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Preharvest Plant Health, Postharvest Losses and Their Impact on Small Farmer Food Security

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Strengthening the Capacity of the Partner Institutions to Address Global Food Security in East and Southern Africa – The Case of Kenya and DRC
&
Current and Emerging Threats to Crops

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Field Infestation and Postharvest Losses

Postharvest loss is a major area of concern in many lower- and middle-income countries (LMICs) that includes Kenya and the Democratic Republic of Congo (DRC).

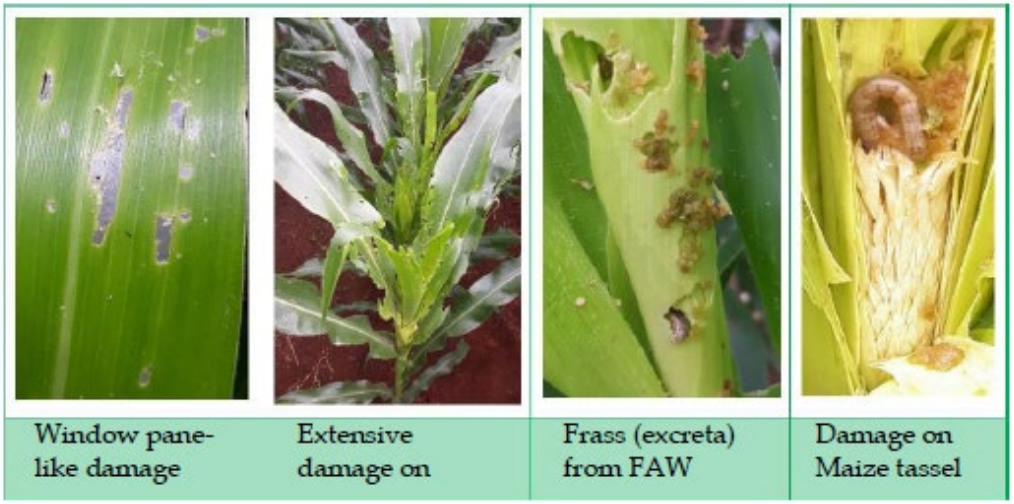
Why are we discussing Plant Health and Postharvest crop loss?

It's needless to protect crops, ensure their health and not pay attention to PH loss reduction.

<u>Postharvest losses stem from:</u>

- ❑ Spillage during handling, transportation, processing and marketing
- ❑ Rotting and aflatoxin contamination (from *Aspergillus flavus*)
- ❑ Losses to pests, birds, insects and rodents
- ❑ Mechanical damages
- ❑ General economic losses

Fall Armyworm Attack on Maize (Kenya)



Fall armyworm (FAW) [*Spodoptera frugiperda*] is an insect pest with moths as the adult stage and larvae (caterpillars) as the destructive stage.

Source: KALRO Fall Armyworm Management Bulletin (www.kalro.org)

Fall Armyworm and Striga Weeds in Farmer Fields

Fall armyworm infestation of maize

Striga-infested maize plants Maize plants infested by Striga with researcher and farmers standing in the maize field (right). Source: International Institute of Tropical Agriculture (2002).

Omondi, P., et al (2022). Socioeconomic and Environmental Impacts of Fall Armyworm and Striga Weed at Three Stages of Maize Value Chains in Kenya. Professional Workers Journal (PWJ)

Striga can destroy maize resulting in c. 100% yield loss. >60% of land cultivated land in SSA is infested with one or more species of *Striga*, which directly impacts over 300 million farmers in more than 25 countries with yield losses estimated at >USD 7b.

Half farmers affected by FAW; infestation estimated @ 55-100% during mid to late growth.

The extent of parasitization is directly linked to FAW estimated @ 8.3% in Kenya. A single larva consumes 140cm^2 of leaf area. Early FAW infestation results in defoliation.

FAW has direct effect on cost of capital: increased labour; losses in yield; ability of agricultural lands to respond to shocks; increasing cost of production and its effect on income

Farmer Survey of Fall Armyworm and Mold Infestation – Kisumu and Siaya Counties

Methodology

- Scouting of plants in farmers' fields was done using Nuru App that uses artificial intelligence (AI) to detect the presence of fall armyworms (FAW) on maize leaves.
- Primary data was collected from 384 farmers and 84 traders (for aflatoxin contamination)

Results

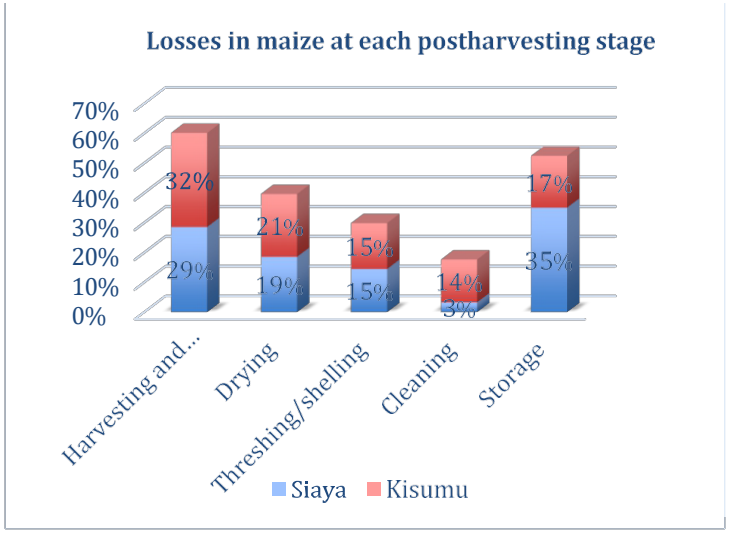
Farmer attitudes towards moldy maize:

- 30% strongly agreed that moldy maize was harmful for human consumption
- 27% of the farmers agreed that it was safe to sell moldy maize to local brewers.

Possible Interventions

- More efforts are needed to train the farmers on integrated pest management (IPM)
- Sensitize farmers and traders to adopt appropriate postharvest technologies to mitigate food insecurity
- Strengthen collaboration with partners on the kinds of existing innovative technologies.

Maize Postharvest Losses in Kisumu and Siaya Counties - Kenya



Hermetic storage bag developed at Purdue University

Community Engagement Interventions



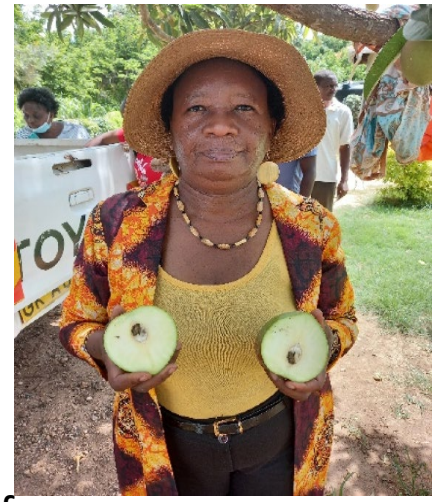




- Top, L-R: Winnie in a farmer's field; Phelix administering survey; Winnie & Phelix at a farmer's homestead;
- Farmer hand shelling maize; Family shelling maize
- Bottom, L-R: MSU team meeting Maseno Disabled Women Group;
- MSU team meeting Mr. Metho; Lynder at Mary Atemo's farm with other group members

Mango Production and Pest Management

- Mango (*Mangifera indica* L.) fruit is one of the most important fruit crops in tropical and sub-tropical regions.
- Mango is the second-most important fruit produced in Kenya, after banana with a market share of > 22%.
- Survey of cooperative farmers revealed many challenges in the mango value chain with postharvest losses of >45:



JKUAT Collaborator (Dr. Evelyn Okoth) showing fruit fly damage of mangoes. IPM training of farmers is needed.

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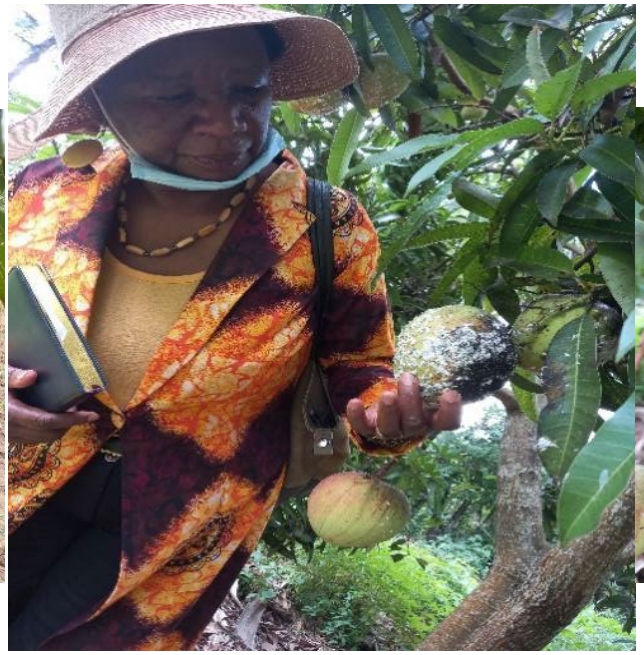
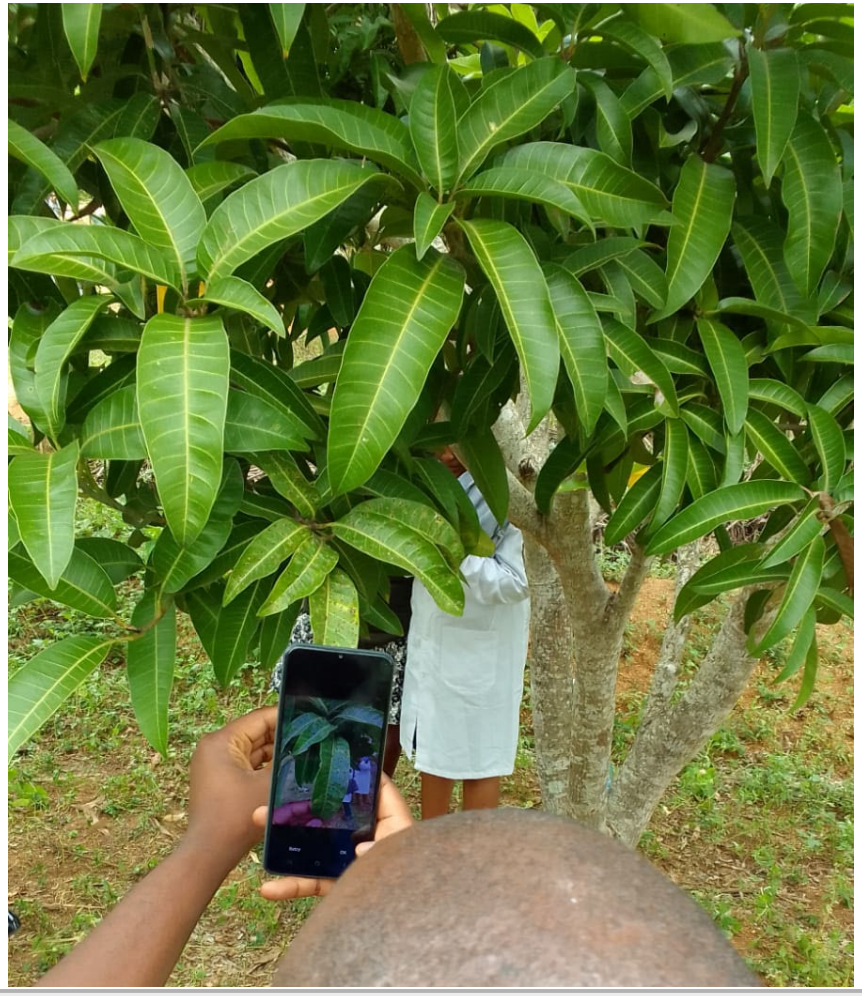
Powdery Mildew attack on Mangoes at Farmer' Field



Dr. Okoth (JKUAT)

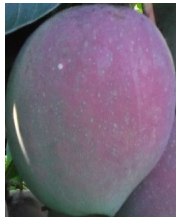
Scouting Mango Diseases using Nuru App



Main Mango Varieties grown in Kitui County

Apple

Ng'owe



Indigenous

Kent

Tommy Atkins

Sensory evaluation Apple, *Ng'owe*, Kent, Tommy Atkins and *Indigenous* ripe mango fruits

Mango Variety	*Peel color*	*Flesh color*	*Taste*	*Flavor*	*Texture*	*O/A*
Apple	8.50^{a}	8.70^{a}	8.40^{a}	7.92^{a}	7.88^{a}	7.98^{a}
Ng'owe	7.40^{b}	7.42^{b}	7.42^{a}	6.85^{b}	7.50^{ab}	7.30^{b}
Tommy Atkins	7.35^{b}	7.44^{b}	7.88^{a}	7.75^{a}	7.45^{ab}	7.75^{a}
Kent	7.40^{b}	7.59^{b}	6.95^{b}	6.80^{b}	6.90^{b}	6.20^{d}
Indigenous	6.50^{c}	6.67^{c}	5.78^{c}	5.30^{c}	5.15^{c}	5.95^{c}
LSD: P≤0.05	1.461	1.461	1.428	1.222	1.430	1.191

Mean sharing similar superscript letters in a column are not significantly different at P≤0.05; (n=5): O/A: Overall acceptability.

Mango value addition & farmer training activities Kitui County - Kenya

Training on mango value-added processing – preparation and steps for solar drying

Apple variety packaged in plastic punnets

Processing of mangoes into dried slices will reduce postharvest losses, create more diversified value-added products for both export and local market.

Ng'owe **variety packaged in plastic pouches**

Thank You!