARDA has established a robust and highly process oriented safe germplasm movement system for its mandated crops (wheat, barley, lentil, kabuli chickpea, field pea, forage legumes and faba bean). The system which handles about 60,000 samples a year consists of five main components: (i) Planting incoming seeds in a dedicated "post entry quarantine field" to monitor diseases and pests in all incoming germplasm for a complete growing cycle; (ii) Implementation of a process focused germplasm rejuvenation and nursery production, processing, storage and distribution system; (iii) Adopting a comprehensive field inspection system covering the whole crop growing cycle; (iv) Making available a fully equipped and well-staffed seed health testing laboratory applying up to date pest monitoring and clearance techniques for seed borne diseases and viruses; (v) Undertaking research, capacity building and training on pests and diseases. This paper describes the four decades old ICARDA facilities, experiences and achievements in safe movement of germplasm across the globe.

Key words: ICARDA facilities, experiences, safe movement, germplasm

Policy gaps in restricting transboundary movement of pests through plant germplasm exchange

R. K. Khetarpal[1] and P. Lava Kumar[2]

[1]CABI South Asia, NASC Complex, Pusa New Delhi-110012, India
[2]International Institute of Tropical Agriculture (IITA), PMB 5320, Oyo road, Ibadan, Nigeria
E-mail: r.khetarpal@cabi.org

Mitigating the risk of introduction of transboundary pests and adopting means to stop the entry and establishment of exotic pests into new areas continues to be a major concern of phytosanitary and quarantine programs. To overcome the undue trade restrictions the Agreement on Application of Sanitary and Phytosanitary (SPS) measures commonly known as SPS Agreement of WTO (World Trade Organization) was put into place. This allows importing countries to have a policy to adopt SPS measures which must be scientifically justifiable and preferably based on International Standards for Phytosanitary Measures (ISPMs) developed by the International Plant Protection Convention (IPPC) of FAO. The situation gets a bit complicated in terms of norms for movement of plant germplasm intended for research, crop improvement and for enriching the national germplasm banks. The National Plant Protection Organizations (NPPOs) have made their own country norms of dealing with germplasm which are loosely followed under the gamut of ISPMs and also SPS measures. A standard global policy and mechanism has not been worked out by international agencies to deal with the international exchange of plant germplasm. For instance, There is no specific ISPM developed till date by IPPC for germplasm risk analysis prior to exchange and on procedure for processing for quarantine and post entry quarantine given the fact that they are exchanged in small quantities, thus often cannot be subjected to sampling procedures and still need to be tested holistically and a part to be released to indenters and in some cases a part to be conserved in gene banks as voucher samples. The presentation will discuss the policy gaps and needs for standard norms for expedited exchange of pest-free germplasm of various national, private and international institutes worldwide and propose options for a way forward to harmonise the germplasm quarantine procedures being undertaken arbitrarily by various NPPOs.

Key words: Germplasm exchange, SPS Agreement, policy gaps, standard norms, quarantine procedures

Role of KEPHIS in Germplasm Exchange and Distribution

Ngundo George[1], Momanyi, G[1].Mwangangi, M[1], Obare O[1], Wanjala B[2], Munguti F[1], Nduta E.[1], Kivuva S.[1], and Khisa S[1].

[1]Kenya Plant Health Inspectorate Service, P.O. Box 49421-00100, Nairobi, Kenya
[2]International Potato Centre P.O. Box 25171-00603, Nairobi, Kenya
Email: gngundo@kephis.org

Movement of plant germplasm is necessary to improve crop performance as well as for introducing superior cultivars and those required to address identified challenges such as emerging diseases. Some of these diseases include the Cassava Brown Streak and Cassava Mosaic Disease, Maize Lethal Necrosis Disease in maize and various diseases of potato. The movement of these materials though necessary comes with a phytosanitary risk of introduction of plant pests. In particular, sweetpotato production and exchange of plant material is on the rise in the whole of sub-Saharan Africa. This growth is primarily driven by increasing awareness about the benefits of sweetpotato, in particular the vitamin A rich orange-fleshed varieties. However, increased production requires timely access to increased quantities of disease-free planting material. The Kenya Plant Health Inspectorate Service – KEPHIS, through the Plant Quarantine and Biosecurity Station facilitates the safe movement of plant germplasm by undertaking testing and cleaning of the germplasm to assure freedom from pests such as viruses and bacteria as a measure to reduce phytosanitary risks. This has been undertaken through collaboration with major national and international organizations.The key collaborators in germplasm management and exchange include the International Potato Center (CIP), International Institute of Tropical Agriculture (IITA), and the Pyrethrum Directorate of AFA among others. Those materials that are tested and found to be infected are taken through a cleaning process involving thermotherapy and meristem tip culture under *in vit*ro conditions. Through collaboration with CIP and the sweetpotato support platform, more than 10 countries across Africa currently send their material for virus clean-up to the station, after which a small amount is multiplied *in-vitro* and sent back into their national seed programmes for distribution to farmers. KEPHIS in collaboration with CIP under the SASHA II Project is also currently producing clean pre-basic sweetpotato seed to multipliers for subsequent sale to root producers. Through other projects like the "New Cassava varieties and Clean seed to Combat CBSD and CMD" (5CP) project launched in 2012, funded by the Bill & Melinda Gates Foundation and led by the International Institute of Tropical Agriculture (IITA), 30 cassava varieties were cleaned, multiplied and distributed to 5 countries namely Malawi, Mozambique, Kenya, Tanzania and Uganda. Similar initiatives could be highly beneficial to ensuring that farmers have access to disease-free planting material of other crops including those that are vegetatively propagated such as passionfruit, banana and cassava.

Key words: Germplasm exchange, safe movement, in-vitro, collaboration

9.3 Session 2: Pest Surveillance in Phytosanitary Systems

ORIENTAL FRUIT FLY PILOT SUPPRESSION STUDY IN BOTSWANA

Keabetswe Ntlogelang

NPPO Botswana
Email: kntlogelang@gov.bw

Oriental fruit fly, *Bactrocera dorsalis,* was introduced in Botswana in 2010 in Chobe district (northern Botswana). Since then, *B. dorsalis* has spread towards the south and caused major economic losses to farmers and traders at the international trade. Under the BONAZAZI FAO project implemented in Botswana, Namibia, Zambia and Zimbabwe, a pilot suppression study was conducted in Chobe district, Botswana. An 18 ha pilot suppression was conducted during 2015 year in a citrus (*Citrus* spp) production area. The suppression strategy consisted of: (1) sanitation by the use of the augmentorium; (2) use of male annihilation technique (MAT) with MAT blocks impregnated with malathion and methyl eugenol (ME) at a density of 10 blocks per ha; (3) spot bait sprays with GF120 insecticide containing spinosad and (4) soil application of the *Metarhizium* spp. To evaluate the fruit fly population density, 5 of the MAT blocks were placed inside yellow bucket traps. The *B. dorsalis* population, showed a decrease from the peak population in February, from about 0.9 fly/trapday (FTD) in 2014 (no suppression in place) to about 0.2 FTD in 2015 (under suppression). The results showed a reduction of *B. dorsalis* population on the working area during the peak population. However, future suppression activities should take into consideration *B. dorsalis* wild hosts in the surrounding area, mainly the marula (*Sclerocarya birrea*) fruits, and the evaluation of the suppression measured by fruit infestation.

Keywords*: Bactrocera dorsalis, field sanitation, male annihilation technique, bait spray, Metarhizium spp., population dynamics.*

TOWARDS THE CREATION OF MANGO FRUIT FLY PEST FREE AREA AT CHEMURUGUI AREA, ELGEYO MARAKWET COUNTY

George Momanyi[1], Hellen Heya[1], Jane Boit[1], Naftal Nyamwaro[1], Dominic Mwenda[1] Ezekiel Muiruri[1], E. Kimani

[1]Kenya Plant Health Inspectorate Service, P.O Box 49421 Nairobi

Email: gmomanyi@kephis.org

Fruit production and sale in Kenya offers an opportunity for income generation, employment creation and improvement in food and nutritional security. Over 80% of fruit production is carried out by smallholders who target both domestic urban and export markets. Several factors constrain production and negatively impact on food security while also limiting the potential for trade and income generation. The invasive tephritid fruit fly, *Bactrocera dorsalis* and other native species in the *Ceratitis* genus cause direct damage to important crops such as mango leading to 40–80% losses depending on locality, variety and season. Quarantine restrictions on fruit fly-infested fruits restrict access to lucrative export markets in the EU. As an intervention towards fixing the *B. dorsalis* menace, a surveillance program was launched at Chemurugui area of Elgeyo Marakwet County in July 2015. The aim of the surveillance was to monitor the pest populations over time, implement suppression/eradication strategy, establish, declare as well as maintain pest free area/area of low pest prevalence. The trapping and monitoring activities have been conducted using lure-responsive trapping methods in mango orchards. At the start of the activity, the fruit fly populations were ranging at > 100 per trap per day (FTD) but after months of mass trapping, the populations went down to nil in November 2015. From mid- December 2015 to Mid- March 2016, the populations increased to about 10 FTD due to high pest pressure during the mango season. Since March 2016 however, the populations have gone down to 1-5 FTD. Lack of adequate farm sanitation where fallen fruits are left to rot in the farm has been a major challenge against the success of the initiative. It has however been observed that County governments keen on promoting mangoes as a key commercial crop offer great opportunities towards the success of the initiative.

Key Words: Pest free area, *Bactrocera dorsalis*, fruitflies mass traps

Countrywide Surveillance to Establish the Pest Status of Fruit flies In Zimbabwe

Jeremiah Masoka
Ministry of Agriculture Zimbabwe

A surveillance to establish the status of fruit flies pest species in Zimbabwe was conducted by the National Plant Protection Organization of Zimbabwe (NPPOZW in 2010 to 2012. The surveillance covered the 10 provinces of the country focusing on fruit and vegetable production sites and along major road networks. Three para-pheromones (Cue lure, Methyl Eugenol and Trimed lure/ fruit fly lure) combined with a dichlorvos as an insecticide were used in Mc Phail type traps that is the Chempac Bucket trap . Trap densities in production sites varied according to the abundance of hosts. One trap was placed per every 100-150 km along major road networks. The three para-pheromones are target host specific. Methyl Eugenol (ME) targets the males of *Bactrocera dorsalis* species, Cue lure targeting the males of *Dacus* species and Trimed lure (TML) targeting the males of *Ceratitis* species. Over 15 indigenous and exotic fruit fly species were trapped during the surveillance period. Preliminary identification of trap captures was done by the NPPOZW and confirmation made by a regional taxonomist in the Republic of South Africa and the Royal Museum for Central Africa in Belgium. Population fluctuations were also observed in the different seasons of the year. These fluctuations are strongly suspected to be attributed to daily temperatures changes, host fruit availability and abundance. The intensive surveillance led to the declaration of the presence of *B. dorsalis* in the Mashonaland Central Province of Zimbabwe, a province which borders Zimbabwe and Mozambique on the Northern Eastern parts of the country. The results of this surveillance served as a baseline for informed decision making on fruit fly management in Zimbabwe.

Key words: *fruit fly, surveillance, Para-pheromones, Bactrocera dorsalis*

Pest surveillance and pesticide risk reduction - the role of Plantwise, an interactive system for agricultural advisory service

Lorna Migiro[1] & Washington Otieno[1]

[1]CAB International, 673 Canary Bird, Muthaiga, Limuru Road, P.O. Box 633 – 00621, Nairobi, Kenya

Prompt detection of and alert on new pests or pest situations have significant implications not only in crop production practices but also in trade. Restricting access to certain markets and loss of reputation of a country as a safe source of exports is best safeguarded by prompt action on emerging pests. Likewise, misuse of pesticides and presence of hazardous pesticides in produce compromises endeavours to demonstrate compliance with sanitary standards relating to contamination of food and feed by pesticides at levels greater than allowable Maximum Residue Limits. Plantwise, a global programme led by CABI to support extension systems in developing countries to provide smallholder farmers with good advice needed to reduce crop loss due to plant health problems, generates useful data to support surveillance for pests and kinds of pesticides being recommended to manage pests. Through 3 key components viz, plant clinic networks, Knowledge Bank and linkages of stakeholders in extension, research, regulation, and input supply, Plantwise is increasingly providing countries with opportunities to manage plant health using own data. Plantwise activities, particularly documenting pests in crops complements the work of National Plant Protection Organizations. Plant clinic data is useable in general surveillance and as a source of Pest Risk information. Plant clinics have the potential to actualize the much needed early warning systems on emerging risks of pests and pesticides; thereby enabling governments to initiate processes for managing the risks effectively. The Plantwise knowledge bank can serve as a platform for plant health data management where information exchange within countries contributes to the global vigilance system for invasive species and regulated pests as well as emerging threats to plant health. This paper presents Plantwise as a complementary approach to phytosanitary and pesticide risk management, with examples drawn from anonymized plant clinic data over the past 4 years.

Keywords: *Pest surveillance, pesticide risks, early warning systems*

Presence and Distribution of *Tuta absoluta* (Meyrick 1917) (Lepidoptera: Gelechiidae) Affecting Tomato Plants in Rwanda

B. Uzayisenga[1], A. Ndereyimana[1], B. Uwumukiza[2], JP. Kalisa[1], P. Karangwa[1], M. L. Oronge[3] and A. R. Nyirigira[1]

[1]Rwanda Agriculture Board, PO Box 5016, Kigali,

[2]Ministry of Agriculture and Animal Resources, Kigali, Rwanda

[3]CABI Africa, Canary Bird, 673 Limuru Road, Muthaiga, P.O Box 633-00621, Nairobi - Kenya

Tuta absoluta (Southern American tomato leafminer) was suspected for the first time in Rwanda in 2015 through a plant health clinic. With subsequent field visits conducted in Bugesera District, Eastern Province of Rwanda, we notified the presence of lepidopteran green larvae causing typical mines symptoms on tomato leaves. In order to confirm the presence and the distribution of tomato leafminer in Rwanda, delta traps with TUTRACK lures containing 0.8 gm of pheromone for trapping the male *Tuta absoluta* moth were put in different Districts representing all agri-ecological zones of Rwanda. Analysis of *Tuta absoluta* data showed independence between grouped number of *Tuta* moths and the area (Province and Districts) and an association between grouped number of *Tuta* moths two and seven days after traps were installed with farmers' land size. Adult moth of *Tuta absoluta* was found in all traps put in place.

Keywords: delta trap, leafminer, pheromone, tomato.

9.4 Session 3: Pest diagnostics in phytosanitary systems

Challenges in diagnostic system of NPPOs in Africa; a case study of KEPHIS as NPPO in Kenya

Macharia Isaac[1], Ngundo, G[1]., Munguti, F. [1], Kimani E. [1], Momanyi G. [1],

[1]Kenya Plant Health Inspectorate Service (KEPHIS), P.O. Box 49592 00100, Nairobi, Kenya

Pest Diagnostics is a key factor for timely decision making in phytosanitary regulation. Recent advances scientific research and diagnostic infrastructure has improved the ability of many countries to accurately and efficiently identify pests. However, in Africa, pest identification still remains a great challenge significantly affecting the phytosanitary decision making. Lack of human and infrastructure capacity has affected the ability of African countries to respond to new and emerging phytosanitary issues. Recent incidences of emerging diseases and pest outbreaks in Kenya, has shown successes and challenges in this regard. Successful identification of Maize lethal Necrosis disease (MLND), quarantine Pectobacteria in seed potatoes, optimization and utilization of diagnostic methods for Cassava Brown Streak Virus (CBSV), and Potato Cyst Nematode (PCN) are notable evidence on the existing diagnostic capacity. On the other hand, the inability to accurately identify the virus complex causing MLND, The recent challenges in identification of Sugarcane Mottle Virus (SCMV) an important potyvirus in MLND combination, and identification of emerging phytoplasmas has indicated the need to enhance both human and infrastructure diagnostic capacity. Embracing new molecular technologies like sequencing, next generation sequencing, microarray and barcoding, establishing networks and collaboration, will strengthen national and regional diagnostic capacity for quick phytosanitary decision making and regulation. This paper presents opportunities and gaps for diagnostic capacity at KEPHIS and the region.

Keywords: pest diagnosis capacity, NPPO, phytosanitary regulation, emerging pests

Adopting Loop-mediated isothermal amplification (LAMP) as a diagnostic tool in support of passion fruit nursery certification

Munguti Florence[1,3], Kilalo, D[2], Nyaboga, E[2] , Macharia, M[3], Njuguna, J[3], and Holton T[3]

1. Kenya Plant Health Inspectorate service, P.O. Box 49592-00100, Nairobi, Kenya
2. The University of Nairobi, P.O.Box 29053 Nairobi, Kenya
3. Biosciences eastern and central Africa, International Livestock Research Institute, P.O. Box 30709-00100, Nairobi, Kenya.

E-mail: fmunguti@kephis.org

Passion fruit (*Passiflora edulis* [*Sims*]) is an important fruit crop grown worldwide for both export and domestic markets. In Africa, it provides smallholder farmers with a secure income due to its high market value and short maturity period of the crop. Passion fruit production in Kenya, like other parts of the world, is severely affected by woodiness viral disease and nursery certification has been identified as one of the effective management strategy. In Kenya, passion fruit passion fruit nursery certification has for a long time been carried out based on visual inspection due to lack of a diagnostic protocol especially for viruses causing woodiness disease which has led to increased incidences of the disease at farmers' level, forcing some farmers to abandon passion fruit production. Use of symptoms alone has been reported to be unreliable because the symptoms are inconsistently expressed in leaf, stem and fruits and are sometimes difficult to distinguish from mite damage and nutrient disorders. In order to implement effective nursery certification, accurate and precise diagnostic tool for detection of the disease needs to be incorporated in routine nursery inspections. Loop-mediated isothermal amplification (LAMP) on a real-time fluorometer Genie II (Optigene) was developed for detection of *Cowpea aphid-borne mosaic virus* (CABMV) and *Ugandan passiflora virus* (UPV) reported to cause woodiness disease. Four sets of primers (External primers F3 and B3, internal primers FIP and BIP) recognizing a total of six regions of the CP gene were designed and the reaction conditions optimized. The assay was demonstrated to be sensitive and no cross-reaction was observed with other closely related potyviruses. Furthermore the method can be performed within a short time and can be adopted as a tool for onsite detection of other pests of phytosanitary concern especially at country's exit points hence facilitating implementation of quarantine regulations. The method has the potential to provide a valuable diagnostic during passionfruit nurseries certification programs hence facilitating an increase in production and distribution of clean planting materials to farmers.

Keywords: Loop-mediated isothermal amplification (LAMP), *Cowpea aphid-borne mosaic virus*, passion fruit, nursery certification, woodiness disease.

DNA barcoding a new molecular tool for identification of insect pest and virus vectors in phytosanitary system

Macharia I.[1], Munguti, F.[1], Ngundo, G.[1], Aved, E.[1], Heya, H.[1]

[1]Kenya Plant Health Inspectorate Service (KEPHIS) P.O. Box 49592 00100, Nairobi, Kenya

Identification of harmful pests and diseases is an important component in any phytosanitary system. Accurate, reliable and fast diagnostics is key in achieving the desired level of plant protection as stipulated in the phytosanitary measures. For a long time, identification of harmful insect pests and virus vectors has heavily relied on the use of morphological identification keys which are laborious, time consuming and require specialized taxonomic expertise for their utilization. Use of morphological characters alone may be difficult to discriminate closely related organisms and is limited in identification of all the life stages of many insect pests as well as in damaged insect samples. This has led to the need to explore other measures or strategies for their identification. DNA Barcoding using mitochondrial cytochrome oxidase 1 gene has been reported as an important molecular tool in accurate identification and establishment of genetic diversity of insect pests and virus vectors. The method does not require taxonomic expertise and resulting nucleotide sequences can be used to compare isolates across the world. CO1 gene has been utilized in identification of many insect species and sequences deposited in the Barcode of life database (BOLD) In the recently study in Kenya, CO1 gene was use in identification of thrips species which are the sole vectors of Tospoviruses and variations were observed among *Thrips tabaci, Frankliniella occidentalis* and *Frankiliella schultzei*. The method can be suitable for identification of quarantine pests in many phytosanitary systems in Africa to ease the burden experienced with the lack of taxonomic expert in insect identification.

Key words: Barcoding, insect pest, Vectors, CO1 gene

Use of next generation sequencing to identify viruses associated with passion fruit woodiness disease in Kenya

Munguti Florence[1,3*], Kilalo, D[2] , Nyaboga, E[2] , Macharia, M[3] , Njuguna, J[3], and Holton T[3]

1. Kenya Plant Health Inspectorate service, P.O. Box 49592-00100, Nairobi, Kenya
2. The University of Nairobi, P.O. Box 29053 Nairobi, Kenya
3. Biosciences eastern and central Africa, International Livestock Research Institute, P.O. Box 30709-00100, Nairobi, Kenya.

E-mail: fmunguti@kephis.org

Plant diseases caused by viruses are among the major constraints of any plant health system. Accurate identification and characterization of the causal agents of these diseases especially in the ever increasing cases of emerging diseases some of which little or no prior knowledge is available is fundamental for frontline diagnosis and supports the implementation of pest management strategies. Next generation sequencing technique has been reported as a powerful tool for the identification and discovery of new viruses in disease complexes, as well as giving an indication of the virus frequency and sequence polymorphism in the infected materials. We used next-generation sequencing to identify the viruses associated with passion fruit woodiness disease in Kenya. Passion fruit leaf samples with characteristic virus-like symptoms were collected from major passion fruit growing areas in Kenya and subjected to illumina next-generation sequencing after nucleic acid extractions. Sequence analysis revealed the presence of complete genome sequences for *Cow pea aphid-borne mosaic virus* (CABMV) and *Ugandan passiflora virus* (UPV) previously reported to be associated with woodiness disease in Kenya and Uganda, respectively. This supports earlier findings and provides a better understanding of the causal viruses of passion fruit woodiness disease in Kenya as well as can be used for further functional studies to uncover the role of each of the viruses in the disease establishment. The sequences obtained will be useful in development of more sensitive diagnostic assays for use by plant health institutions in certification of passion fruit nurseries. Utilisation of next generation sequencing should be evaluated to ensure its use in the discovery of viruses in plant health systems.

Key words: *next generation sequencing; woodiness disease; passion fruit*

Occurrence of potato virus Y (PVY) in major potato cultivars in Kenya

Onditi, J. O ([1,2]), Nyongesa W.M ([2]) and van der Vlugt, R.A.A ([1])
(*(1) Wageningen University, Laboratory of Virology, Droevendaalsesteeg 1, 6708 PB, Wageningen, Netherlands (john.onditi@wur.nl)*
(2) Kenya Agricultural and Livestock Research Organization (KALRO), Horticultural Research Institute, KALRO-Tigoni, Kenya

Potato virus Y (PVY) is one of the major viruses of phytosanitary significance and contributes to rejection of seed crops when found in potato fields during inspection. Knowledge of prevalence and regional distribution of PVY strains in different cultivars is useful in management of the virus. This work was conducted to deduce levels of resistance to PVY and major potato viruses from the virus prevalence levels in the farmers' fields. A total of 194 potato leaf samples were collected in a survey conducted in major potato growing counties of Kiambu, Molo and Nyandarua. The cultivars sampled were mainly, Shangi (59 %), unknown farmer varieties (23 %) and Ndelamwana (7%). The samples were tested for six potato viruses by ELISA and PCR. There was very low (1.5 %) prevalence of PVY compared to other viruses like PVS (63 %), PVX (59 %) and (PVM 18 %). Due to low PVY prevalence, it was not possible to deduce levels of PVY resistance from prevalence of PVY strains in cultivars. PVY-NTN (75%) was detected in samples collected from Kiambu and Nyandarua counties while PVY-O (25%) was detected only in Molo. The low PVY prevalence was attributed to use of one popular cultivar like Shangi which may be PVY resistant. The findings of this study and those of previous reports suggest that the low prevalence of PVY could be due to the use of one predominant resistant cultivar. Controlled screening of potato cultivars for PVY resistance and survey covering other potato growing regions is recommended.

Key words: potato viruses, seed potato, seed quality

9.5 Session 4: Export control in phytosanitary systems

Devitalisation of Cut Rose (*Rosa hybrida* L.) Flowers cv. 'Bellerose': Effects of Glyphosate (Glyphogan® and Roundup®) on Propagation Ability and Vaselife

M.J. Hutchinson[1], **H.K. Miranyi[2]**, C. M. Onyango[1] and E. Kimani[2]

[1]Department of Plant Science and Crop Protection, University of Nairobi
P.O. Box 30197–00100, Nairobi, Kenya
[2]Kenya Plant Health Inspectorate Service (KEPHIS),
P.O. Box 49592–00100, Nairobi, Kenya

Email: hmiranyi@kephis.org

The objective of this study was to establish the effectiveness of devitalisation treatment phytosanitary measure on propagation ability of cut rose flowers (*Rosa hybrida* L.) cv. 'Bellerose' at different dipping levels and assess the effects of the treatment on its vase life. Harvested export quality rose cut flowers obtained from Sian Roses Flower Company, were dipped in glyphosate solutions of Roundup® (a.i 360g/l) and Glyphogan® (a.i 480g/l) following procedures described in the Australian pre-shipment devitalisation treatment guidelines. Tap water acted as a control. To assess propagation ability, 50 cm cut roses were dipped in prepared solutions at 15, 25, 35 or 45 cm depths. Data on percentage rooting, number of roots, root length and percentage necrotic stems was collected after 26 days in the propagation unit. For the vase life experiment, 40 cm cut roses were dipped up to 35 cm depth and thereafter held in holding solution containing 2% sucrose and 1% sodium hypochlorite solution. Changes in fresh weight, water balance, leaf abscission, chlorophyll content and vase life were determined. The results showed that devitalisation treatment inhibited rooting even at lowest dipping depth of 15 cm and triggered necrosis of the stems. The treatment further increased leaf abscission and wilting, reduced chlorophyll content and shortened vase life of cut roses by about 2 days. Glyphosate-treated flowers also recorded a worse negative water balance and fresh weight change while the flower petals were not affected by the treatments. Considering bio-security concerns, the observed negative effects of devitalisation on the cut flower vase life cannot compromise adherence to the requirements.

Key words: Bio-security; Glyphosate; Phytosanitary measures; Rosa hybrida L; Vase life.

Measuring the trade effect of wood packaging standards on African exports: The case of ISPM 15

Elissaios PAPYRAKIS[a,b] and **Luca TASCIOTTI[a]**

[a] *Institute for Social Studies, Erasmus University Rotterdam, Kortenaerkade 12, 2518 AX The Hague, the Netherlands*

[b] *School of International Development, University of East Anglia, Norwich, NR4 7TJ, UK*

There has been an increasing concern about the (often unintended) trade effects of international environmental standards. On the one hand, broad adherence to such standards is necessary in order to minimize environmental impacts associated with the production and transportation of exported commodities. On the other hand, such standards often act as non-tariff barriers that decrease trade volumes and often place developing countries at a comparative disadvantage. The International Standard on Phytosanitary Measures (commonly referred to as ISPM 15) is such an environmental standard on the treatment of wood packaging materials (as a means against the spread of pests) and has been implemented by over 50 countries over the last decade. Surprisingly, given the widespread use of wood packaging in exports, very little is known about the trade effects of the ISPM 15 standard on trade volumes of implementing countries. While implementing countries might face higher export costs, non-implementing countries may also face reduced access to international markets. It might also be the case that the standard leads to trade clustering, where ISPM-15 developed and developing countries increase their bilateral trade volumes, whereas non-compliant developing economies are forced to export to a small group of developed economies characterized by looser environmental regulations. We make use of a gravity model (using an extensive panel dataset) to estimate such bilateral trade volumes between 1990-2012 and the impact thereof of the ISPM 15 standard (taking into account the adoption stage both for the importing and exporting country, distances, GDP size, colonial ties, language, institutional dimensions). We also disaggregate results according to the type of commodities exported in order to measure any sector-specific effects of the standard adoption.

Keywords: Trade costs, ISPM 15, standards, gravity model.

Implementation of ISPM 15 in Kenya and Its Impact on International Agricultural Trade

Faith Ndunge[1], A. P. Kivi[1], P. M. Nyaga[1]

[1]Kenya Plant Health Inspectorate Service (KEPHIS), P.O Box 49592-00100 Nairobi, Kenya

Email: fndunge@kephis.org

Exports from Kenya comprise mainly of Agricultural produce and the country is, therefore, expected to meet market requirements in accordance with International Plant Protection Convention (IPPC) and (World Trade Organization (WTO) Sanitary and Phytosanitary (SPS) agreement. The International Standards for Phytosanitary Measures (ISPM) 15, *Guidelines for regulating wood packaging material in international trade*) was developed to reduce the risk of the introduction, establishment and spread of quarantine pests associated with international trade in packaging materials made from raw wood. Implementation of ISPM 15 in Kenya began in 2008 and the methods used for treatment of wood packaging material include heat treatment, fumigation using methyl bromide and the dielectric method. There are nineteen (19) wood treatment companies implementing the standard in Kenya and registered by KEPHIS. A study was carried out in Kenya to establish whether implementation of ISPM 15 has generated losses or benefits and how they have been distributed among stakeholders. The company representatives were interviewed using a structured questionnaire. The data collected was entered in an excel format and analyzed. It was found that out of the nineteen companies, sixteen use heat treatment method whereas the other three use Methyl Bromide. The study established that ninety nine percent of treated wood packaging materials are used to export agricultural produce. The total investment cost of implementation ISPM 15 was found to range between Kshs 300,000 to Kshs 3,500,000. Implementation of ISPM 15 in Kenya has resulted into increased agricultural export business and job creation among stakeholders. However, the implementation of the standard might adversely be affected in future due to declining forests and high initial cost which might cause exporters shifting to alternative means of packaging materials. Hence there is need, by the Kenya government, to implement efforts aimed at increasing forests and giving subsidies to wood treating companies.

Key words: ISPM 15, wood treatment

Role of agricultural commodity logistic providers in phytosanitary compliance

Kimani E[1], Wahome J[1], *Syanda J[1],

[1]Kenya plant Health Inspectorate Service

Email: jsyanda@kephis.org

Trade in agricultural products at global, regional and national levels contributes significantly to food security and national development. Conversely, cross border movement of agricultural products presents the risk of introduction and spread of exotic pests and diseases in new territories which could have negative economic and environmental impact. Article IV of the International Plant Protection Convention makes general provisions for National Plant Protection Organizations (NPPO) to set up measures for preventing introduction, establishment and or spread of pests in foreign territories. The conventional practice by NPPOs to comply with this requirement has been to focus mainly on exporters and importers of plants, plants products and regulated articles of agricultural nature. In most regulatory systems, inspection for phytosanitary compliance commences at the production level while certification is done at the point of exit. The consignments are then handed over to logistic providers for conveyance. Although the agricultural commodity logistic providers are primarily understood in terms of transportation (conveyance) of consignments from exporters to importers, they are also responsible for cold chain management, documentation, temporary storage and transportation of consignments after certification. Given that agricultural produce consignments are handed over to logistic providers for conveyance either during or after certification the actors have a role of ensuring sustained phytosanitary compliance. Available information shows that interceptions have occurred due to absence of phytosanitary certificates lost in transit or transportation of produce without the necessary inspection and certification. A trace back on such interceptions indicates that the documentation non-compliance occurred while the consignment was at the logistic providers phase.

Key words: Agricultural commodity logistics providers, phytosanitary certification, certificates lost in transit

Towards Harmonized Potato Certification Standards in the Eastern African Region: What are the Options?

Simon M. Maina

Kenya plant Health Inspectorate Service
Email: smaina@kephis.org

Potato is the 4th most important crop worldwide and holds great potential for food and nutritional security in the Eastern African Region. In spite of its importance, potato productivity in the region is low due to varied reasons, among which is the limited availability of certified seed. Annual seed production is hardly one percent of the national requirement in most countries in the region. However, in the recent past, there have been initiatives to increase supply of certified seeds through importation from countries with strong certification systems like the Netherlands. Although importation of potato is a quick way increase available seed, it comes with the risk of introduction and spread of foreign pests and diseases, due to its means of propagation. Countries in the region have seed certification systems, which emphasize mainly crops propagated by means of true seeds and less on vegetatively propagated crops like potatoes. National certification systems are paramount but the porous nature of the countries' borders, limit their effectiveness. In order to ameliorate this, harmonized regional frameworks have been established to provide for a common approach to phytosanitary risks and thus, facilitate trade. These efforts have been championed by regional bodies such as COMESA, SADC, and EAC. This has been made easy as all countries in the region are members of IPPC while some apply OECD schemes and ISTA guidelines. Equally, East African Community member states have signed a Sanitary and Phytosanitary protocol, which provides a framework for harmonized phytosanitary standards for the region. The available frameworks are general in nature, but specific harmonized certification standards for the region are not yet available. At the international level, the UNECE standards for seed potatoes have been developed, which act as a world reference for defining harmonized quality requirements for seed potatoes. This paper reviews these standards and identifies aspects that could be customized in development of regional standards.

Key Words: Potato, phytosanitary, seed certification, harmonized standard

Emerging Challenges in Meeting Export Market Requirements in the Fruits and Vegetable Sector, Phytosanitary Experiences From Uganda

Joyce Brenda K. Kisingiri

Ministry of Agriculture Animal Industry and Fisheries (MAAIF), P.O. Box 102, Entebbe, Uganda

Email: ninakisingiri@gmail.com,

Majority of Ugandan farmers involved in growing horticultural produce for exports are smallholder farmers, spread out all over the country. Most of them are illiterate or semi illiterate. Farmers and exporters start their business or grow for export without initial or any knowledge on export market standards. Smallholder farmers do not implement good agronomic practices and are not conversant with identification and biology of pests of quarantine importance. This *adhoc* farming for export results into non-compliance with sanitary and phytosanitary (SPS) export market requirements. It strains the thin certification inspectorate services available. When exporters' consignments are intercepted and destroyed, farmers are not paid and thus remain earning little or no income. The above situation results into the vicious cycle of poverty; it does not enhance commercial farming due to the sustained chronic inabilities of farmers to improve their incomes. Many exporters are business oriented and lack knowledge concerning the obligations and terms and conditions governing the SPS agreement in international trade to inculcate phytosanitary controls for their companies. Other challenges are the existence of weak public private partnerships that do not promote synergies between regulators, farmers and exporters to promote quality assurance and weak self-regulation among exporters to enforce compliance to market requirements. Therefore there is need to strengthen extension systems up to village level to promote dissemination of sanitary and phytosanitary information to farmers. Promote strong linkages of farmers to relevant District Agricultural Officers. Strengthen certification inspectorate services to ensure that certification of produce is done before harvest. Continue to support building of strong export companies and farmer associations that promote self-regulation, accountability and compliance to market requirements.

Key words: sanitary and phytosanitary, extension systems, compliance, market requirements

9.6 Session 5: Technologies and Innovation in Phytosanitary Systems

Bio-Efficacy of Some Natural Plants on the Oil Palm Leaf Miner *Coelaenomenodera Lameensis* Berti and Mariau (Coleoptera: Chrysomelidae)

Raymonda A. B. Johnson

Crop Protection Service, MAFFS, Sierra Leone

Email: raymonda.johnson@yahoo.com, raymonda.johnson.rj@gmail.com

In most African and tropical countries, oil palm is an economically important commercial tree crop. Amongst constraints to oil palm production insect pests are the most important challenge, Oil palm leaf miner *Coelaenomenodera lameensis* Berti and Mariau is the most important insect pest in West and Central Africa. The most disastrous stages are the adults and larvae Management of this pest is mainly by synthetic insecticide (Evisect S) which poses major problem to the environment and human health. In addition there is risk of induced resistance of the pest, thus necessitating the search for safe, environmentally-friendly and effective alternative control agents using botanicals for its control. Consequently, toxicity test of the leaves, barks and roots of three indigenous plants: *Zanthoxylum xanthoxyloides*, *Moringa oleifera*, *Securidaca longepedunculata* and leaves of *Ocimum gratissium* were assessed for bio-efficacy against adults' *C. lameensis*. The powder forms, aqueous and organic solvent extracts of the various plants were assessed. The powder forms of all the plants were very effective for controlling *C. lameensis* adults in the order; *O. gratissium* > *M. Oleifera* > *Z. xanthoxyloides* > *S. longepedunculata*. The roots were most effective followed by the barks and leaves. *Z. xanthoxyloides* powdered ratios (leaf: stem; leaf: root and leaf: stem: root) were more effective than the other plants for the control of *C. lameensis* adults. Aqueous extracts of the various plants were not effective for controlling *C. lameensis* adults. The Methanol extract shows that only *Z. xanthoxyloides* plant parts were effective for controlling *C. lameensis* adults. Only *Z. xanthoxyloides* root and stem were effective for the control of *C. lameensis* adults after the organic solvent (acetone) extraction. The findings of this study lend credence to the usefulness of yet another bio-pesticide and its incorporation into integrated pest management system for recommendation.

Key words: natural plants; oil palm leaf miner; oil palm; bio-efficacy

ICT4 Plant Health - a new frontier for Early Warning Systems

MaryLucy Oronje, Willis Ochilo, Elizabeth Nambiro & Washington Otieno

CABI Africa, Canary Bird, 673 Limuru Road, Muthaiga, P.O Box 633-00621, Nairobi, Kenya

Email: M.Oronje@cabi.org

Current developments in Information Communication Technologies (ICT) have opened up new frontiers for collecting and disseminating information along crop value chains from production to marketing. Both producers and service providers of other services in plant health have improved opportunities to perform their roles and responsibilities. ICT tools enable real time access to plant health information, an essential enabler of effective pest monitoring programs and ultimately early warning system. Working with partners CABI has developed and piloted the Plantwise data collection App and the Factsheet Library App and tested Pestpoint to facilitate the collection and dissemination of plant health information within and beyond the plant clinic networks. The mobile applications are available on Google Playstore for desktop and handheld android-based devices. Using the Plantwise data collection App, information on the crop presented by farmers attending plant clinics is collected and deposited in access controlled database. Diverse stakeholders in plant health can access and use validated content from Plantwise Factsheet App with ease and efficiency thereby enhancing credibility in giving plant health advice. Over 200 plant doctors in Kenya (120), Zambia (12), Rwanda (20), Ghana (37) and Uganda (16) equipped with tablet computers have access to secure country specific cross-platform messaging applications namely- Telegram and WhatsApp through which they share images and information on plant health and seek real-time support on diagnosis and management advice from their peers other experts in the network. In Ghana, for example, a plant doctor posted images of rice fields affected by an unknown pest and inconclusive diagnosis necessitated immediate field visits by experts who made quick diagnosis of bacterial blight of rice. The problem was finally traced back to a contaminated seed lot. Plant doctors in Zambia, indicated suspected cases of *Tuta absoluta* after distinct image symptoms on tomatoes were shared within the Telegram network. Plant health experts have also corrected a few cases of misdiagnosis with samples collected from farms submitted to local or international laboratories for identification. This paper presents these ICT tools as providing a real-time means of collecting, verifying and disseminating pest information thereby creating a strong framework for surveillance and early warning systems.

Keywords: Pest surveillance, pest monitoring, plant health, early warning systems

Application of Electronic Certification (Ephyto) For Enhanced Phytosanitary Compliance

Josiah Syanda[1] & **Shane Sela[2]**

[1]Kenya Plant Health Inspectorate Service (KEPHIS)
[2]International Phytosanitary Convention (IPPC)

The increasing world population and changes in global climatic conditions coupled with improved transport systems have influenced the volumes and speed at which plants, plant products and regulated articles of agricultural nature move across international borders. Demand for food in various parts of the world, exchange of plant germplasm, movement of people, animals and conveyances pose the risk of introducing, establishment and spreading exotic pests in new territories. The International Phytosanitary Convention (IPPC) makes provision for NPPOs to use Phytosanitary certificates as assurance that exported or re-exported plants and plant materials meet the specific phytosanitary requirements of the importing country. Authentic, correct and fully completed phytosanitary certificate is a key component for market access of agricultural produce. International Standards for phytosanitary Measures (ISPM 7, ISPM 12) provides framework for creation and transmission of phytosanitary certificates. Included in the standard is a harmonised format for paper phytosanitary certificates which has been in use for a long time. The conventional use of paper for phytosanitary certification has presented NPPOs with various challenges, including fraud, paper costs, consignments delays, loss of certificates and forgeries, among others. Emerging innovations and applications in Information Communication Technology (ICT) provide huge opportunities for mitigation of the limitations experienced with paper certification. The Electronic Phytosanitary Certification (ePhyto) is an IT innovation which allows countries to generate as well as receive electronic formats of consignment phytosanitary data. ePhyto certification process includes collection of phytosanitary data, creation of encrypted electronic phytosanitary certificate, transmission of the certificate and decryption of the certificate at the destination point. Benefits of ePhyto include reduced fraud, certification system reliability, reduced costs, enhanced verification of consignments during inspection and improved government to government and government to business communication.

Key words: Electronic certification; Verification of consignments, Market access

INNOVATIVE TECHNOLOGY TO COMPLETE PHYTOSANITARY CHECKS ONLINE: A KENYAN SOLUTION

David Lawrence-Brown[1]

[1]Muddy Boots Software Limited (MBS), Phocle Green, Ross On Wye, United Kingdom

Email: d.lawrence-brown@muddyboots.co.ke

Online Checks are now conducted for more than 80% of UK retail fresh produce at Sainsbury, Tesco, Waitrose, Lidle, Aldi, Morrison's and do form part of a wider more significant solution from Muddy Boots Software that is now being used to share quality and supplier approval information across supplier chains. Many of Africa suppliers now receive 'real-time' data back down the supply chain, with calendars and corrective action reporting that keep wastage to an absolute minimum. Businesses enabled with our web based end to end quality control application being used for intake, dispatch, issuance and receipts are showing sector savings of up to 40% and 'real-time' notification of issues as they arise. Produce that is 'Out of Specification' at the time Dispatch Phyto Sanitary Check are conducted were likely out of specification at harvest. More measurement is needed earlier and in real time and signs that your business will benefit immediately from our Phyto-dispatch technology. How the system works: Supply that is assessed prior to dispatch inspection and time of loading receives 'positive release' approval with instant notification business wide and is a process that can be accredited by your regular. Online Phyto-Dispatches are now part of a larger family of checks that your business can do on a daily basis that drive waste out and bring consistency in. Greenlight systems from Muddy Boots Software ensure very high levels of visibility through measurement and real time accountability that reduce costs and increased revenue by ensuring produce begins its harvested life 'fit for purpose' and arrives on shelves in good condition resulting in a happy customer. With higher costs, greater customer demands, evermore compliance requirement this is a good time to look closer at innovation to ensure you meet the challenge. Welcome to the world of Muddy Boots.

9.7 Session 6: Industry views on phytosanitary systems

The role of bio-pesticides in management of Phytosanitary challenges

Louise Labuschagne

RealIPM

P.O. Box 4001-01002, Madaraka, Thika, Kenya

Email: Labuschagne@realipm.com

There are an increasing number of pest challenges in the international Phytosanitary arena like *Bactrocera* spp. and other fruit flies, which are threatening international trade and smallholder livelihoods in Africa. The fruit fly problem is symptomatic of a wider scenario facing farmers, which is leading to less effective control of pests and increased Phytosanitary challenges. Retailers are demanding fewer chemical residues on crops and governments are banning the use of neonicotinoid pesticides due to their effect on bees. Resistance of pests and diseases to chemical pesticides and the reduced number of chemical options available to farmers is likely to further compromise farmers' ability to protect their crops and may increase interceptions of quarantine pests. Cheap generic, broad-spectrum chemicals are widely used and negatively impact on indigenous natural enemies of fruit flies, which might otherwise contribute to control of the pest. This paper examines the opportunities offered by affordable biopesticides to address issues of resistance, lack of retailer-approved pesticides and poor control of pests. It reviews the threats, which may limit the uptake of bio-pesticides as alternative methods of control. The role of Regulators, Researchers, Retailers and Value chains in the development and implementation of bio-intensive Integrated Pest Management solutions is examined, using Real IPM Kenya's commercial experience in the development of a biological control programme for fruit flies for mangoes in Kenya.

Keywords: Integrated Pest Management, bio-pesticides, pesticide residues, neonicotinoids, resistance, entomopathogenic fungi, fruit fly control.

Improving Access to Niche European Market for Fresh Vegetables through Reduction of Phytosanitary and Pesticide Residue Constraints

Geraldin Lingai

University of Nairobi

Email: lingaig@gmail.com

Horticultural export to the EU markets is a key foreign exchange earner in Kenya contributing to over 33% of the GDP. The main fresh produce exports include French beans, runner beans, snow peas, mangoes, avocadoes and cut flowers. Horticultural industry employs many people along the value chain and contributes to rural economic development. Pest such as bollworms, leaf miners, whiteflies, thrips, and fruit flies constitute a major phytosanitary challenge and small scale farmers rely on synthetic pesticides leading to accumulation of residues in the produce. Some producers and exporters have been de-listed from accessing the niche markets and access costs increased by up to 10% due to intensified inspection, sampling and delays at ports of entry in the EU. Various approaches have been developed to mitigate the adverse effects of using synthetic pesticides. These include use of pheromone traps, increased training and awareness creation on pesticide usage and early pest detection, GLOBAL GAP certification, improved sanitation and hygiene to avoid contamination with harmful microorganisms. Integration of microbial pesticides, botanical products and diversification of cropping systems into spray programmes have been shown to drastically reduce synthetic pesticide usage while parasitoids and predators are effective in managing fruit flies, leaf miners and aphids. Attainment of the required MRLs and phytosanitary standards will be achieved through continuous monitoring of produce, accreditation of analytical laboratories, staff training programs to improve efficiency of inspections, establishment of structured grower systems for exporters, strict enforcement of standards and investment in research to develop new technologies. Execution of these mitigation strategies will lead to compliance to MRLs and phytosanitary requirements which will then result in farmers producing clean, safe, healthy and large volumes of fresh produce for the niche markets.

Key Words: Fresh produce, Market compliance, Pesticides residues

Capacity Building in Early Warning Systems to Enhance Market Access for Small Holder Cut-Flower Growers in Kenya: Public-Private Sector Collaboration

Pamela Kibwage[1], E.W. Kimani[1], J. Ngige[2], **P. Chege[3]**, G. Nchari[1]
[1]Kenya Plant Inspectorate Service (KEPHIS), P.O. Box 49592-00100, Nairobi, Kenya
[2]Kenya Flower Council (KFC), The Greenhouse building Ngong Road, Nairobi Kenya
[3]Mukungi Floriculture P.O. Box 234-20318, North Kinangop, Kenya

The Kenyan floriculture industry has grown significantly contributing 1.01% to the national GDP in the year 2015. In addition it is one of the top foreign exchange earner and impacts over 2million livelihoods. Cut-flowers are produced by both large scale and small holder growers with the small holder growers accounting for over 70% of the summer flower production. These flowers are labour intensive but require less resource input. The major summer flowers produced are Eryngium planum, Alstroemeria, Ornithogalum sp., Craspedia globosa, Ammi visnaga, Scabiosa stellate, Polianthes tuberose (Tuberose), and Rudbeckia (Echinacea purpurea). Small scale growers face various challenges that impact on market access; lack of information on market requirements, access to clean planting material and pests. In the year 2011-2012 there were a high number of interceptions of cut-flower consignments in the EU due to the presence of leaf miner (*Lyriomyza spp.*). A majority of these interceptions were of Erygium sourced from small scale growers in Nyandarua County. KEPHIS and Kenya Flower Council collaborated to facilitate capacity building for the farmers on market requirements and use of the early warning system in pest management. Farmers were trained on use of weather patterns for pest prediction, detection and monitoring of pests, scouting and record keeping, integrated management, and post-harvest practices. The impact of the capacity building was noted in the year 2014 when there was an outbreak of leaf miner (*Lyriomyza spp.*) in Eryngium and other flowers and the small holder growers had few if any interceptions.

Key words: Capacity building, small holder growers, early warning systems, market access, cut flowers

Status of seed potato supply systems and phytosanitary issues in Kenya

Mumia I. Bornventure[1], Rama D.Narla[1], James W.Muthomi [1]and Moses Nyongesa[2]

[1] Department of Plant Science and Crop Protection, University of Nairobi

[2] Kenya Agricultural and Livestock Research Organisation, National Potato Research Center, Tigoni

[1]Corresponding author: mechaisaya@gmail.com

Potato is the second most important food crop in Kenya for food security and source of livelihood of small scale farmers. Lack of adequate supply of quality seed potato is the main challenge reducing yield. About 95% of farmers recycle seed potato leading to seed degeneration through accumulation of seed borne pests including bacterial wilt, bacterial soft rot, late blight, Fusarium dry rot, potato viruses, nematodes, wireworms and potato tuber moth. The formal seed system supplies less than 5% of quality certified seed while the informal system supplies 95% of seed potato sourced from markets, neighbours and farm-saved seed potato. Seed potato from the informal sector is readily available but is of unknown quality. Quality control standards such as varietal purity, freedom from seed borne pets, uniform seed size; labelling, packaging and certification are applied to formal system. Problems of seed borne pests lower seed quality. Other constraints include inadequate supply and costly certified seed, lack of improvement of informal seed system, inadequate testing laboratories, slow uptake of seed potato improvement technologies and lack of quality seed stock. Use of improved seed potato production technologies including positive seed selection and seed plot techniques, pest and disease surveillance, trainings and harmonisation of seed laws have been adopted to increase seed supply. Supply of adequate quality seed being the main challenge, various solutions can adopted to raise supply through increased and decentralised production of certified seed, improved certification standards, improved seed potato technologies and equipping of laboratories.

Key words: Potato, seed borne pests, seed systems, seed quality

Enhancing competitiveness of French beans in the export market by overcoming phytosanitary and quality challenges

A. M. Fulano[1], J. W. Muthomi[1], J. M. Wagacha[2] & A. W. Mwang'ombe[1]

University of Nairobi, Kenya
[1]Department of Plant Science and Crop Protection, University of Nairobi

[2]School of Biological Sciences, University of Nairobi , P. O. Box 30197,0100 GPO, Nairobi, Kenya

Email: fluxali.alex@gmail.com

Kenya is the largest exporter of the world's finest French beans from Sub-Saharan Africa and more than 80% is produced by small holder farmers. French bean export volume has remained below potential and about 1.23% of export market share has been lost over the last five years due to failure to meet phytosanitary and quality requirements. Pests including bollworms, whiteflies, leaf miners, spider mites, thrips, rust and anthracnose are a major challenge. Growers have in the past excessively used synthetic pesticides to manage the pests leading to high levels of pesticide residues. In addition, contamination of pods with harmful organisms has affected access to the European markets. Consequently, sampling and inspections for residue analysis has been increased by 10% resulting in delayed deliveries. Therefore, there is need to develop approaches to overcome the phytosanitary and quality challenges to enhance competitiveness of French beans. These include the use of non-synthetic chemical options such as potassium salts of fatty acids, diversified cropping systems, botanicals and microbial antagonists. Sustainable agricultural practices should be promoted such as modification of spray regimes to incorporate less harmful bioproducts that preserve natural enemies to pests such as predators and parasitoids. There has been intensified research to develop new IPM approaches such as development of snap bean varieties with multiple disease resistance, evaluation of pheromones and kairomones, mass production and formulation of natural enemies, entomopathogens and microbial antagonists. Early detection of MRL non-compliance in produce has been improved through accreditation of KEPHIS laboratory for residue analysis while there is increased capacity building initiatives to create awareness among growers and other stakeholders. The diligent adoption of these approaches will contribute to increased export volume that meets phytosanitary and quality requirements, and thereby safeguard Kenya's niche export markets.

Key Words: French beans, market access, pesticide residues, phytosanitary, quality

The Role of Biopesticides in Pest Management, Food Safety and Phytosanitary Compliance

Allan Mweke[1,2]

[1]Humboldt-Universität zu Berlin, Faculty of Life Sciences, Division Urban Plant Ecophysiology, Lentzeallee 55-57, 14195 Berlin, Germany
[2]International Centre of Insect Physiology and Ecology (ICIPE), P.O. Box 30772-00100 Nairobi, Kenya.

Email**:** amweke@icipe.org

There is increasing concern on food safety in relation to use of pesticides due to associated health risks and this has been accelerated by consumers demand for safe food and environment. This has led to development of strict standards for allowable pesticide residues in agricultural produce. These standards are being reviewed regularly downwards every few years. The smallholder resource poor farmers are the most affected by these regulations since they are the majority producers of fresh produce for export and the cost of compliance to these standards is high. This situation has called for search for alternative pest management products. Biopesticides are emerging as promising alternative pest management approach because they are environment friendly, do not harm beneficial arthropods, are highly specific and some have ability to reproduce once applied thus eliminating need for repeat applications. Biopesticides also have lower chances of development of resistance by target pests. These products do not leave residues on produce hence are safe to human and have no requirements for post-harvest intervals and hence are suitable for fresh produce like fruits and vegetables which have short periods in between harvests and which are attacked by many pests and diseases therefore requiring repeated applications of pesticides. Currently there is a lot of focus on research and development of biopesticides and their market share has been on upward trend, however, the rate of adoption by smallholder producers is low. There is therefore need to develop an enabling policy and regulatory environment to ensure these products once developed reach the end users who are the smallholder farmers as this will help them to improve productivity and solidify Kenya's position and competitiveness as a leading horticultural exporter.

Key words: Biopesticides, food safety, pesticide residues, smallholder farmers.

Industry Viewpoints towards International Phytosanitary Standards Compliance

Gerald Musyoki N

Flamingo horticulture Kenya limited,

P.O box 10200 -00100, Nairobi, Kenya

Email: Gerald.Nyumu@flamingo.net; gerrym22001@yahoo.co.uk

This paper explores some areas of concern by the industry with regard to the implementation of the WTO SPS measures within agro supply chains for developing countries. The agro industry sectors level of competitiveness is largely dependent on enhanced business opportunities which lead to increased food security but this goal can't be achieved unless the private sector players are able to pursue increased business opportunities under proper solid regulatory frameworks. Sanitary and Phytosanitary standards are among the many factors affecting competitiveness in agricultural commodities trade, and whereas SPS measures serve as a source of competitive advantage, to most developed countries they have come into focus in developing countries where they are seen as barriers to fair international trade which impacts on trade policy formulation by governments and the marketing strategies adopted by the private sector. While appreciating the vital role that regional NPPOs have played in facilitating trade specifically in the areas of pest diagnosis, early warning systems, surveillance and certifications at border points it's the industries view that some more collaboration and involvement of the private sector is necessary in the areas of PRA and the management of rapid response incidents where interceptions are involved. At a global level there is a need to work more on harmonizing SPS standards especially where IPPC has provided discretion to national NPPOs to determine the best approach to adopt in localized situations. This would also require benchmarking SPS standards with the market driven private standards impacting on Phytosanitary concerns so that the basic principles of transparency, equivalence of measure and non-discrimination between trading partners don't crop up while at the same time enhancing the spirit of trust between the private sector and NPPOs.

Key words: WTO SPS measures, agro supply chains, food security

9.8 Session 8: Emerging Phytosanitary Issues, capacity building and communication

The Standards and Trade Development Facility (STDF): a global partnership in SPS building

Roshan Khan[1]

[1] Standards and Trade Development Facility, World Trade Organization, 154 Rue de Lausanne, Geneva, Switzerland

Email: roshan.khan@wto.org

The STDF is a global partnership established by the FAO, OIE, World Bank, WHO and WTO. The partnership aims to enhance capacity of developing countries to implement SPS standards, guidelines and recommendations and ability to gain and maintain market access. The presentation will briefly outline the history and structure of the STDF. It will highlight STDF's value added as a global coordination/knowledge hub and as a mechanism to support and fund SPS project development and implementation. STDF's recent cross-cutting thematic activities, including research work on Trade Facilitation in the context of the SPS Agreement will be presented. This work has sought to identify, analyse and foster dialogue on experiences, lessons and good practices to improve the implementation of SPS controls in way that facilitates safe trade, while minimizing transaction costs. Information will be provided on STDF supported project development and implementation. The presentation will focus on results of some key STDF projects in the area of plant health.

Regional SPS Frameworks: Is Africa Doing Enough?

Andrew Edewa

Standard and Market Access Programme (SMAP)

Email: andrewedewa@gmail.com

Countries often require the compliance of imported agricultural products with their national sanitary and phytosanitary (SPS) regulations. Government agencies at the national and local levels lay down thousands of regulatory standards to protect the health and ensure the safety of the population, to promote production and to conserve the environment. Such measures can become obstacles to trade if they differ widely between countries. Regional Economic Communities (RECs) the East African Community (EAC) are useful arrangements to promote trade and development between countries. In particular, they can promote harmonisation of SPS regulations and establish regional SPS compliance infrastructure. However, regional SPS frameworks can become an additional constraint to countries if their policies, procedures and programmes do not facilitate transactions by private sector. This study was conducted in 2014 to assess the scope and performance of Regional SPS frameworks in Africa using an institutional analysis methodology with a range of socio-economic tools across the eight RECs in Africa. For each REC, the study gathered and analysed information on their SPS policies and institutions. Overall, SPS compliance infrastructure across the 8 RECs and in their member countries is inadequate. Moreover, the capacity of regional SPS frameworks to sustainably support compliance with SPS standards is weak, particularly in the phytosanitary area. More specifically, regional agricultural and trade policies emphasize on boosting agriculture and trade but strategies to address SPS risks are not adequate. While there is a drive towards development and strengthening of SPS institutions, their linkages and collaboration with international SPS frameworks is sub-optimal. Investments in SPS compliance infrastructure have received low priority in government budgeting compared with recurrent expenditure in individual countries, except for technical assistance programmes from development partners. In conclusion, while RECs open up opportunities for increased intra-Africa trade, African countries continue to face serious SPS related challenges in trade and development. SPS related concerns remain a major obstacle to boosting Africa's agricultural productivity and trade. Africa must put its house in order by establishing the SPS requisite conditions for facilitating agro-food trade. Emphasis should be on conducting systematic assessments of SPS capacity development needs; boosting understanding of the main SPS constraints and possible responses; strengthening SPS institutions at regional and national levels; and supporting private sector to produce goods that meet set SPS requirements without excluding smallholder producers.

Key words: Regional SPS frameworks, SPS Institutions, SPS Compliance, SPS Capacity

Technical Assistance and Implementation of Sanitary and Phytosanitary Standards: Towards Market Compliant Horticultural Exports

Kigamwa J.N.[1], Kyalo D.N[2] & Kimani E.N.[1]

[1.] KEPHIS, P.O. Box 49592-00100, Nairobi, Kenya
[2.] University of Nairobi, College of Education and External Studies, Faculty of External studies, Kikuyu, P. O. Box 92 - Kikuyu, Kenya

Agriculture is the mainstay of the Kenyan economy with an annual direct and indirect contribution to the GDP of 24 percent and 27 percent, respectively. Horticulture is among the leading contributors to the Agricultural GDP at 36 percent. Agricultural exports (i.e. tea, horticulture, coffee and tobacco) contributed 45 % to total exports from Kenya in 2015; with the share of horticultural exports over total exports being 17 %. Kenya is a major exporter of horticultural produce to international markets especially to the EU. The success of Kenya's horticultural exports can partly be attributed to complying with international market requirements like sanitary and phytosanitary (SPS) requirements but there are challenges of meeting these requirements. Kenya's horticultural exports are being threatened by inability to comply with SPS measures imposed by importing countries. These include interceptions due to the presence of harmful plant pests, non-compliant documentation and exceedances of pesticide Maximum Residue Levels. Increased awareness of food safety issues has led to intensive use of SPS and quality-related regulations and standards, imposing a burden on exporting countries worldwide. The purpose of this study was to review journal articles and other papers on five distinct independent variables linked to technical assistance i.e. transfer of knowledge, compliance infrastructure, training, research and monitoring of SPS measures in the context of technical assistance; there was one dependent variable on implementation of SPS measures and the role they play on horticultural exports compliance to SPS market requirements. 37 papers were reviewed. The theory of change has been used to explain the role played by technical assistance in bringing change in the arena of SPS implementation. According to the reviewed articles, technical assistance is necessary as SPS measures keep changing due to the need to address new and emerging SPS risks, and exporting developing countries will need support to meet such dynamic measures. In conclusion, all five variables assessed showed a positive contribution to SPS compliance.

Key words: Technical assistance, SPS, theory of change, compliance infrastructure, training, transfer of knowledge, research and monitoring.

Maize Lethal Necrosis Disease: Surveillance Report for Zambia

Mable Mudenda

Zambia Agriculture Research Institute, Plant Quarantine and Phytosanitary Service

Email: banji.mudenda@gmail.com

Maize is the principal staple food in Zambia. It comprises the country's dominant agricultural activity being the most popular crop. In the 2014/2015 season, the country exported 876,738mt surplus maize grain and 120,000mt seed maize within the SADC region and COMESA member countries. The presence of Maize Lethal Necrosis Disease (MLND) in the region is of great concern to Zambia. The disease is caused by the combination of Maize Chlorotic Mottle Virus (MCMV) and any member from the potyvirus group. This disease is new to the region and is highly trans-boundary in nature. It threatens maize production in the country and may have significant negative impact on the food security and economy if introduced. The Plant Quarantine and Phytosanitary Service (PQPS), the National Plant Protection Organization (NPPO) of Zambia has undertaken countrywide surveillance since 2015 to establish the occurrence of the disease in the country. A total of eight provinces of Zambia have being visited with 257 fields surveyed and sampled. The methodology used involved the administration of a questionnaire to farmers and the use of rapid field assessment for Maize Chrolotic Mottle Virus (MCMV) using AgriStrip test strips. The surveillance detected the presence of MLND vectors such as the maize stalk borers (*Busseola fusca)*, black beetles *(Heliothis sp)* and aphids (*Aphis spp)*. The alternative weed hosts of concern for MLND identified included napier grass (*Pennisetum purpureum*) *and* guinea grass (*Panicum maximum*). It was further discovered that 50% of the farmers plant local varieties while 20% plant recycled seed and 90% do not practice crop rotation, all these practices can exacerbate the spread of the disease if detected in the country. The non-detection of MLND in the surveillance programs conducted is good news for the Zambian export market and the country's food security. Prudent and stringent plant biosecurity measures need to be put in place and adhered to by all stakeholders in the country if this status is to be maintained.

Key words: Surveillance, potyvirus, disease, trans-boundary, export, food security, Plant bio-security.

Maize chlorotic mottle virus in Maize seed in Kenya

Kimani E[1]., *__Wangai A[1]__., Miano D[2]., Macharia I[3]., Mugambi C[1]., Wamaitha J[1]., Too A[1]., Monjero K[1]., Cherono M[1].

[1]Kenya Agricultural and Livestock Research Organization (KALRO)
[2]Department of Plant Science and Crop Protection, Faculty of Agricultural Sciences, College of Agriculture and Veterinary Services, University of Nairobi
[3]Kenya Plant Health Inspectorate Service (KEPHIS)

Maize chlorotic mottle virus (MCMV) was first reported in Kenya in 2011. The effect of this virus in combination with a cereal potyvirus causes the Maize lethal necrosis disease, which has been reported to cause up to 100% maize yield loss. Transmission of the virus is by vectors, manually and seed. Seed transmission by seed has been reported at very low amounts of 17 of 42,000 plants (0.04%) from twenty five seed lots in Hawaii. However, the rapid spread of the disease in the Eastern and Central Africa region led to the need to understand the transmission of MCMV by seed, since seed is the main germplasm exchange mode globally. In this paper, we present preliminary results of detection of MCMV- Kenya isolate in maize seed obtained randomly from thirteen counties in the country. A total of 436 samples were collected in year 2015, incorporating 55 seed varieties, having different lot numbers, and from 17 different companies. Four hundred seeds per sample were planted in KALRO-Kabete seed lab, and stringent conditions employed to avoid infection of the samples. The grow-outs were harvested after 7-10days, and the samples bulked into one composite sample. Total RNA was extracted using CTAB method, and the quality and quantity confirmed. Real Time PCR was used to detect MCMV using primers designed for the coat protein of the virus. Out of the 355 samples tested so far, the preliminary results shows about 20% of the samples are positive for MCMV on real time PCR. It is concluded that MCMV is present in the seed in Kenya. Further analysis and seed transmission studies are on-going and the information generated will contribute to management of MCMV transmission through seed.

Prevalence of Maize Lethal Necrosis Disease in Major Maize Seed Production Areas in Kenya

Waithera. J[1], Miano, D[2], Macharia, I[1], Ngundo, G[1]., Momanyi, G[1]., and Maina, W[2].

[1]Kenya Plant Inspectorate Service, P.O. Box 49592, Nairobi

[2]University of Nairobi, Faculty of Agriculture, Department of Crop Production and Plant Protection, P.O. Box 29053 Nairobi

Maize is the most important cereal crop in Sub-Saharan Africa (SSA) and an important staple food crop for more than 1.2 billion people. In Kenya, maize is the main staple food for over 90% of the population. Pests and diseases are key constraints in maize production. In September 2011, a serious disease outbreak, later diagnosed as maize lethal necrosis (MLN), was reported on maize causing yield losses of up to 126,000 metric tonnes. The disease is as a result of co-infection of maize with *Maize chlorotic mottle virus* (MCMV) and *Sugarcane mosaic virus* (SCMV). The disease is seed borne and is also transmitted by thrips, leafhoppers and beetles. A study was carried out in 12 counties to determine the prevalence of MLND in major maize seed production areas in Kenya. Surveillance was conducted in the maize growing regions and the incidence of the disease determined. This was done using seed maize inspection protocol. Symptomatic samples were collected and analyzed using RT-PCR and ELISA for the presence of the MLND causing viruses. A high incidence of MCMV (62 to 100%) was found in symptomatic samples while SCMV incidence ranged from (22 to 67%) which was slightly lower than MCMV. Muranga, Embu and Meru counties had the highest (100%) incidence of MCMV while Kakamega had the highest (67%) incidence of SCMV. Co-infection with MCMV and SCMV within the counties ranged between 22 to 57 % with Kakamega having the highest SCMV and MLND disease incidence. A total of 29 varieties were sampled and analyzed for the viral and disease incidence. A least 71% of the samples analyzed had MCMV, 44% had SCMV and 33% were co-infected with both viruses. Eighteen varieties were found to be co-infected with both viruses. The survey results indicate that MCMV is widely distributed within the maize growing regions and most of the maize varieties are susceptible to infection with the virus. MLN incidence was significantly high within the counties and among varieties. Therefore, there is need to establish the role of seeds in disease transmission.

Keywords: Maize seed, Surveillance, Maize Lethal Necrosis (MLN)

First Report of *Tuta Absoluta* (Tomato Leaf Miner) in Zambia

Abass M.S.L

Zambia Research Institute
Email: viczhane@gmail.com

Tomato is one of the most important vegetable crops in Zambia grown both on a small scale and commercial scale as a cash crop. Studies show that tomato is one of the top five crops dominating smallholder systems which accounts for 86% of the total value of fresh fruit and vegetable sales within the smallholder sector for Zambia. *Tuta absoluta* (Lepidoptera: Gelechiidae), the tomato leaf miner has caused significant economic losses for tomato farmers in Africa. *T. absoluta* is a small moth 7mm long, brown or silver colour with black spots on wings. Its life-cycle has four stages: egg, larva, pupa and adult. Adults usually lay eggs on the underside of leaves or stems which hatch into young larvae. The larvae penetrate fruits of hosts (i.e. tomato) and this is the most destructive stage. By 2014, the pest was reported to occur in Algeria, Egypt, Ethiopia, Libya, Morocco, Niger, Senegal, Sudan, Tunisia, Kenya and Tanzania. The spread of this pest southwards, posed a high risk to Zambia. For this reason, the NPPO of Zambia, the Plant Quarantine and Phytosanitary Service (PQPS) initiated a detection surveillance of the pest in reported areas in February 2016. Preliminary surveys using delta traps with Optima Lure, revealed that the pest is present in Northern, Muchinga, Copperbelt, Lusaka, Central and Southern Provinces of Zambia. Identification of the pest was confirmed by observing collected adult moths for key taxonomic features; filiform antennae, brown or silverfish with black spots on the moth wings and moth size. Other factors for identification were; characteristic damage on leaves and fruits; pheromone traps catches and consultation of international experts in Tanzania. Introduction of *T. absoluta* to Zambia has devastated the Zambian tomato production industry both economically and threatens Zambia's food security. Reports received from affected farmers indicate that *T. absoluta* infestation is having huge direct impacts on their production. The pest has since continued to spread due to high production by small holder farmers who regularly move seedlings for propagation across the country. The Zambia Agriculture Research Institute (ZARI), Plant Protection and Quarantine Division (PPQD) through PQPS is working with Zambia National Farmers Union and farmers through the taskforce to address the threat being caused by *Tuta absoluta.* A wider surveillance of the pest has been scheduled. Zambia has also updated its phytosanitary import conditions for tomato since this confirmation and drafted the legislation to regulate movement of tomatoes. Notification for this first report has since been sent to the International Plant Protection Convention (IPPC).

Key words: first report, *Tuta absoluta*, tomato leaf miner

Incidence and Prevalence of Potato Cyst Nematode in major potato growing regions of Kenya

George Ngundo[1], George Momanyi[1], Maureen Mwangangi[1], Ivan Obare[1], Florence Munguti[1], Sammy Muthoka[1], Pamela Kibwage[1], Eunice Ringera[1,] Sospeter Gachamba[1]

[1]Kenya Plant Inspectorate Service (KEPHIS), P.O. Box 49592-00100, Nairobi, Kenya.
E-mail: gngundo@kephis.org

Irish potato (*Solanum tuberosum* L.) is the world's fourth largest food crop after wheat, rice and maize while in Kenya it the second most important food crop after maize. The production of Irish potatoes in Kenya is faced with many challenges including the recently reported potato cyst nematodes (*Globodera rostochiensis*). Potato cyst nematodes (PCN) species are classified as A2 quarantine pests for almost all National and Regional Plant Protection Organisations including EPPO, NAPPO, CPPC and IAPSC. This implies phytosanitary and trade implications in over 100 countries. Potato cyst nematodes have been classified as a quarantine pest in Kenya but have been reported in the country recently in 2014. In order to determine the occurrence and distribution of PCN, both active and passive surveys were carried out in potato growing areas since January 2015. During the active surveys, a questionnaire was administered to capture cropping data while soil samples were taken from each of the selected farms using the standard EPPO soil sampling protocol and analysed in the laboratory for presence of nematode cysts. A total of 162 samples were collected for analysis at the Plant Quarantine and Biosecurity Station, Muguga. Nematodes were extracted from the soil samples using the Fenwick can method. Extracted cysts were analysed using morphological characteristics under a stereo microscope. The results show that there is high prevalence of PCN in many of the sampled regions with a prevalence of over 70%. The number of cysts per 200 cc of soil ranged from 1 to 250 among the samples. The introduction and spread of the pest in other countries is often attributed to the usage of uncertified farm saved seed as well as the movement of high risk materials such as soils on tubers and farm equipment, farmyard manure and building materials. Consequently, there is an urgent need to conduct a more thorough countrywide survey to comprehensively establish the distribution of PCN and to investigate the possible mitigation measures such as instituting strict movement restrictions of risky material as well as the use of resistant varieties in an integrated pest management strategy. There is also need to identify PCN free farms and zone them for seed potato production as a PCN mitigation measure.

Potato cyst nematodes *Globodera rostochiensis* in Kenya: The Way Forward.

J. M. Mwangi[1] and *G.M. Kariuki[2]

[1]Department of Biological Sciences Chuka University, P.O Box 109-60400, Chuka, Kenya
[2]Department of Agricultural Sciences and Technology, Kenyatta University, P.O. Box 43844-00100 Nairobi, Kenya

Email: gmmkariuki@yahoo.com

Potato (*Solanum tuberosum*) plays a significant role in supporting Kenyan economy and alleviating hunger and is now ranked the third most important food and cash crop in Kenya. Potato production is constrained by various factors among them, pests and diseases. Plant parasitic nematodes (PPN) have not been considered to be major threat to potato production in Kenya though there have been reports of root-knot nematode (*Meloidogyne* spp.) infecting potato. The cyst nematode (*Globodera rostochiensis*) is categorized by EPPO as A2 quarantined crop pest. The nematode is a major threat to potato production leading to losses of up to 80% worldwide. A survey of PPN associated with potatoes was conducted in four potato growing areas of Nyandarua County with the aim of identifying and reporting presence of potato cyst nematode. Soils from various purposefully selected farms were pooled together to form four (4) composite samples for analysis. Nematode cysts and second stage juvenile (J2) were extracted from the soil samples. Morphological characteristics of the isolated cysts and J2 were studied and identity confirmed by multiplex PCR test. DNA was extracted from twenty (20) cysts and the DNA amplified using two species specific primers, PITSp4 for G. *pallida* and PITSr3 for *G. rostochiensis* in combination with ITS5 universal primer. PCR was run and the amplified. PCR products were purified and sequenced at the Inqaba Biotech in South Africa and at the university of Bonn, Germany. The generated sequences were BLAST with the previously published sequences in NCBI database. Morphological description of the cyst and J2 from all the four samples matched those of *G. rostochiensis*. Ribosomal DNA-ITS sequence data were matched with all other available data sources in GeneBank and had up to 99.7% match with *G. rostochiensis*. No amplification was produced with the specific primers for *G. pallida*. This is the first report of cyst nematode in Kenya. Result from this study has become a very strong foundation of further research work consisting of a consortium of KEPHIS, KARLO, ICIPE, IITA, State Department of Agriculture and Public universities who are now jointly looking at capacity building, characterization, occurrence, distribution, density and pathogenicity of the nematode in various potato growing areas in Kenya with an aim of managing the spread of nematode and identifying clean sites for certified potato seed production.

Key words: *Globodera rostochiensis*, multiplex PCR, Potato cyst nematode, Management

Phytosanitary Control of genetically modified crops – Kenyan experience

Abed Mathagu[1]

[1]AATF

Many African countries have put in place phytosanitary policies, laws and regulations that provide a platform for research as well as an opportunity for commercial trade in products that are modified using modern biotechnology. The International Plant Protection Convention has developed a phytosanitary Standard; ISPM No 11 which provides for risk assessment of such plants. World over, it is clear that the Phytosanitary community need to think seriously about how risk assessment can be synchronized to ensure that countries issue unified Import permits and phytosanitary certificate that take care of both phytosanitary and biosafety concerns. One such concern is the question of Low level presence envisaged by *Codex Alimentarius* Commission when handling grain and regulated products which have been assessed for risk and safety using the exisiting country systems. Recognition of an approval from a Biosafety Authority is normally accompanying an Import Permit but it is not in all cases clear who it is addressed to in some instances. The role of phytosanitary Authorities – NPPO who will ordinarily have the mechanism to communicate the existence of the attachment on the import permit to counterpart authorities and whether such synchronous processes exists should be clear. It is not unusual for one to be granted approval or clearance by one agency only to find a different agency down the regulatory chain with fresh and time consuming conditions. The environment is therefore ripe for large scale movement of genetically modified plant products and this calls for clear harmony between the Phytosanitary and Biosafety Standards and the agencies implementing the standards. The author has used information based on experience in movement of research material, literature review and existing data from the Water Efficient Maize for Africa Project to develop the content herein.

Key words: Phytosanitary and Biosafety standards, genetically modified

9.9 Poster Session

1. Distribution of *Bemisia tabaci* and other Whitefly Species in Major Horticulral Production Areas in Kenya

Macharia I[1]., Heya, H[1]., Momanyi, G[1]., Koech A[1]., Muriithi, D[2]., Mweke, A[2]., Gachamba, S[1].

[1]Kenya Plant Health Inspectorate Service (KEPHIS), P.O. Box 494592, Nairobi
[2]International Centre for Insect Physiology and Ecology (ICIPE), Nairobi

Whiteflies have been reported as important pests in many horticultural crops. Their importance a virus vector of a wide range of viruses has led to interest in understanding their distribution. A survey was undertaken to determine the distribution of *Bemisia tabaci* in major horticultural areas in Kenya. A total of 26 districts representing 17 counties were surveyed during the survey and whitefly samples were collected from different crops across all the growing stages. Fields were randomly selected and whiteflies were observation alond fixed transects where different host plant were inspected for the pest and *whitefly* samples collected using an aspirators into ethanol. Collected samples were submitted to the laboratory for identification at the Plant Quarantine and Biosecurity Station, Muguga where identification was done using morphological identification using whitefly keys. Samples were refered to national Museum and ICIPE for confirmation. Five whitefly species were identified from samples that were collected *B. tabaci, Aleurodicus disperses, Trialeurodes vaporariorum, Aleurocanthus woglumi, Aleurodicus spp,*. Out of the collected samples, 62.4% were *Bemisia tabaci*, 25.9%, *T. vaporariorum*, 9.8% *Aleurodicus species*, 1.6% *A. disperses* and 0.1% *A. woglumi, B. tabaci* and *T. vaporarium* were observed on tomato, cassava, sweetpotato and curcubuits amngo other while the rest had a low host range. *B. tabaci* and *T vaporariorum* were collected in almost all the districts surveyed indicating that the two whitefly species are widely distributed in most of the production areas.

Key words: Vector, Interception, whitefly, virus transmission, horticulture

2. Efficacy and Safety of *Fusarium Oxysporum,* A Biological Control Agent of Witchweed *Striga Hermonthica* in Maize in Western Kenya

Edith Avedi

KEPHIS

Email: eavedi@kephis.org

The production of maize, a major staple food crop in Kenya is seriously constrained by the parasitic witchweed *Striga hermonthica*. Management of *Striga* through methods such as weed-tolerant cultivars, cultural practices and chemical control using herbicides has not been fully effective. Therefore, phytopathogenic *Fusarium oxysporum* f. sp. *strigae* strain 'Foxy 2' that cause's wilt disease of *Striga* species in Ghana is being developed for biological control of *Striga* in Kenya. Before commercialization, efficacy and safety data need to be generated locally. To avoid any phytosanitary risk of the biological control agent, research was conducted in post entry quarantine (PEQ) facilities established at four sites in western Kenya in line with ISPM 34. The treatments included two maize varieties, each of them either treated with Foxy 2 formulated in seed coating substance (Gum Arabic), with Gum Arabic only, or a control (untreated seeds). Data was collected over seven sampling periods on maize plant growth, yield, *Striga* germination rate, *Striga* wilt incidence and severity. *In vitro* assessment of the effect of rhizosphere and endophytic microbes from maize and *Striga* on the growth of Foxy 2 was conducted under laboratory conditions. Fungal colonies were assessed for their inhibitiveness to Foxy 2. There was no significant difference in all assessed parameters from plants grown from seeds coated with Foxy 2 and the ones without. Most endophytic and rhizosphere microbes assessed were found to inhibit the growth of Foxy 2 *in vitro.* Growth and developmental parameters of maize assessed in this study were not constrained by Foxy 2. Foxy 2 was found to be predominantly safe on maize, but its efficacy in controlling *Striga* was not evident in Kenyan soils similar to observation made on the fungal isolate in Nigeria. Though the isolate was reported to be host specific, host range studies done in Nigeria indicate that Foxy 2 is pathogenic to Solanaceous plants hence the need to use PEQ to minimize phytosanitary risks. There is need for further investigations on the biological control agents and check the possibility of using native strains of *Fusarium oxysporum* isolates.

Keywords: *Fusarium oxysporum*, *Striga hermontica*, PEQ, Biological control agent, maize

3. Emerging Challenges and Market Requirements

Lucy Nyathogora Ngatia

Kenya Plant Health Inspectorate Service (Kephis), P.O. Box 2129-60100, Embu, Kenya

Email: lngatia@kephis.org

Agriculture is the pillar of most developing economies. For Sub-Saharan Africa, it is the biggest sector, accounting for 15% of the regions overall GDP, an equivalent of more than $100 billion per year. The sector contributes heavily in building the economy, and is a source of sustenance for majority Africans. The continent, with 53 countries has heterogeneous market structure. Economists have segmented Sub-Saharan Africa markets into four tiers i.e. in relation to market potential and competitive dynamics. However, in-spite of its enormous significance, the sector, all the world over, undergoes similar challenges and researchers have single out several factors stifling agricultural growth like weak institutions, market failure, and government protection as the weak points. Today, unlike in the last few decades, the plight of agricultural growth in the continent is believed to have been worsened by new and emerging challenges relate to several causes. Top in the list is marginalization, brought forth by global market integration; liberalization; technology and institutional changes. Intensification of International Regulatory Framework (SPS & TBT matters) as stipulated by the WTO Agreements only makes the situation worse as developing nations find it more challenging to access the lucrative markets owing to high investments involved. It is broadly assumed that agricultural markets in sub-Saharan Africa more often perform poorly due to inadequate infrastructure, insufficient credit, weak currency, lack of market information and low productivity, all leading to ineffective performance. This has been made clearer through experimental studies geared towards analyzing the extent of regional participation of agricultural markets through adoption of 'time-series' price data. More importantly, a recent proposed analysis for market competence includes both price and non-price data to help in the illustration of market function. In the case of emerging challenges and market requirements, it is notable that the double burden of food safety and agricultural health standards are increasingly becoming important, as developing nations strive to achieve excellence resulting from potential impacts on public health, informed consumer awareness, food security and trade competitiveness. Furthermore, research scientists have lately recorded an upsurge in crop pests and diseases, a predicament attributed to sporadic weather changes such-as intensified rainfall, often alternated with severe droughts and extreme temperature levels. The emergence of new pests and diseases, some of which had been thought to have disappeared re-emerging, has complicated the situation further. However, against all the odds, there are still great opportunities for sub-Saharan Africa. New technologies will transform African agricultural systems and enhance compliance with market access requirements. Better still, opportunities in the universal markets and rational ratification of trade agreements can benefit indigenous farmers in the continent if policymakers focus on their potential role of sector support. The study was set to analyze emerging challenges and market requirements seen to cripple small-medium scale farmers, in their effort to access the high-end markets amidst new market trends and an enlightened consumer base. The study employed a combination of relevant literature reviews and critical analysis on continent case studies on agriculture production and market trends.

Key words: Emerging challenges – Market requirements – agriculture production – Market access

4. Import control to prevent introduction and spread of quarantine pests

N Tefania[1], J Syanda[1] & Njagi Esther[1]

[1] Kenya Plant Health Inspectorate Service (KEPHIS) P.O. Box 49592 Nairobi Kenya

Email: tnikuze@kephis.org

Imports of plants and plant products is the most common pathway through which pests and diseases are introduced and spread across , countries and continents. In the history of virology, farmers observed variegated jasmine and thought it was beautiful so they grafted it with other healthy plant in order to obtain the beautiful color breakage unknowingly to them the color breakage was caused by a virus which later became a mayhem in management and up to this date there is no available pesticide known to control the virus. A country's agriculture is strong as its import and quarantine regulatory system. Once a pest or diseases is introduced in a country it is difficult to eradicate it as there are cost implications involved. The Kenya Plant Health Inspectorate Service (KEPHIS) is the national Plant Protection Organization mandated to coordinate plant health matters. The Competent authority has therefore laid down procedures to be followed before import of any plant material. Plant import permit is an official document issued by KEPHIS to the country of export stating import conditions which have to be met before shipping. Imports of plants, plant products and regulated articles are classified into four categories which include quarantine import, permit import, prohibited import and regulated articles and border control. All this measures are key in protecting a country agricultural sector Importation of biological control articles in Kenya is subject to approval by a specialized committee (KSTCIE) set up to evaluate imports and exports of such nature. There is a need to continually improve the import systems so as to protect agriculture as a way of enhancing food security.

Key words: Import control, pathway, quarantine,

5. Incidence of Passion fruit woodiness disease in passion fruit nurseries in Central Kenya and Nairobi region

George Momanyi[1], Maureen Mwangangi[1], Ivan Obare[1], Florence Munguti[1], Jully Nyapur[1], Stephen Khisa[1],

[1]Kenya Plant Inspectorate Service (KEPHIS), P.O. Box 49592-00100, Nairobi, Kenya.

Email: gmomanyi@kephis.org

Passion fruit woodiness disease is one of the most devastating disease in passion fruit production in Kenya. The disease causes up to 50 % reduction in yield and nursery certification has been identified as one of the effective management strategies. However, passion fruit nursery inspection in Kenya has been carried out based on visual inspection due to lack of a diagnostic protocol for woodiness viral disease which has led to increased cases of the woodiness disease at farmers' level. With the recent development of accurate molecular diagnostic assays to detect these viruses based on Loop mediated Isothermal amplification (LAMP) and Real-time PCR (RT-PCR), a survey was carried out in January 2016 in Nairobi and Central Kenya regions to establish the incidence, prevalence and severity of passion fruit woodiness disease in passion fruit nurseries. A total of twenty two nurseries were inspected and sampled for woodiness disease identification. Disease incidence was determined by considering the ratio of the number of seedlings with symptoms to the number of seedlings examined, disease prevalence was estimated as the proportion of nurseries having disease to the total number of nurseries whereas severity was determined using a scale of 1 to 5 with; 1 = no symptoms, 2 = mild symptoms, 3 = moderate symptoms, 4 = severe symptoms and 5 = very severe symptoms. Thirty five representative symptomatic and asymptomatic samples with the latter at a pre-determined proportion were collected. Seventy eight percent of the inspected nurseries had seedlings exhibiting symptoms of the woodiness disease and 45% of the samples collected tested positive for Ugandan Passiflora virus (UPV) associated with woodiness disease in Kenya. The positive samples were sourced from Kirinyaga, Nyeri and Muranga counties. However the samples sourced from Kiambu and Nairobi were found to be negative for the virus. In the severity scale of 1-5, the severity of the disease in the counties the virus was detected was 3 (moderate symptoms). The survey revealed that most of the passion fruit nurseries located in Central region are infected with woodiness virus hence the need to step up nursery certification with the newly developed molecular methods on a countrywide basis. Furthermore, there is need to create awareness on the need to use certified planting material in order to control the negative effect of woodiness virus in passion fruit production in Kenya.

Key Words: Passion fruit woodiness disease, incidence, prevalence, severity

6. Promoting better rice yields through improvement of rice seed system in Kenya.

Yvonne. A. Mutinda[1], James W. Muthomi[1], George N. Cheminig'wa[1], John M. Kimani[2] & Florence Olubayo[1]

[1]Department of Plant Science and Crop Protection, University of Nairobi; P.O. Box 30197, 00100 GPO Nairobi, Kenya
[2]Kenya Agricultural and Livestock Research Organization

Email: agnesvonne@gmail.com

Rice is a major food crop, source of income and sustains livelihood for over 300,000 local small holder farmers in Kenya. Rice yields have been low due to pests and diseases which cause up to 37% yield loss. In addition, use of poor quality seeds and agronomic practices has led to reduction in yields. This study was carried out in Mwea irrigation scheme to determine the rice seed systems in Mwea irrigation scheme. Information was collected rice varieties grown, sources of seed, pests and diseases, seed production, handling and treatment. Rice seed samples were also collected and analyzed for physical purity, germination and seedling infection. In some regions, over 50 % of the farmers do not use certified seed. Rice blast was the main disease reported by majority (57.6%) of the farmers and none of the farmers treated seeds before storage or planting. All the rice seed samples had purity levels purity below the recommended 99% but had germination of more than the recommended 70%. The seeds resulted in seedlings that showed symptoms of seedling infection. The study showed the need of creating awareness on importance of using certified seed, seed selection and treating seeds before planting. This would reduce seed borne diseases. Involvement of private sector in production and distribution of high quality seeds needs to be encouraged.

Keywords: Rice, seed system, informal seed system, certified seed, seed quality

7. Status of the False Codling Moth (Thaumatotibia Leucotreta) in Avocado Production Farms in Kandara Area of Muranga County

George Momanyi[1], Hellen Heya[1], Jane Kamau[1], Isaac Macharia[1] & Sospeter Gachamba[1]

[1]Kenya Plant Health Inspectorate Service, P.O Box 49421, Nairobi

Email: gmomanyi@kephis.org

False Codling Moth/FCM (*Thaumatotibia leucotreta*) is an emerging regulated pest in the fruits and vegetables crops from Kenya destined for export. It has been a target pest for quarantine restrictions and interceptions in the EU market since 2014. Although avocado is listed as host of FCM, there is no data on the pest damage on this crop in Kenya as well as its ability to reproduce in the fruits. Such data is critical in market access negotiations for Kenyan avocado fruits destined for foreign markets that have listed FCM as a quarantine pest as well as for institution of appropriate management measures of the pest at farm level. A survey was therefore conducted on representative farms in major avocado export production zones of Kandara in Murang'a County in January 2016. Yellow delta traps baited with a pheromone lure in a mixture of (Z)-8-Dodecen-ol acetate and (E)-8-Dodecen-ol acetate and at a ratio of 50:50 were set out at the site of the detection and in each square mile in the first and second buffer areas in a standard grid array. The traps were suspended from the tree limbs at a height of 4 ½ feet (1.5 m) and monitored for three days. The avocado farmers' knowledge on the pest was also established through a questionnaire. The damage on avocado fruits was assessed by visual inspection and the symptomatic fruits were collected and taken to KEPHIS, Muguga for incubation. The trapped FCM adults were collected, identified and further verification was performed at ICIPE. In all the farms visited, the fruits showed symptoms of FCM infestation through damaged skin, with the damage prevalence ranging between 40-60%. Moreover, all the interviewed farmers lacked the knowledge of FCM and as a result, no IPM practice was in place. The incubation of fruits with visible pest damage did not however produce any larvae. The survey results indicate occurrence of FCM in avocado production in Kandara and suggest an inconclusive link between the damage observed on fruits and FCM attack. There is therefore need to create awareness on the management of FCM in avocado production areas in order to avert potential restriction of Kenyan avocado produce in foreign export markets where FCM is a quarantine pest. There is also need to conduct more studies for purposes of conclusively linking the high damage observed in avocado fruits to FCM attack.

Key Words: False codling moth, avocado, damage, prevalence

8. Strategies for Management of Plant Parasitic Nematodes in Banana Productions in Embu County

Augustus Kivi[1], W. M. Muiru[2], J. W. Kimenju[2]

[1]Kenya Plant Health Inspectorate Service (KEPHIS), P.O Box 49592-00100 Nairobi, Kenya
[2]University of Nairobi (UoN) P.O Box 30197 - 00100, Nairobi, Kenya

Email: akivi@kephis.org

Plant parasitic nematodes are important pests of bananas with *Radopholus similis, Pratylenchus loosi*, *Meloidogyne spp* and *Helicotylenchus spp* reported to cause significant losses in banana production. Majority of banana farmers use nematicides as an option for management of these parasitic nematodes. However, these chemicals are under restricted use and most of them have been banned from use due to their adverse effect on human, animal and environment. A study was conducted in Embu County to determine other options for management of plant parasitic nematodes in banana orchards. Samples of soil and roots were taken in banana orchards where different agronomic practices had been applied. The agronomic practices were irrigation, mixed cropping, manure and use of nematicides. Field trials, with five treatments of soil amendments in banana stools, were also conducted in two seasons for four months under Randomized Complete Block Design (RCBD). Soil amendments used were cow manure, chicken manure, goat manure and compound fertilizer. The treatments were replicated three times and samples for both soil and roots taken. Nematodes, both free living and parasitic, were extracted from the samples and identified to genera level. Data collected was then analyzed for variance. Nematodes population, for both free and parasitic, was lower in samples collected from orchards where various agronomic practices had been applied. The population was also lower in samples collected from treated banana stools. In this study, it was found that parasitic nematodes in banana orchards are wide spread in Embu and application of agronomic practices and uses of soil amendments significantly reduce their population in banana orchards. This research established that there is a need to implement efforts aimed at educating farmers on use of soil amendments and agronomic practices in management of plant parasitic nematodes in banana production.

9. Promoting availability of Quality Seed Potato through innovative seed delivery strategies

Oyoo J, Ng'ang'a, N, Nyongesa, M, Kinyae P, Karinga, J. Pwaipwai, P, and Ngaruiya, J

KALRO Tigoni, P.O. Box 338-0217 Limuru.

Email: moses.nyongesa@kalro.org

The challenge of availing quality seed potato to growers remains the most limiting constraint to potato production in Kenya. On average, yields obtained seasonally from a hectare range between 7 and 15 ton/ha against a potential of over 40 metric ton/ha according to the economic review of agriculture 2015. The estimated national certified seed potato requirement is 300,000 metric tons annually. However, less than5% of this demand is met by the formal seed potato supply system. The shortfall is met by the informal seed supply system which is characterized by lack of quality assurance mechanisms. The legislation that governs potato seed and varieties defines seed only as certified seed and requires mandatory certification. This restricts possibilities for use and improvement of other viable seed supply systems. For example, alternative seed systems such as quality declared seed (QDS) and positively selected seed (PSS) have been proven at research level, piloted in Kenya and are currently in use in Ethiopia. This review highlights the bottlenecks in availing certified seed potato to farmers and proposes possible solutions including how the legal framework can accommodate alternative seed systems. Particularly, the paper recommends a reduction in the number of certified seed classes in potato production, proposes creation of entrepreneurial opportunities for investment in mini-tuber and basic seed production and supply through policy change, and underscores the need for legal recognition and setting up of standards for QDS. Once the legal framework is in place, further gains can be made through increased farmer trainings and accreditation of private inspectors to facilitate the uptake and use of quality seed potatoes.

Key words: Seed potato, seed regulation, quality declared seed, positively selected seed

10. Empowering children on phytosanitary measures and management of pest through children science center Kenya

Kenneth Monjero, Abel Too and Roy Gitonga

Kenya Agricultural and Livestock Research Organization, Children Science Centre Kenya (SCK)

P.O. Box 14733-00800, Nairobi Kenya

Email: *kentrizakari@gmail.com*

Phytosanitary measures are plant health standards set for conformity with import and export standards of plant products and are regulated by the National Plant Protection organization. Kenya exports over 75% of its horticultural and vegetable products to the international market where these stringent measures are keenly taken into account. Children have been left behind on matters of phytosanitary concerns. Science Center Kenya (SCK) seeks to bridge this gap in empowering children through insects awareness, identification, important; for food, human disease vectors and agricultural pests. Management with judicious use of chemicals to safeguard Kenya's natural resources on risks associated with the establishment and spread of pests. Children acquire knowledge which will be shared and disseminated with parents and superiors at home. Through this program, SCK target pupils in their upper classes and high school level. Children are subjected to insect (destructive and beneficial) collection in agricultural fields using simple insect techniques like sweep nets and sedating them in kilner jars. The collected insects are identified using simple keys and grouped accordingly. Partitions are done in the fields and each child is to control entry of any insect from neighboring portions yet neighbors try fighting insects which crisscross boundaries.

Key words: Science center Kenya, phytosanitary, pest, insects

11. Countries collaborate to break SPS related barriers to facilitate trade in the COMESA Region

Florence Chege

CABI

Intra-regional trade within COMESA remains low despite countries having free trade agreements. A major reason is the high cost of doing business as a result of various factors including how SPS measures are administered and implemented. SPS processes both at and behind borders can be complicated and lengthy. Inspections and treatments are costly especially if duplicated or when there are over-stringent requirements arising from unnecessary measures. Further, value chain actors may not have the knowledge or capacity to meet technical requirements. This may be due in part to different countries having differing requirements, but is also due to technical difficulties that some problems, such as animal diseases, present. One effect of high costs of doing businesses is that competitiveness or profitability is reduced. This in turn lures traders to adopt illicit methods that bypass the SPS regulatory functions designed to protect human, animal and plant health, so increasing the risks to public health. With funding from STDF, COMESA is implementing a project, *Breaking barriers, facilitating trade,* whose objective is to reduce trading costs associated with SPS measures for selected commodities (maize, fish, oranges, beef, milk) on selected trade routes in Egypt, Sudan, Uganda, Kenya, Zambia, Zimbabwe and Malawi. The project aims to identify and pilot tools and approaches for simplifying the application of SPS measures, upgrading and harmonising regulatory protocols and standard schemes, and developing the necessary institutional and human resources capacities to facilitate intra–COMESA trade. The project will identify good practices and innovative approaches that can be disseminated and replicated elsewhere in COMESA.

12. Strengthening the Phytosanitary Capacity of the Floriculture Sector in Uganda

Florence Chege

CABI

Uganda's flower industry started in 1992 with three farms and by 2012 had grown to be a significant exporter. However, the sector was not achieving its full growth potential as a result of increased interceptions in consignments arriving in the European Union (EU). This was due to non-compliance to International Standards for Phytosanitary Measures (ISPMs) and the presence of pests regulated in the EU, particularly *Spodoptera littoralis* and *Helicoverpa armigera.* In 2010 the Standards and Trade Development Facility (STDF) and Ugandan government funded a project "Strengthening the Phytosanitary Capacity of the Floriculture Sector in Uganda" to improve compliance with international phytosanitary standards by flower producers and exporters in Uganda. The Department of Crop Protection (DCP) led implementation in liaison with the Uganda Flower Exporters Association (UFEA). DCP's capacity was built through study tours to Kenya and practical training on how to conduct inspections and issue phytosanitary certificates. Twelve new standard operating procedures (SOPs) were developed and issued to inspectors along with a quality management systems (QMS) manual outlining DCP's operations in line with the newly adopted Plant Protection and Health Act 2015. Mechanisms for cooperation between DCP and the flower industry were fostered through joint trainings and dialogue with UFEA which led to stakeholders entering into a partnership agreement. Through the partnership they instituted and began to implement a traceability system and a self-regulating process that included disincentives for non-compliance. A technical task team (TTT) comprised of DCP inspectors and farm scouts was constituted to audit implementation of agreed measures and continue training scouts in pest identification and data collection contributing to sustainability of outcomes. Due to these measures and the good relations built between UFEA and DCP, farms got prompt advice on measures they needed to implement. Subsequently they benefited by realizing greatly reduced interceptions.

13. Survival of viruses causing Maize lethal necrosis disease in crop debris and soil

Rose K. Nyakundi, Douglas W. Miano, Dora Kilalo and Daniel Mukunya

Department of Plant Science and Crop Protection
University of Nairobi

To determine the role of the plant debris and contaminated soil in the epidemiology of the viruses causing Maize lethal necrosis disease, a study was carried out in the greenhouse using chopped plant materials from previously inoculated experimental plants. The treatments were; Sugarcane mosaic virus (SCMV), Maize chlorotic mottle virus (MCMV), SCMV+MCMV, inoculum from the SCMV+MCMV plants (MLN) and the negative control. The varieties used were H614, H513, and Duma 43 representing the hybrids and Kikamba and Kinyanya representing the landraces. The plant materials were incorporated into one set of planting bags while another was left without debris but had the soil previously holding infected plants. This was to access significance on the acquisition of the viruses either from soil alone or with incorporated debris. The plants were assessed for severity using the scale of 1-5 in addition to determining the area under disease progress curve. The percentage incidence was determined by counting the number of plants with disease symptoms divided by the total number per treatment multiplied by hundred. The samples were analyzed using DAS-Elisa with the Agdia kit. There was no significant difference in acquisition of the viruses either from the soil with debris or with none. However, the landraces recorded high disease incidences for most of the treatments and higher disease severity. Additionally, they had a bigger area under disease while on the treatments; SCMV+MCMV combination had a bigger area under disease. On the Elisa test results; most of the samples (58.3%) tested positive for MCMV while none were positive for the SCMV. On the third planting; there were only few plants that showed disease symptoms. Of the tested samples, 28% were positive for MCMV, while none were positive for SCMV. The SCMV symptoms were however very distinct and clear on the plants. The above experiment demonstrates that viruses causing MLN disease can be acquired easily from the soil irrespective of whether there is debris or not or the variety is hybrid a or a landrace so long as there were plants infected before in the same soil. Hence crop rotation is recommended to reduce the recurrence of the disease.

14. Genetic diversity of vectors of Tomato spotted wilt virus in tomato production systems in Kenya

Isaac Macharia[1,2], David Backhouse[1], Shubiao Wu[1], Rob Skilton[2] , Elijah Ateka[3], Solomon Maina4, Moses Njahira[2]

[1]School of Environmental and Rural Science, University of New England, Armidale, NSW, 2351, Australia

[2]Kenya Plant Health Inspectorate Service (KEPHIS), PO Box 49592, Nairobi 00100, Kenya.

[3]Biosciences Eastern and Central Africa -International Livestock Research Institute Hub (BecA-ILRI Hub), PO Box 30709, Nairobi 00100, Kenya,

[4]Jomo Kenyatta University of Agriculture and Technology (JKUAT), PO Box 62000, Nairobi 00200, Kenya

Thrips are primary vectors of *Tomato spotted wilt virus* (TSWV) with *Frankliniella occidentalis* reported as the most important and efficient vector. A study was undertaken to establish the diversity of thrips and presence of vectors for TSWV in four major tomato production areas in Kenya. The cytochrome oxidase 1 (CO1) gene was used to generate sequences from thrips samples collected from tomatoes and weeds, and phylogenetic analysis done to establish the variation within potential vector populations. *Ceratothripoides brunneus* was the predominant species of thrips in all areas. *F. occidentalis* and *T. tabaci* were abundant in Nakuru, Kirinyaga and Loitokitok. Other vectors of tospoviruses identified in low numbers were *F. schultzei* and *Scirtothrips dorsalis*. Variation was observed in *T. tabaci, F. occidentalis* and *F. schultzei.* Kenyan specimens of *T. tabaci* from tomato belonged to the arrhenotokous group while those of *F. occidentalis* clustered with the Western flower thrips G group. The detection of RNA of TSWV in both of these species of thrips supported the role they play as vectors. The study has demonstrated the high diversity of thrips species in tomato production and the occurrence of important vectors of TSWV and other tospoviruses.

10. SESSION 7: DETAILED FIELD VISIT PROGRAM

Thursday, 15th September 2016

Group 1 – Thika	
Time	**Activity**
9.30 a.m. – 12.30 p.m.	**Kakuzi Limited** • Harvesting of pineapple • Packhouse visit to see processing of avocado and pineapple • Treatment methods used • Pest management methods used
1.00 p.m. – 2.00 p.m.	Lunch at Taji Gardens Hotel, Thika
2.00 to 4.00 pm	• Enkasiti
6.30 p.m.	Dinner – Dari Hotel
Group 2: Dudutech and Vegpro Naivasha:	
Time	**Activity**
9.30 a.m. – 12.00 p.m.	**Dudutech Biological Control Facility** • Thrips management • Red spider mite management • White flies management • Soil health management • Pest control products registration and efficacy trials • Laboratory services • Exports • Enhanced root and crop development
12.30 p.m. – 1.30 p.m.	Lunch At Java in Buffalo Mall, Naivasha
2.00 p.m. – 4.30 p.m.	**Vegpro (K) Ltd Farming Division – Gorge Farm** • Opening meeting with management • Visit the farm to see large scale vegetable production
6.30 p.m.	Dinner – Dari Hotel, Karen
Group 3: Oserian Flowers and Dudutech in Naivasha	
Time	**Activity**
9.30 a.m. – 12.00 p.m.	**Oserian Flowers Farm** • Opening meeting with management • Visit the farm to see large scale flower production
12.30 p.m. – 1.30 p.m.	Lunch Options for Buffet with one soft drink At Java in Buffalo Mall (Naivasha)
2.00 p.m. – 4.30 p.m.	**Dudutech Biological Control Facility** • Thrips management

	• Red spider mite management • White flies management • Soil health management • Pest control products registration and efficacy trials • Laboratory services • Exports • Enhanced root and crop development
6.30 p.m.	Dinner – Dari Hotel, Karen

11. SIDE EVENTS SCHEDULE

Date	Time	Activity	Venue	Person Responsible
Monday 12th Sept	5.30 p.m.	Pest Risk Analysis and Surveillance Sensitization forum	Meeting Room	Hellen Mwarey
Tuesday 13th Sept	8.00 a.m. to 12.15 p.m.	Sensitization forum on regulation of biological organisms, products and related articles	ACL Meeting Room	Mellon Kabole
Tuesday 13th Sept	5.30 p.m.	Evening meeting with regulators	Conference hall	Hellen Mwarey
Wednesday, 14th Sept	1.00 to 5.00 p.m.	Seed Certification Sensitization forum	ACL Meeting Room	Simon Maina
Wednesday 14th Sept	8.00 a.m. to 1.00 p.m.	E-Certification Sensitization forum: Phytosanitary Department	ACL Meeting Room	Faith Ndunge
Wednesday 14th Sept	5.30 to 6.30 p.m.	Interceptions of Africa's products in the EU: a case of FCM	Meeting Room	Hellen Mwarey
Thursday 15th Sept	1.00 to 4.30 p.m.	Sensitization forum on MRL issues by ACL Department	ACL Meeting Room	Onesmus Mwaniki
Friday 16th Sept	9.00 a.m. to 2.30 p.m	Sensitization forum focusing on the youth and university students by the PR and communications department	ACL Meeting Room	Catherine Muraguri
Wednesday, 14th Sept	5.30 to 6.30 p.m.	WTO - SPS Capacity Building	Conference Hall	Roshan Khan, STDF

12. EXHIBITORS DETAILS

Kenya Plant Health Inspectorate Service (KEPHIS)

KEPHIS was established under the State Corporations Act (Cap 446) pursuant to Legal Notice No. 305 of 18th October 1996; it commenced operations in 1997 [Order L.N. 305/1996, Corr. No. 50/1997, L.N. 124/1997]; it is under the Ministry of Agriculture, Livestock and Fisheries. The role of the Corporation is to undertake a regulatory role in the agricultural sector by assuring the quality of agricultural inputs and produce to promote sustainable agriculture and economic growth. **Contacts**: The Managing Director; Kenya Plant Health Inspectorate Service (KEPHIS); P. O. Box 49592-00100, Nairobi, Kenya; Tel: +254709891000 ; Email: director@kephis.org; Website: www.kephis.org

Centre Of Phytosanitary Excellence (COPE)

COPE domiciled in KEPHIS was officially launched in October 2010 and since then has trained 954 stakeholders from Kenya and beyond. COPE was established with the rationale that African countries lack effective systems for managing phytosanitary measures at the national level and also lack good regional co-ordination of the implementation of the International Plant Protection Convention – International Standards on Phytosanitary Measures (ISPMs); hence the need to build phytosanitary capacity of African countries from existing strengths within National Plant Protection Organizations. **Contacts**: The COPE Secretariat; C/O The Managing Director; Kenya Plant Health Inspectorate Service (KEPHIS); P. O. Bo 49592-00100, Nairobi, Kenya; Tel: +254709891000 ; Email: director@kephis.org; Website: www.kephis.org; www.africacope.org

Koppert Biological Systems (K) Ltd.

Koppert Biological Systems contributes to better health of people and the planet. In partnership with nature, Koppert make agriculture healthier, safer and more productive. Koppert provides an integrated system of specialist knowledge and natural, safe solutions that improves crop health, resilience and production. Koppert has several products for control of pest and disease. **Contact**: P.O. Box 41852 - 00100, Nairobi, Kenya; Tel: +254 20 2021918 / 4453780/1/2; Mob: +254 731 202191; Fax: +254 20 3744675; E-mail: info@koppert.co.ke / cmacharia@koppert.co.ke www.koppert.co.ke

International Institute of Tropical Agriculture

The International Institute of Tropical Agriculture (IITA) is one of the world's leading research partners in finding solutions for hunger, malnutrition, and poverty. IITA is a non-profit international organization founded in 1967. It is a member of CGIAR and governed by a Board of Trustees. Our award-winning agricultural research for development (R4D) addresses the development needs of the poor and vulnerable in the tropics. We work with public and private sector partners to enhance crop quality and productivity, reduce producer and consumer risks, and generate wealth from agriculture. **Contact**: IITA Headquarters; PMB 5320, Oyo Road, Ibadan 200001, Oyo State, Nigeria; Tel: +234 700800; IITA, +1 201 6336094; Fax: +44 208 7113786 Email: iita@cgiar.org; www.iita.org

Centre for Agriculture and Biosciences International

CABI (Centre for Agriculture and Biosciences International) is an international not-for-profit organization that improves people's lives worldwide by providing information and applying scientific expertise to solve problems in agriculture and the environment. CABI's approach involves putting information, skills and tools into people's hands. CABI has worked in Africa for many years, but in 1995 it formally established a regional centre in Nairobi. CABI's centre in Kenya strives to improve livelihoods, working with the communities that it serves to address the problems they face using sustainable approaches. A key element of the centre's work is helping smallholder commodity growers to produce for and compete in local and global markets. The centre also encourages

rural innovation and helps local users access global information and knowledge. Plant health is safeguarded through a range of initiatives, which include the management of invasive species, work to reduce the transmission of harmful pests and diseases through traded goods, the development of safe and effective biological controls, and Plantwise, CABI's global project to reduce crop losses. The centre works in partnership with many organizations in both the public and private sector, to enable work to be achieved in the most effective and cost efficient way. **Contact**: CABI**,** Canary Bird 673, Limuru Road, Muthaiga, P.O. Box 633-00621, Nairobi, Kenya; T**:** +254 (0)20 2271000/ 20 ; E**:** africa@cabi.org; www.cabi.org

ETG

Founded in Kenya in 1967, ETG has emerged as one of Africa's largest and most respected traders in agricultural products. ETG's footprint expands across sub-Saharan Africa, North America, Europe, the Middle East and South East Asian countries. The Group's supply chain penetrates deep into remote agricultural regions where we procure commodities from smallholder farmers through our strategically located centres. Fertilizers are currently ETG's single largest product line, accounting for a significant percentage of our trading volumes and revenue. Fertilizer flows inwards to Africa's farmers along the same ETG supply chain that transports their commodities outwards. ETG is a "ONE-STOP SHOP" solution for farmers. We supply all their farming inputs such as seeds, agro-chemicals, fertilizers and agronomic services, while purchasing their agricultural outputs. Subsistence farmers sell their surplus crops to ETG and purchase affordable fertilizers and other agricultural implements to further increase their outputs. **Contact**: Ground Floor, Heritan House, Woodlands Road off Argwings Kodhek Road, Hurlinghum, Nairobi, Kenya, P.O. Box 57661-00200; Ph: +254 20 2660880/1/2; Mob: +254 722864205; Fax: +254 026608832; Skype: shem.odhiambo1

International Potato Centre

The International Potato Center, known by its Spanish acronym CIP, was founded in 1971. It is a research and development organization with a focus on potato, sweetpotato, and Andean roots and tubers. CIP is dedicated to delivering sustainable science-based solutions to the pressing world issues of hunger, poverty, gender equity, climate change and the preservation of our Earth's fragile biodiversity and natural resources.CIP is a member of CGIAR. CGIAR is a global agriculture research partnership for a food secure future. Its science is carried out by the 15 research centers who are members of the CGIAR Consortium in collaboration with hundreds of partner organizations. Contact: CIP Headquarter, Av. La Molina 1895, La Molina. Apartado 1558, Lima 12, Perú. ; Phone : 5-11-3496017 ; Email : cip-cpad@cgiar.org; Website : www.cipotato.org

Elgeyo Marakwet county

Elgeyo Marakwet County covers a total area of 3029.9 km^2. It borders West Pokot County to the North, Baringo County to the East, Trans Nzoia County to the Northwest and Uasin Gishu County to the West. The Highlands constitutes 49 percent of the county's area and is densely populated due to its endowment with fertile soils and reliable rainfall. The Escarpment and the Kerio Valley make up 11percent and 40 percent respectively. There is a marked variation in amount of rainfall in the three zones; The Highlands receive between 1200mm and 1500mm per annum while The Escarpment and the Kerio Valley receives rainfall ranging between 1000mm to 1400mm per annum. In altitude, the Highland plateau rises from an altitude of 2700 meters above sea level on the Metkei Ridges in the South to 3350 metres above sea level on the Cherangany Hills to the North. Administratively, the county is divided into four sub-counties, namely: Marakwet East, Marakwet West, Keiyo South and Keiyo North each with several Divisions, Locations and Sub-locations. Politically, the county is divided into four constituencies: Marakwet East, Marakwet West, Keiyo South and Keiyo North and twenty Wards; six in both Marakwet West and Keiyo South and four in Marakwet East and Keiyo North. The county's total population was 370,712 in 2009 (National Population and Housing Census). The inter-census population growth rate for the county is 2.7 percent per annum. **Contact**: Governer, County Government of Elgeyo Marakwet; P.O. Box 220-30700, Iten, Kenya; +254(0)734 220220; +254(0)734 220220; Website: www.elgeyomarakwet.go.ke

Dudutech

Since 2001 Dudutech has been working with farms to develop appropriate biological products for fully Integrated Crop Management systems designed to reduce pesticide use and active ingredients in crops, and improve soil health and long term sustainability in agriculture. Dudutech is committed to playing a positive social and environmental role in all communities that we work in. Dudutech supplies zero residue biological control products for environmentally and socially intelligent farming. Dudutech is not just suppliers of biological pest control products, but delivers the whole range of services that are so essential for the implementation of a low residue, low socio-enviornemntal footprint, fully holistic cost nautral Integrated Crop Management Program. **Contact**: Dudutech IPM Solutions; Kingfisher Farm; Naivasha South lake Road; P. O. Box 1927 – 20117, Naivasha, Kenya; Email: info@dudutech.com; Telephone: +254 50 2020859; www.dudutech.com

SGS

SGS is the world's leading inspection, verification, testing and certification company. We are recognized as the global benchmark for quality and integrity. The SGS network comprises over 1,800 offices and laboratories and more than 85,000 employees around the world. SGS has been operating in Kenya since 1950; today there are 19 office locations the entire country. Contact: Victoria Towers Kilimanjaro Ave Upper Hill; Nairobi, 00200**,** Kenya; +254 20 273 3690 ; +254 20 273 3664

NIC Bank

NIC Capital is a subsidiary of NIC Bank and has its origins in 2006 when the directors resolved to establish an Investment Bank that would support the growing advisory and financing needs of Kenyan and East African corporates. NIC Capital owns NIC Securities Ltd, a Capital Markets Authority licensed brokerage firm and a member of the Nairobi Securities Exchange. NIC Capital looks to bridge the gap between investors and issuers through an enhanced platform of debt and equity issuance that will enable borrowers to meet their financing needs and investors to meet their return objectives through a diversified product array. NIC Capital helps its clients identify and pursue strategic alternatives, to enhance shareholder value, raise capital to meet growth objectives, and develop new ideas and deeper perspectives regarding individual companies and the relevant industry sectors. Through partnerships with group companies including NIC Bank Group, ICEA Lion Group, East African Re and other investors. NIC Capital has the capacity to successfully execute and place significant amounts of both debt and equity offerings. **Contact**: NIC House; Masaba Rd. Upperhill; P.O.Box 44599-00100, Nairobi Kenya; Tel: +254 (20) 2888217; Fax: +254 (20) 2888505; Mobile: +254 (711)041 111/ +254 (732)141 111; Email: customercare@nic-bank.com

Crop Nutrition Laboratory Services Ltd

With 16 years experience, Crop Nutrition Laboratory Services Ltd (CropNuts) is East Africa's most respected agricultural testing laboratory. The wide range of **ISO 17025 accredited** analytical services offers our clients a "one stop shop" for all their testing needs, providing results and advice on time, in professional, user friendly reports. Our laboratory services include testing of soil, irrigation & drinking water, leaf, hydroponic solutions, nematodes, plant diseases, fertilizers, animal feeds and NEMA accredited effluent waste water. **Contact**: P.O. Box 66437 – 00800; Cooper Center, Kaptagat Road, Off Kangemi Flyover, Waiyaki way, Nairobi, Kenya; Phone : +254 736 839933; +254 720 639933; Email: support@cropnuts.com; website : www.cropnuts.com

Agri-Seed Co Limited

Seed Co Limited, is a public listed company incorporated in Zimbabwe and quoted on the Zimbabwe Stock Exchange, is the leading producer and marketer of certified crop seeds in Southern Africa. It has branches in many African countries one of which is Kenya. Its history dates back from 1940 when the Rhodesia Seed Maize Co-operative Company was formed and trace our life to date, where Zimbabwe Seed Maize Co-op Company Limited has stood the test of time, through various challenges and stand proud of our evolution. Seed Co

develops and markets certified crop seeds, mainly hybrid maize seed, but also cotton seed, wheat, soya bean, barley, sorghum and ground nut seed. Most of our hybrid and non-hybrid cereals and oil crop seed varieties are proprietary, having been developed and bred at our research stations through market-oriented research and breeding programmes. Our seed is produced from our own parent seed under contract by an established producer network. Research has been and will continue to be, the cornerstone of Seed Co's success and leading market position in the Southern African region. **Contact**: Agri-Seed Co Limited, Mombasa Road (next to Mabati rolling Mills), P. O. Box 616 – 00621, Village Market, Nairobi, Kenya**;** Phone: +254 20 3228000 / 8046358, Fax: +254 20 8046360, Main contact: Kassim Owino, Email: kassim.owino@agriseed.co.ke

Elgon Kenya Limited (EKL)

Since its inception in 1980, Elgon Kenya Limited (EKL) (formerly: Elgon Chemicals Limited) has endeavored and established itself as a profitable business partner to the Horticultural Floricultural industries in the East and Central regions of Africa. We are the largest agri-input suppliers company in Kenya who can meet almost 90% of farm agri-input especially into floriculture sector. Nevertheless, our company stands top in providing other packaging materials like BoPP flower sleeves, corrugated boxes, self adhesive labels which are all used in exporting flowers to Europe. Apart from above, we are the leading the manufacturers of Jerrycans, Green house sheeting, planting and carry bags, Buckets, Crates. We are the Agri– input supplies stood No 1 in Floriculture sector and firmly establishing in other sectors like Cereals, Seeds, Irrigation sectors, Tea and coffee sectors which farm bulk cultivation in Kenya. We are the exclusive distributors for MNCs like BASF, Dupont, Sumitoma, Cheminova, Excel Crop care Ltd, UPL, Chemtura, Russel IPM & Sinochem Ningbo while on Non-exclusive basis for Bayer E A Ltd, Syngneta E A Ltd, Arysta life Sc., making us the single largest company providing more than 125 original molecules and around 25 generic molecules into Kenya Floriculture industry from different corners of the world. In Packaging, EKL is an ISO 9000 & BRC certified company. It specializes in the manufacturing of Corrugated Flower Boxes, BOPP flower sleeves–Printed and Plain, Green house Sheetings, Planting/Harvesting bags, Strapping Rolls (printed/plain), Jerrycans, Harvesting Crates and Buckets by blow and injection molding techniques, Labels. EKL is also the sole distributor of A.A. Politiv Ltd, Israel: A leading supplier of the green house sheeting in the world. EKL meets more than 95% requirements of flower farms and this makes us the true 'ONE STOP SHOP'. We are not only limited to Kenya but also forayed into our neighbouring countries through our exclusive distributors Tanzania Crop Care Ltd and Uganda Crop Care Ltd in Tanzania and Uganda respectively. **Contact** for Elgon Kenya Limited; National Park East Gate Road, Off Mombasa road; P.O Box 46826 –00100, Nairobi (Kenya); Contact:+254-20-6534410 / 6534810/01/09. Email : info@elgonkenya.com; menaria@elgonkenya.com

Monsanto

Monsanto is an agriculture company with more than 20,000 dedicated employees with a focus on making a balanced meal accessible to everyone.We work to help farmers produce food in a sustainable way. We think holistically about how our food is grown so farmers have the tools they need to have better harvests - to make a plate of meats, grains, fruits and vegetables within reach for every family. We produce seeds for fruits, vegetables and key crops – such as corn, soybeans, and cotton. We work collaboratively to find sustainable solutions for soil health, help farmers use data to improve farming practices and conserve natural resources, and provide crop protection products to minimize damage from pests and disease. We also work in many other areas, such as traditional plant breeding, data and precision agriculture, biotechnology and more. Advancements in these areas are helping farmers have better harvests while using water and other important resources more efficiently. And when farmers have better harvests, a balanced meal is more accessible for families around the world. Contact: P.O. Box 47686, 00100 Nairobi; Tel: +254 20 2060922/44, 020 3574301-4 ; Fax: +254 20 823086 ; Cell: +254 722 205294/529, +254 733 600 468/629 414; Email: betty.kiplagat@monsanto.com; everlyn.musyoka@monsanto.com

Uasin Gishu County

Uasin Gishu County is situated in the mid-west of the Rift Valley covering an area of 3,345.2 square kilometers and lies between longitude 34 degrees 50' east and 35 degrees 37' west and latitude 0 degrees 03' south and 0 degrees 55' north . The county is further sub-divided into six sub-counties namely; Soy, Turbo, Moiben, Ainabkoi, Kapseret and Kesses. It borders six counties namely Elgeyo Marakwet County to the East, Trans Nzoia to the North, Kericho to the South, Baringo to the South East, Nandi to the South West and Bungoma to the West. The county has an estimated population of 894,179 with urban population contributing about 31% of the entire population. The population density is 267 persons per sq.km .The County has potential labor force of 550,000 (56%) of the entire population. Hence 44% of the population is dependent. Uasin Gishu County is a highland plateau with altitudes falling gently from 2,700 metres above sea level to about 1,500 metres above sea level. The County lies within the Lake Victoria catchment zone and all its rivers drain into the lake. The main rivers include; Sosiani, Kipkaren, Kerita, Nderugut, Daragwa and Sambu. **Contact**: Governor, County Goverment of Uasin Gishu; Uganda Road, P.O.Box 40-30100, Eldoret; Tel +254-53-2916000; info@uasingishu.go.ke

Bomet County

Bomet County is situated in the former Rift Valley Province of Kenya. Its capital and largest town is Bomet. The county has a population of 730,129 (2009 census) and an area of 1,997.9 km². Bomet County is a multiracial, multi-ethnic nation with citizens of diverse socio-economic, religious and cultural backgrounds co-existing with the collective will of making things better for future generations. Contact: Governor, Bomet County, P.O.BOX 19 – 20400 Bomet, Kenya; Tel: 0202084069/70; Email: info@bomet.go.ke

Syngenta

0Syngenta is one of the world's leading companies with more than 26,000 employees in over 90 countries dedicated to our purpose: Bringing plant potential to life. Our culture differentiates us, transforming agriculture through our people, culture of innovation and integrated offers. Our name, Syngenta, has two distinct roots. "Syn" stems from Greek. It reflects synergy and synthesis, integration and consolidating strengths. "Genta" relates to humanity and individuals. It stems from the Latin "gens", for people or community; so Syngenta means "Bringing People Together."The strategy of Syngenta is to develop crop programmes through innovative solutions that offer farmers not only single plant protection products, but also complete crop solutions to assist them in producing an outstanding crop in both quality and quantity limiting post-harvest losses. For agriculture to remain sustainable, it is necessary to achieve a critical balance between increased productivity and environmental protection. **Contact**: Syngenta East Africa Ltd, P.O. Box 30393-00100 Nairobi; Tel Nos.+254703018000 /+254703019000

Agdia biofords

Agdia-Biofords is the exclusive commercial platform of Agdia, Inc for all of Europe, the Middle East, and Africa. We provide products and services to different industries and professionals as seed, growers, plant research and diagnostic laboratories. We work closely with people coming from different industries (ornamentals, vegetables, fruits and field crops) to contribute to the control of plant pathogens and help to the development of new varieties and to lot production quality control. Agdia-Biofords provides diagnostic solutions based on immunological and molecular technologies for plant pathogens and GMO. The Contacts are: 5 rue Henri Desbruères Genavenir 8, 91030 Evry Cedex, France ; **Phone:** + 33 (0) 1 60 78 81 64 ; **Fax:** + 33 (0) 1 69 13 08 65 ; **Email:** info@agdia-biofords.com

Muddyboots

Muddy Boots is unique in this sector as we operate at every level of the supply chain from grower to retailer, giving us insight and understanding of the challenges that face the food industry. This has allowed us to build a portfolio of products that support businesses in solving today's challenges. Harnessing collaborative technology that enables you to measure and monitor the performance of your sites, suppliers and products is the cornerstone of a sustainable future in food and farming. The **Products include: Greenlight Assessments** (Schedule and complete audits, assessments and visits through a single system. Measure and address the performance of your supply chains); **Greenlight Quality Control** (Centralise your product specifications to ensure you deliver an accurate and consistent approach to quality control, driving waste and cost out of your business); **Greenlight Supplier Approval** (Easily access, update and share due diligence information to ensure that your supply chain is always safe and approved to supply); **Greenlight Grower Management** (Connect with your farmers, agronomists and contractors to quickly access, update and share field and crop activity). Contact: Cellsoft Technologies P.O. Box 713 -00502 Karen Nairobi Kenya; t: +254 (0) 780 780 540; Email: sales@muddyboots.co.ke & support@muddyboots.co.ke; Website: www. en.muddyboots.com

Genetics Technologies International Ltd (GTIL)

Genetics Technologies International Ltd (GTIL) is a privately owned Kenyan company that started its operations in 1995. The company basically specializes in Micro-propagation of disease and pest-free planting materials through Tissue Culture (TC) and Aeroponics Technologies. The Vision of GTIL is to maintain the leading position as a credible Tissue Culture Laboratory in the region that aims at developing and supplying superior healthy planting materials to the farming community thereby enhancing sustainable Agriculture and economic growth. Contact: Lower Kabete Road, opp. Telkom Bldg., P.O. Box 47430, 00100-NAIROBI, Kenya. Email: kae@africaonline.co.ke

13. ADMINISTRATIVE & LOGISTICS NOTE

With few exceptions, most persons entering Kenya must be in possession of a valid passport and visa. Participants are advised to ascertain the entry requirements for Kenya, where required, obtain the necessary visas (including enroute transit visas if applicable) prior to departure from their home countries for all segments of travel. Please see below link for online visa: http://evisa.go.ke/evisa.html. The International Phytosanitary Conference Secretariat will provide an official invitation letter to facilitate visa processing. However, the Secretariat will not be able to intervene in any matter relating to visas, visa fees and other related costs. All participants will be responsible for making their own travel arrangements; to and from the conference venue except as otherwise agreed in the invitation letter.

Dress Code
The dress code is official attire apart from the field visits.

Mobile Telephones
Mobile phones should be switched off or be put on silent mode when inside the conference hall.

Smoking
KEPHIS is a non-smoking area

Security
Participants are required to wear their official meeting badges during the conference and comply with all official instructions in the event of an emergency.

Time in Kenya
Time in Nairobi, Kenya is GMT+3:00

Mobile Phone Service
Upon arrival in Nairobi, participants may purchase a mobile phone sim card at the airport for easy communication. Common mobile service providers in Kenya include *Safaricom, Airtel,* and *Orange.*

Weather
The weather in September is likely to be relatively warm at 24^{o}C during the day and it is likely to be sunny. The conference room may be cool because of air conditioning, so we suggest you bring a jacket/sweater.

Local Currency
The Kenyan Shilling (KES) is the local currency. Credit cards are widely accepted in Nairobi, and are widely accepted in larger hotels; there are a number of forex bureaus where you can change your currency and are within reach in Karen and at the airport. All major currencies can be exchanged in Kenya.

Social Amenities
There are several shopping malls around KEPHIS; the nearest being *The Hub*, and *Nakumatt Karen*, both located in Karen, about 3 kilometers away. Others include *The Junction* and *Galleria Mall*, both about 10 kilometers away. Banks and Exchange Bureaus are also located within 3 kilometres from KEPHIS. The Karen Hospital and AAR Medical Centre is also about 10 kilometres away from the venue.

Accommodation
KEPHIS has accommodation rooms at a cost of USD 35 per person per day for residents and USD 50 per person per day for international guests (this is half board). In addition, alternative accommodation is

available at KCB Leadership Centre which neighbours KEPHIS at a cost of USD 57 per person per day (half board). Other hotels with Karen vicinity are available in our conference website page under 'Accommodation Options'.

Extra Meals and Additional Expenses
All additional expenses such as extra meals, telephone, laundry, alcoholic and non-alcoholic beverages, printing, will be at the participant's own expense.

Conference Documents
Printed copies of the programme and other materials will be made available as necessary for all participants.

Refreshments
Refreshments will be provided throughout the duration of the conference as follows:
10.00 a.m. tea/coffee & snacks | *1.00 p.m.*: Buffet lunch | 3.30 *p.m.* tea/coffee & snacks | Drinking Water | Sweets

Internet / Wi-Fi
Participants will have free access to Wi-Fi throughout the duration of the conference.

IPC Secretariat
A secretariat office will be on standby throughout the duration of the conference for any assistance/additional information. Contacts:

1. Email address: phytosanitaryconference2016@kephis.org
2. Mr. Joseph Kigamwa, Coordinator Projects, KEPHIS | Mobile: +254727963907 | Email: jkigamwa@kephis.org
3. Dr. Isaac Macharia, Ag. Regional Manager – Mombasa | Mobile: +254702255235 | Email: isaac.macharia@kephis.org
4. Mrs. Pamela Kipyab, Deputy Coordinator Projects | Mobile: +254721292063 | Email: pkipyab@kephis.org
5. Mrs. Winnie Njuki, Executive Office Administrator | Mobile: +254722832830 | Email: wnjuki@kephis.org

Official Dinner
You are cordially invited to a reception dinner hosted on Thursday, 15th September 2016 from 6.30 p.m. at Dari Hotel, Karen, Nairobi

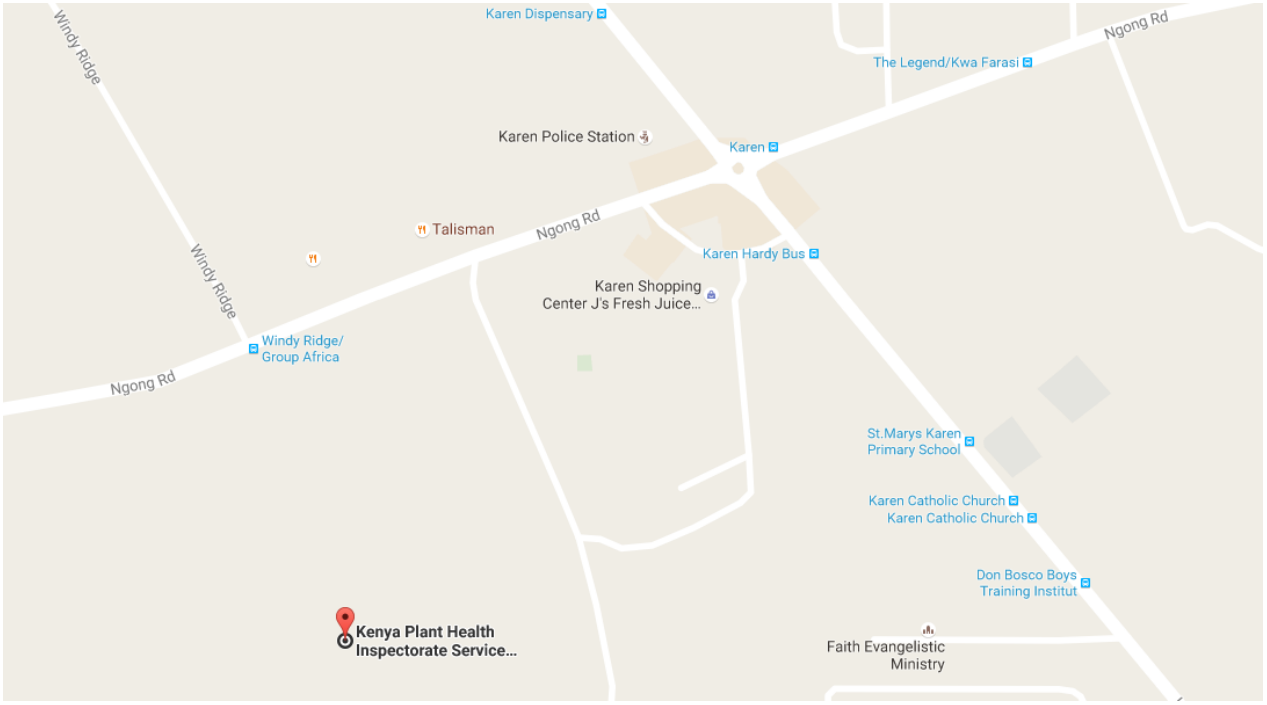
Cocktail
There shall be cocktail on Monday, 12th September 2016 to welcome you to Kenya and provide networking opportunities with all present at KEPHIS Hq, Karen outside the main conference hall.

Electricity

Electrical sockets (outlets) in Kenya are the "Type G" British BS-1363 type. If your appliance's plug doesn't match the shape of these sockets, you will need a travel plug adapter in order to plug in. Travel plug adapters simply change the shape of your appliance's plug to match whatever type of socket you need to plug into.

14. IMPORTANT MAPS

Amenities around Kenya Plant Health Inspectorate Service, Karen Hq



Direction of KEPHIS hq from Jomo Kenyatta International Airport

15. ABOUT KENYA

Kenya is one of the most beautiful and culturally diverse countries in the world, a nation which brings visitors from all over the globe to admire and experience it's magnificent wildlife, sandy and white beaches, great savannahs, rich history, mountains and hills and to sample cuisine that is second to none.

Located in East Africa, with a coastline in the Indian Ocean, the country is home to world famous long distance runners, Mount Kenya which is Africa's second highest mountain, the Cradle of Mankind and *Mpesa*, the mobile money transfer service that is a first of its kind in the world. The country also boasts of the Nairobi National Park, the only game park in the world located inside a capital city. Kenya's horticultural exports, i.e. coffee, tea, flowers, fruits and vegetables are enjoyed worldwide.
Kenya is home to the Big 5 – the Elephant, Rhino, Buffalo, Lion and Leopard and the small 5 – the Rhinocerous Beetle, Buffalo Weaver, Elephant Shrew, Leopard Tortoise and the Ant Lion. The annual wildebeest migration, one of the seven wonders of the world, takes place in the internationally known Maasai Mara.

	
A herd of elephants	**A rhino and her young**

Fact File:

Full Name: Republic of Kenya (Jamhuri ya Kenya)
President: H. E. Uhuru Kenyatta
Land area: 582,644 square kilometers
Capital and largest city: Nairobi
Number of counties: 47
Currency: The Kenyan shilling
National Languages: English and Kiswahili
Location: Lies astride the equator. It neighbours Uganda to the East, Tanzania to the South, the Indian Ocean to the south east, Somalia to the west and Ethiopia and South Sudan to the north.
Weather patterns: Long rains (March-May) and short rains (October-November).

National Parks and Reserves

Nairobi National Park
Aberdare National Reserve
Amboseli National Park
Lake Nakuru National Park
Tsavo National Park
Meru National Park
Marsabit National Park and Reserve
Rimoi National Reserve

NAIROBI

Nairobi is the capital and largest city of Kenya. It is also the financial, technological, commercial, social and economic gateway hub of east and central Africa. In 2016, it has been ranked among the 20 most successful cities in the world for its innovation, livability and capacity to reinvent itself.

A multi-cultural city with people from all walks of life, it is adorned with skyscrapers, is home to world class restaurants, modern shopping malls, modern banking facilities, road and rail transport and is a central attraction for Kenyan tourism and local and international activities and events. Some global organizations have their headquarters here such as the United Nations Environment Programme (UNEP). The name Nairobi comes from the Maasai word 'Nyrobi' meaning a place of cool waters. It has been described as having very good weather, conducive for both work or leisure.

	
The Thika Superhighway is a masterpiece world class road that links the industrial town of Thika to the city centre	The Kenyatta International Convention Centre, located at the City Centre, is a masterpiece work of art. The statue of Kenya's founding president *Mzee* Jomo Kenyatta is located here

16. ABOUT Centre of Phytosanitary Excellence (COPE)

COPE domiciled in KEPHIS was officially launched in October 2010 and since then has trained 954 stakeholders from Kenya and beyond. COPE was established with the rationale that African countries lack effective systems for managing phytosanitary measures at the national level and also lack good regional co-ordination of the implementation of the International Plant Protection Convention – International Standards on Phytosanitary Measures (ISPMs); hence the need to build phytosanitary capacity of African countries. The courses offered at COPE are In-service training to enhance capacity of Africa's national phytosanitary systems. The course duration is between 1-2 weeks but can be tailor made to suit clients institutional requirements; the mode of course delivery is face to face training sessions, laboratory and field practical sessions, demonstrations and attachments. These courses are either offered at KEPHIS or in the country of interest. The indicative fees are from USD 900 per student for two week training course and USD 700 for one week training course. Some of the courses with summarized content are as below:

Introduction to International Treaties and Standards in phytosanitary systems • World Trade organization – Sanitary and PhytoSanitary Agreement • The international Plant Protection Convention • International Standards on Phytosanitary measures • National and regional frameworks • Private standards	**Phytosanitary import regulations and export certification systems** • phytosanitary import regulatory systems • phytosanitary export certification systems • phytosanitary import inspections **Pre and post harvest phytosanitary management** • Pests of phytosanitary significance • Pre and post harvest management practices • Quality checks and traceability

Pest Risk Analysis (PRA) • Principles of PRA • Sources of PRA Information • Stages of Pest risk analysis • Tools for PRA	**Pest Surveillance** • Types of pest surveillance • Surveillance methodology • Analysis of surveillance data • Pest reporting and pest listing • Establishment of pest free areas in places of production and areas of low prevalence

Pest Diagnostics • Types of diagnostics and diagnostic protocols • Diagnostic and detection capacity evaluation • Pest detection methods and identification procedures • Reference collection and documentation • Pest management	 Trainees from Burundi NPPO during a practical training session on pest diagnostics

Contact: The COPE Secretariat; C/o The Managing Director; Kenya Plant Health Inspectorate Service (KEPHIS); P. O. Bo 49592-00100, Nairobi, Kenya ; Tel: +254709891000 ; Email: director@kephis.org
Website: www.kephis.org; www.africacope.org

Regional Integration Implementation Program (RIIP)

The regional integration implementation program under COMESA is a specific program meant to implement regional integration commitments with support by the European Union in an arrangement dubbed regional integration support mechanism (RISM). The funds are managed through the national treasury. The overall objective of the regional integration implementation program (RIIP) in accordance with Article 10 of the COMESA adjustment facility (CAF) protocol is to provide support to eligible member states for revenue loss and supplement economic and social costs due to deepening regional integration. As a member of COMESA and EAC, Kenya has committed itself to pursue policies and strategies that enhance trade and investment within the regional blocks and to be supplemented with the outcomes of the COMESA-EAC-SADC tripartite. One of the activities under RIIP is creation of areas of low pest prevalence (ALPP) and with this; KEPHIS has piloted the creation of ALPP for fruit flies in various places in mango growing areas: Elgeyo Marakwet, Meru and Makueni. Other activities include are trainings of stakeholders and staff on emerging phytosanitary issues; support to East Africa regional pest risk analysis work and training & conferences under COPE.

The Standards and Market Access Programme (SMAP)

The Standards and Market Access Programme (SMAP) is being supported under the 10th European Development Fund (EDF). KEPHIS is one of the implementing partners of the programme. Through SMAP, over 3000 farmers have been trained on how to ensure that their produce, destined to the European Union market, meets the requirements for export. This includes the absence of pests and diseases on the produce. Hence, farmers in Kenya are able to meet market requirements and therefore export beans and peas in pods, and other horticultural produce, thus lifting their standards of living and Kenya earning foreign exchange.



Mr. Francis Kiplagat (left) and Silas Turchi (centre) of Elgeyo Marakwet County hold their healthy mangoes that are safe for local consumption and for export. KEPHIS has been working with mango farmers in the county by providing them with fruit fly traps which help in reducing the population of the mango fruit flies, hence reducing the incidences of the pest prevalence.

The Standards and Market Programme…….Supported by the European Union

Syngenta Foundation

The Syngenta Foundation for Sustainable Agriculture (SFSA) is a non-profit organization established by Syngenta under Swiss law. Its mission is to create value for resource-poor small farmers in developing countries through innovation in sustainable agriculture and the activation of value chains. SFSA focuses on raising smallholders' yields and linking them to markets. The Foundation runs projects in Africa, Asia, and Latin America, and contributes to the agricultural policy debate worldwide. It works with a wide range of partners operationally and in thought leadership. As well as establishing pilot projects, SFSA also puts major emphasis on successful scale-up. www.syngentafoundation.org

For more information on the conference, please contact:

The Managing Director
Kenya Plant Health Inspectorate Service (KEPHIS)
P. O. Bo 49592-00100, Nairobi, Kenya
Tel: +254 709891000
Email: phytosanitaryconference2016@kephis.org
Website: www.phytosanitaryconference2016.com