STATUS AND PROGRESS OF RESEARCH ON MAIZE LETHAL NECROSIS DISEASE (MLND) IN KENYA

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MLN TEAM

WORKING GROUP

- **Ministry of Agriculture**
- **KARI**
- **KEPHIS**
- **PCPB**
- **UON**

Government Organizations

- **CIMMYT**
- **ICIPE**

International Organizations

- **STAK**
- **CGA**
- **AAK**

Private Organizations

COLLABORATORS

- **OARDC- Ohio State University , USA**
- **University of Minnesota, USA**
- **CABI**
- **Food and Environment Research Agency (FERA), UK**

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Disease Outbreak

Farmers in Bomet call it, '***Koroito***' – the vernacular name for a **plague**

- A sudden phenomenon that could not be explained,
- Cause unknown,
- Having a devastating effect to the community.

Background – Genesis of the problem

- **September 2011**, disease first reported in the lower parts of Longisa division of Bomet District.
- **February 2012**, noted in Bomet Central division, spreading into neighbouring Chepalungu District, Narok North & South Districts, Naivasha
- **April 2012,** Disease spread into Sotik,, Koinon, Transmara, Rumuruti, Kisii, Bureti, Kericho, Mathira East, Imenti South and Embu.
- Field observations revealed that the disease is affecting all maize varieties grown in these regions,
- Estimated yield loss in affected fields ranged from 30-100%

Farmers' views on possible origin of MLND:

- Contaminated seeds from agro vet shops
- Government relief seeds
- Insects damage
- Frost damage
- Do not know the source
- God's vengeance

Disease Identification:

Maize Lethal Necrosis (MLN) Disease

(Synonym; Corn Lethal Necrosis (CLN)Disease.

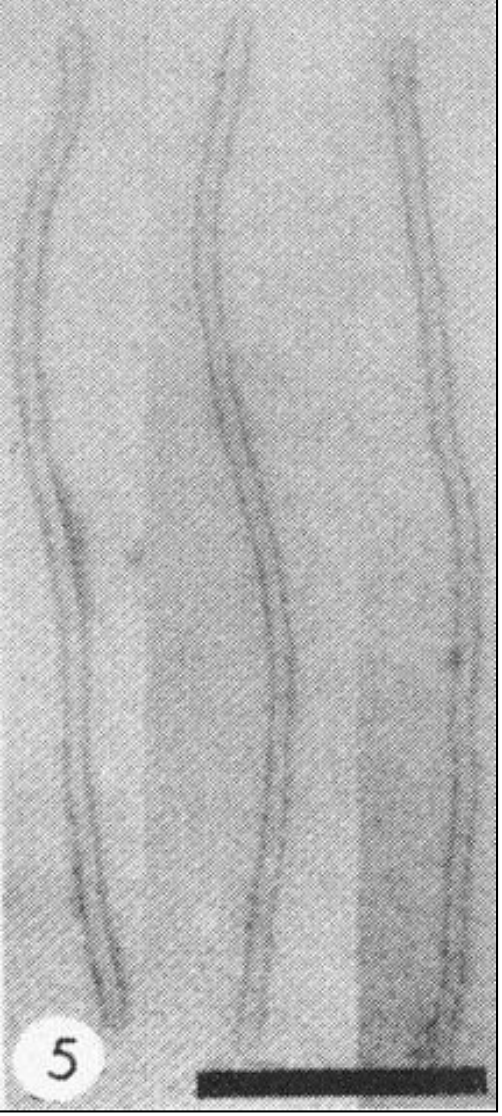
Disease caused by co-infection with

Maize chlorotic mottle viruses (MCMV)

AND

Sugarcane mosaic virus (SCMV)

OR any other cereal virus in the Potyvirus group (eg. Maize mottle virus -MMV and Wheat streak virus-WSV).



Sugarcane mosaic virus

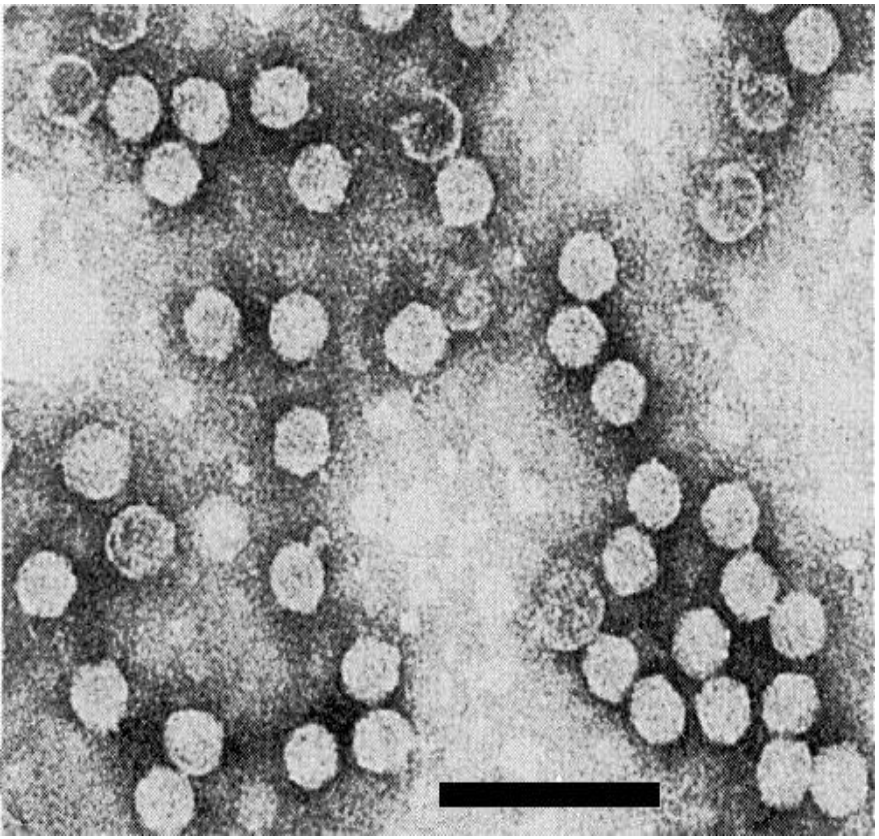
Family: *Potyviridae*
Genus: *Potyvirus*
Species: *Sugarcane mosaic virus*
Acronym: SCMV

How is SCMV transmitted

- Mechanical
- Insects
  - Aphids
- Seed transmission rates – very low rates

SCMV = 21/72,897 plants (0.03 %)

Maize chlorotic mottle virus-(MCMV)



Family: *Tombusviridae*
Genus: *Machlomovirus*
Species: *Maize chlorotic mottle virus*
Acronym: MCMV

How is MCMV transmitted

- Mechanical
- Insects
  - Corn thrips
  - Cereal leaf beetle
- Seed transmission – v. low
  - MCMV = 17/42,000 & 1/22,189 seeds **(0.04%, 0.005%)**
  - MDMV = 21/72,897 plants **(0.03%)**

FIELD OBSERVATIONS:

A young maize field crop infected by MLND

Ultimate Death

INFECTED VS HEALTHY

Severe chlorotic mottle on leaves

Severe mottle on the leaves

‘Dead Heart’ symptoms

Mosaic, mottle, necrosis

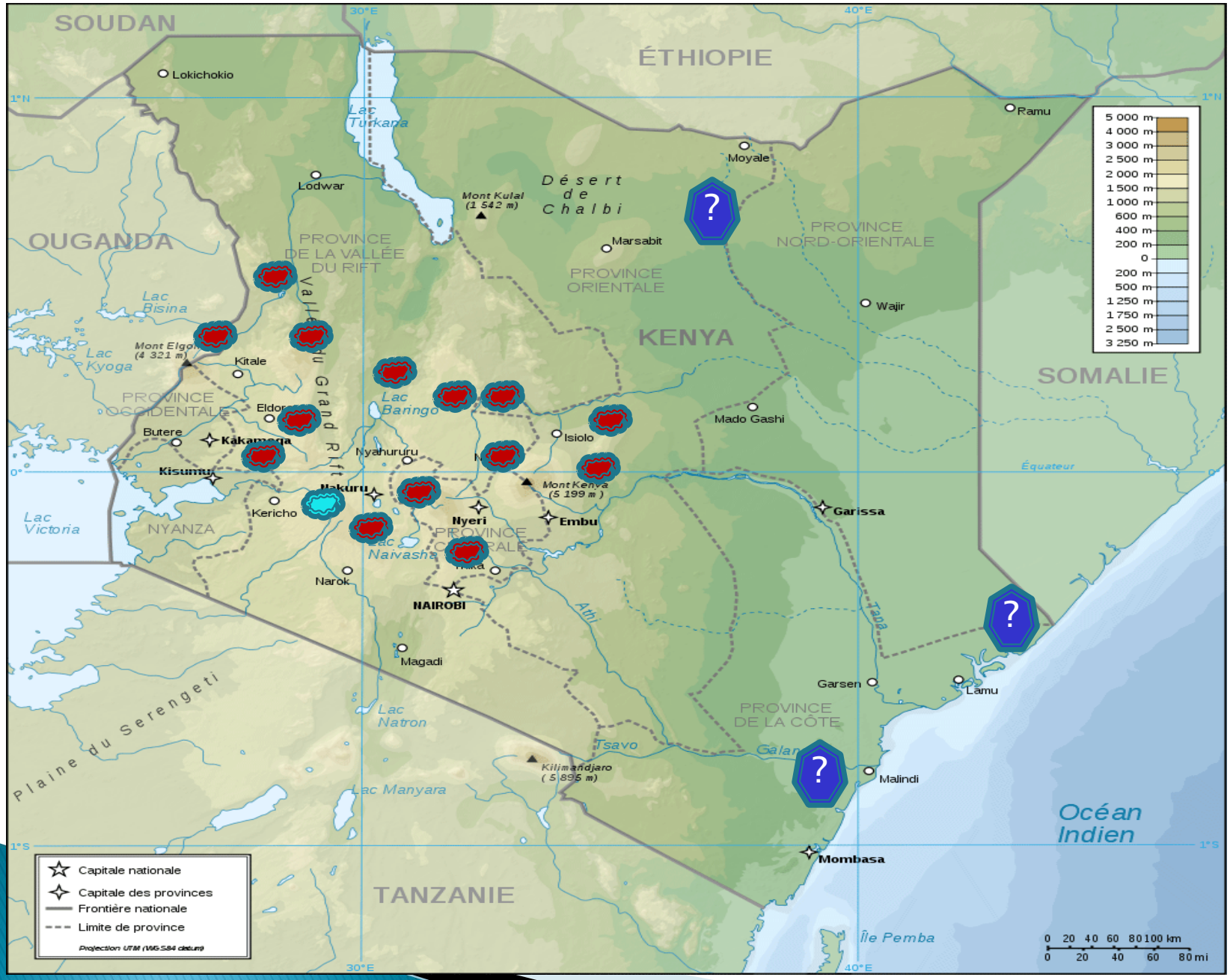
Husks dry prematurely, no grain

Infection at germination stage

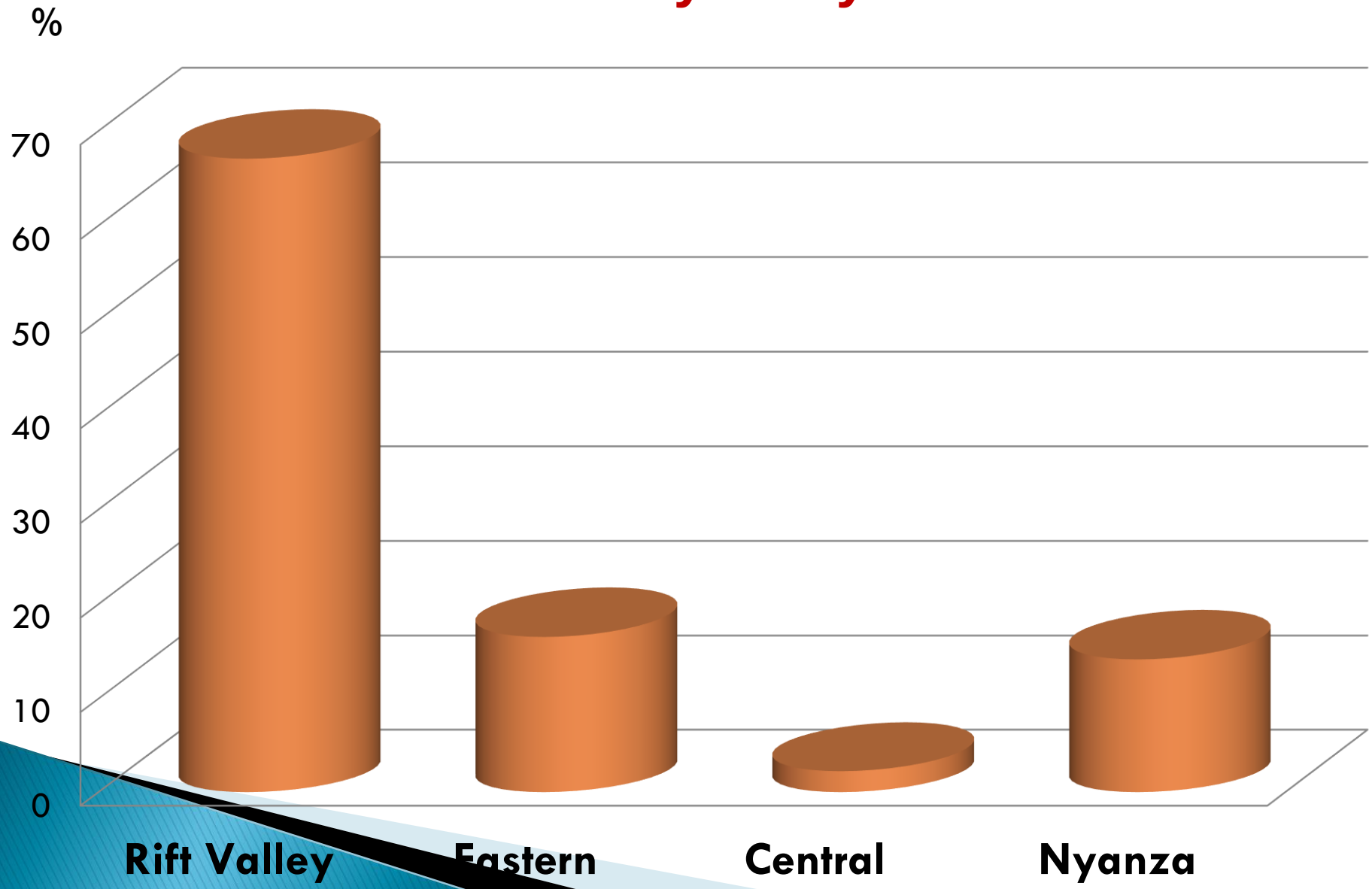
Losses along Value chain

- Food and economic security threatened
- Losses for seed producers (for both growers and seed companies)
- Millers (both in quality and quantity)
- Transporters (reduced volume of business)
- Storage facilities (dormant capacity)
- Middlemen (loss of business volumes)

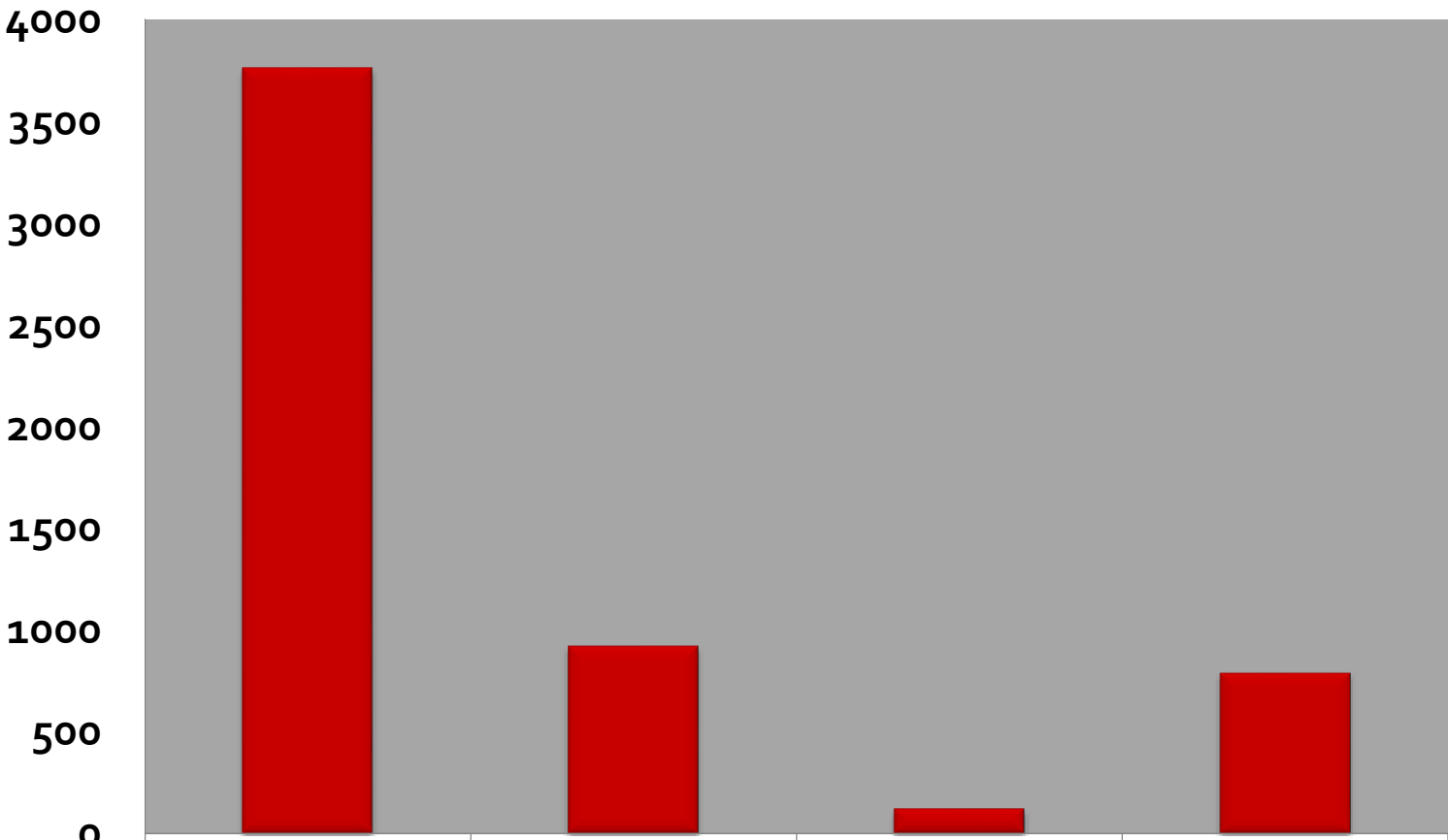
MLND DISTRIBUTION -2012



Relative areas reported affected by MLND nationally - July 2012



Economic loss (M-Ksh) (Total US $ 67m))



	Rift Valley	Eastern	Central	Nyanza
Economic loss (m-Ksh)	3762.5	927.5	125.6	794.5

Regions

Epidemiological & diagnostics of the MLN virus

-Survey maize growing areas in May-June by KARI and Prof. Lockhart, University of Minnesota to

- Identify distribution of SCMV and MCMV
- Enhanced diagnostic testing for MLN at KARI Biotech

Prof. Ben Lockhart with District crops officer Sotik

Survey results

15 Counties surveyed:	10 counties to be surveyed:
Narok	Nyeri
Kisumu	Embu
Bomet	Muranga
Nandi	Meru
Nyamira	Machakos
Kericho	Kitui
Migori	Kilifi
Nakuru	Tana River
Siaya	Kwale
Trans Nzoia	Taita Taveta
Busia	
Baringo	
Kakamega	
Elgeyo Marakwet	
West Pokot	

Survey results

- **Counties surveyed and disease severity:**

SEVERE–Narok, Bomet, Nyamira, West Pokot, Nandi

MILD– Migori, Siaya, Busia, Kakamega, Kisumu,, Kericho, Naivasha , Elgeyo Marakwet, Baringo.

VERY LOW– Trans Nzoia (except West Pokot), Uasin Gishu, Nakuru

- Over 2000 samples collected

Screening of germplasm for resistance to MLN in Kenya

- Screening of inbreed lines by (KARI, CIMMYT)
- KARI-CIMMYT team has evaluated over 2,000 maize genotypes in Narok and Naivasha
- elite inbreed , pre commercial hybrids, elite lines & pre-commercial hybrids, commercial hybrids
- Evaluated lines revealed ca. < 5% resistance/moderate

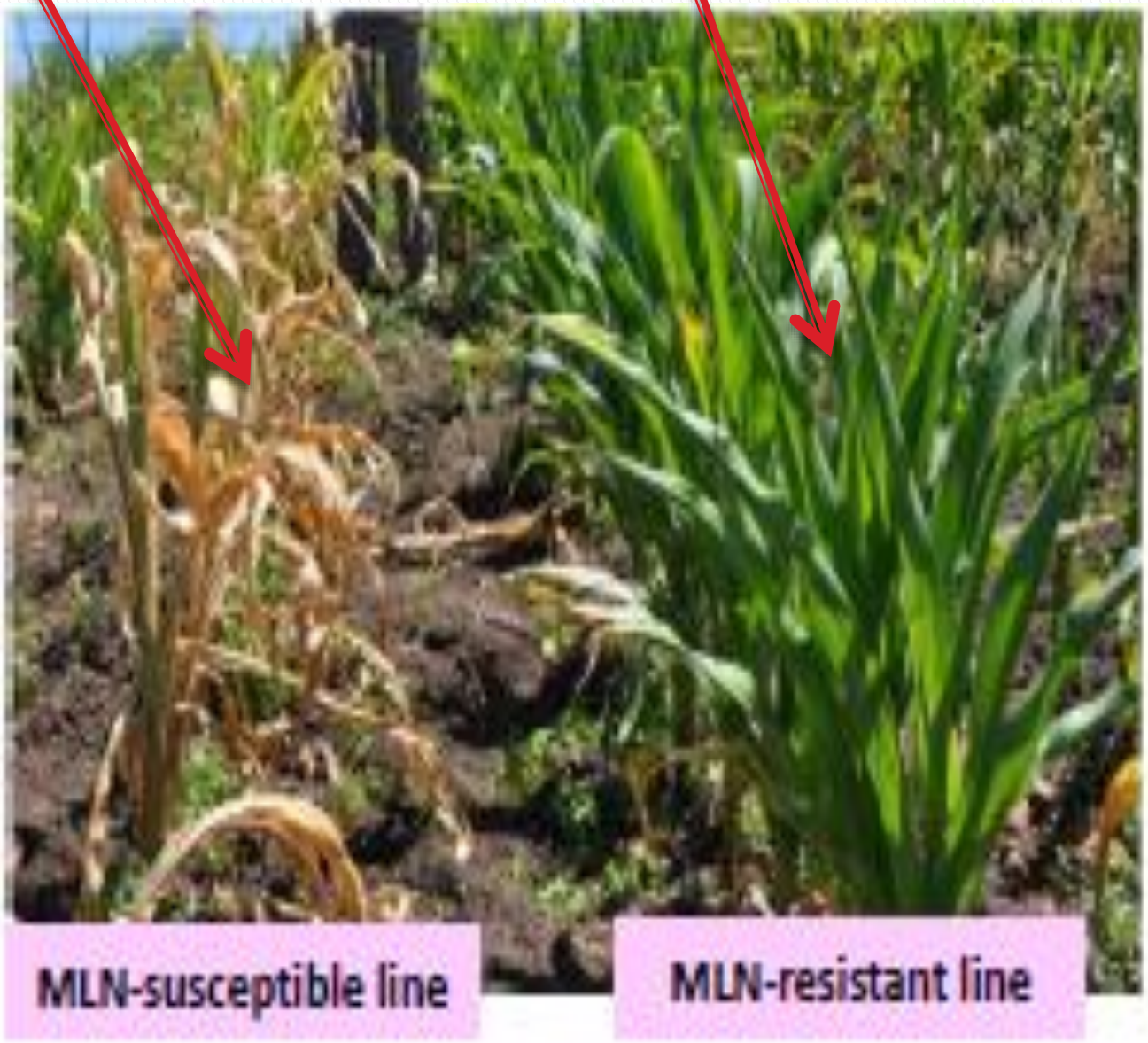
MLN testing Network for Eastern Africa

- Establishing a centralized MLN screening facility at KARI-Naivasha (In progress)

- Offer an opportunity for screening elite germplasm for KARI, CIMMYT as well as public and private partners in EA

1.2 ARTIFICIAL INOCULATION PROCESS

Susceptible and tolerant lines



Creation of awareness among researchers working on maize program

CIMMYT & NARS WORKSHOP –Two workshops

Objectives:

- Raise awareness about MLN to scientist, technicians & skilled field staff
- Train MLN identification
- Train Scoring MLN
- MLN management
- Draft strategies to combat MLN

Creation of Awareness on Extension staff and farmers

KARI and MoA:

Created public awareness on disease and management options to Extension staff, Stakeholders, Farmers via

a) Electronic and Mass media

b) Technical Publications

c) Public Forums

d) Field days

e) Workshops for Extension Officers in 36 counties

Recommendations

- Creation of public awareness
- Conducting tests to verify seed transmission of viruses in local cultivars
- Host Resistance:
  - Intensify screening of maize germplasm for tolerance/resistance to MLND
  - Initiate MLND tolerance/resistance breeding in maize improvement programs

……Recommendations

- Review cropping practices
  - Introduction of closed maize seasons,
  - Quarantine movement, removal and disposal of infected maize crop,
  - Crop Rotation Schedules
- Vector management
  - Commend regime of pesticide applications for vector control (seed and foliar)
- Integrated Pest Management options
  - Genetic resistance, Vector control, Cultural, Good Agricultural Practices
- Identifying alternate hosts of viruses and vectors

Long term Disease Management measures

- Strategic research for tolerance/resistance
- Capacity building along value chain for disease and pest management
- Establish a system for pest and disease forecasting & early warning
- Establish a centralized data bank and backup system
- Formulate and implement conducive policies on handling of emerging pest and disease epidemics

FOR FURTHER INFORMATION CONTACT

- Principal Secretary, Ministry of Agriculture
- Director, KARI