Republic of Kenya

Challenges and Current Initiatives on Management of Fall Armyworm

Presentation by

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Presentation during the

Thematic Session of World Trade Organization's Sanitary and Phytosanitary Committee on Enabling Access to Tools and Technologies: Fall Armyworm Case Study

Tuesday, 19 March 2019

WTO, Centre William Rappard, Geneva, Switzerland

Presentation Outline

1. Background information
   - Fall armyworm invasion - Kenya and other countries

2. Economic importance of fall armyworm
   - Threat to agricultural stability
   - Yield losses

3. Interventions and achievements
   - Activities carried out
   - Outcomes

4. Sustainable management initiatives
   - Sustaining action plan
   - Addressing knowledge & technological gaps

Background Information

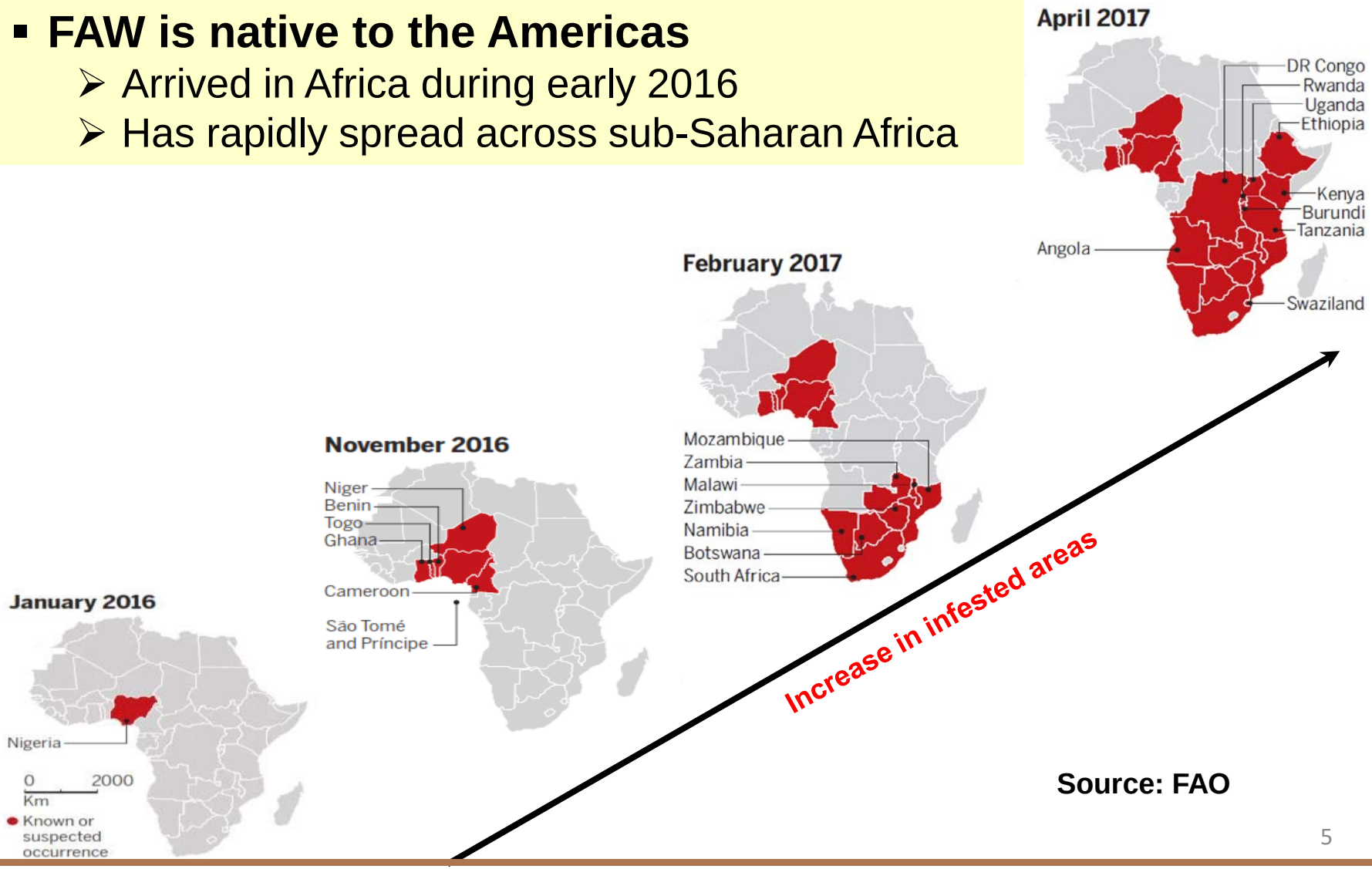
Fall armyworm description

- Fall armyworm (FAW), *Spodoptera frugiperda*, is a plant pest with larvae (caterpillars) as the destructive stage

Fall armyworm is invasive and migratory

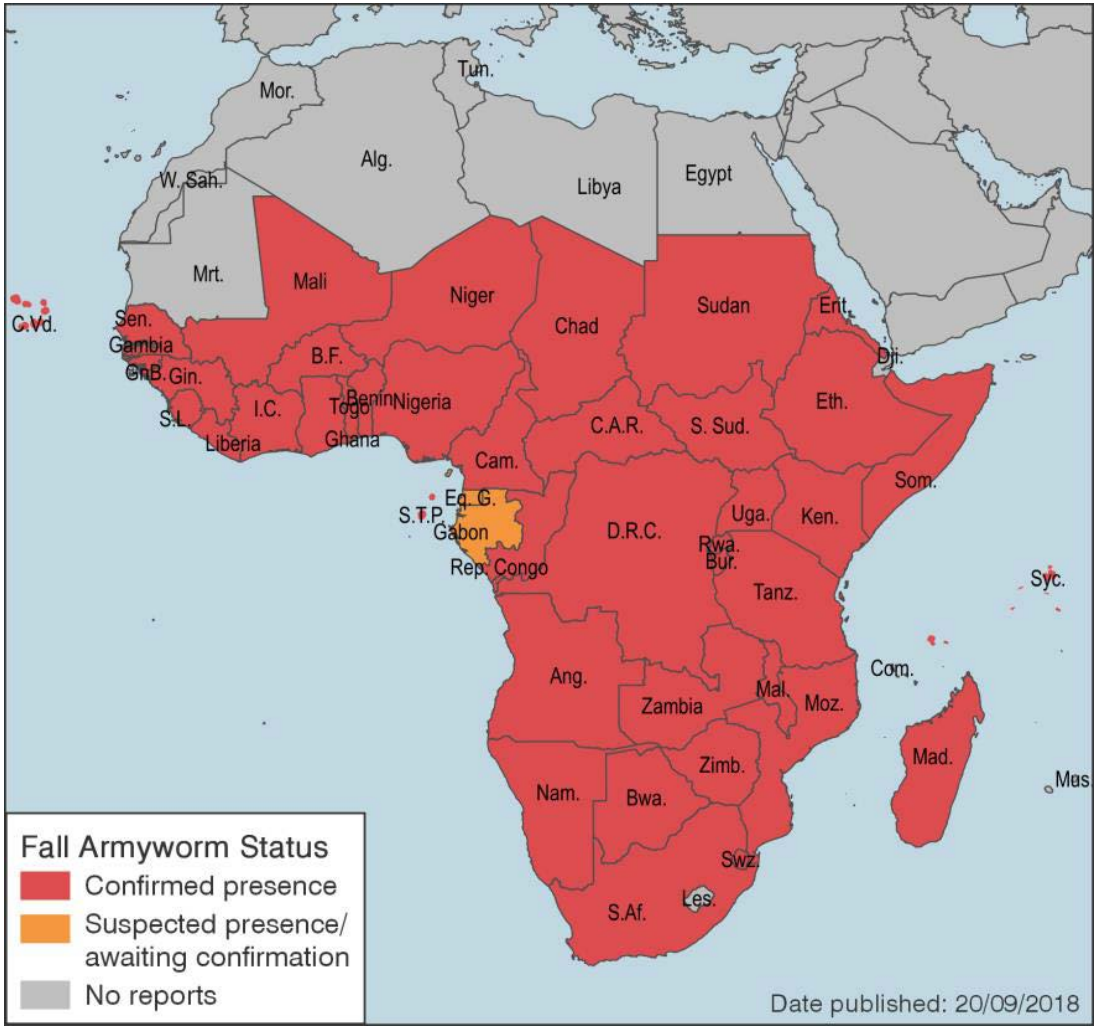
Rapid spread in Africa

- **FAW is native to the Americas**
  - Arrived in Africa during early 2016
  - Has rapidly spread across sub-Saharan Africa



Source: FAO

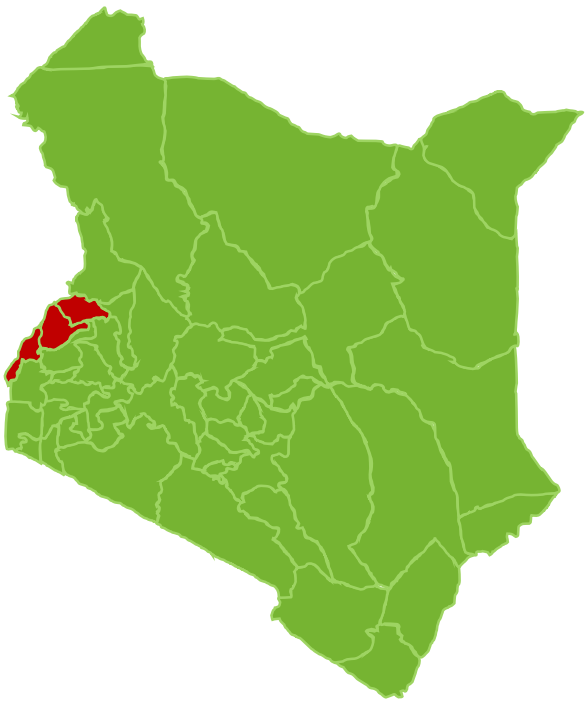
FAW is reported in a majority of African countries - 2018



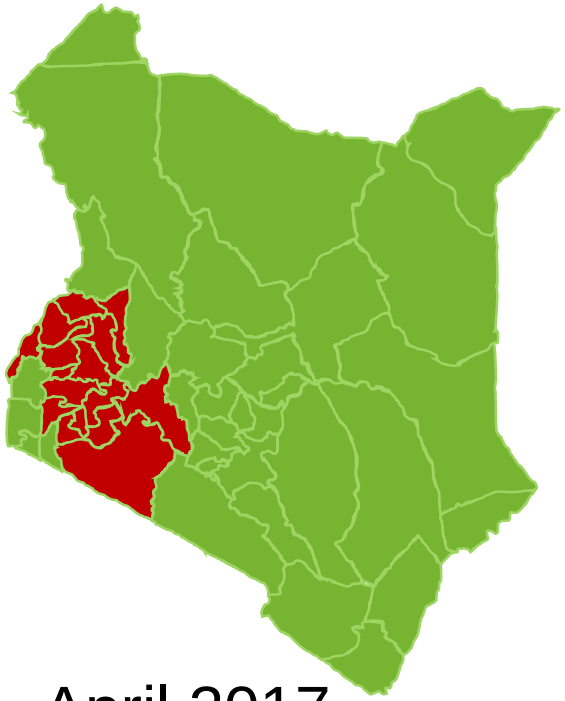
CABI Evidence Note – October 2018

Rapid spread in Kenya

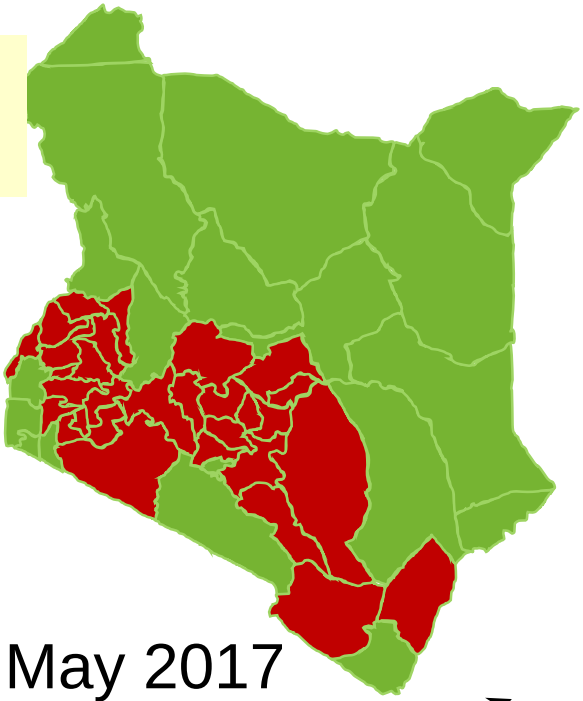
- FAW reported in March 2017 for the first time
  - ➢ rapid spread to all maize-producing areas



March 2017



April 2017



May 2017

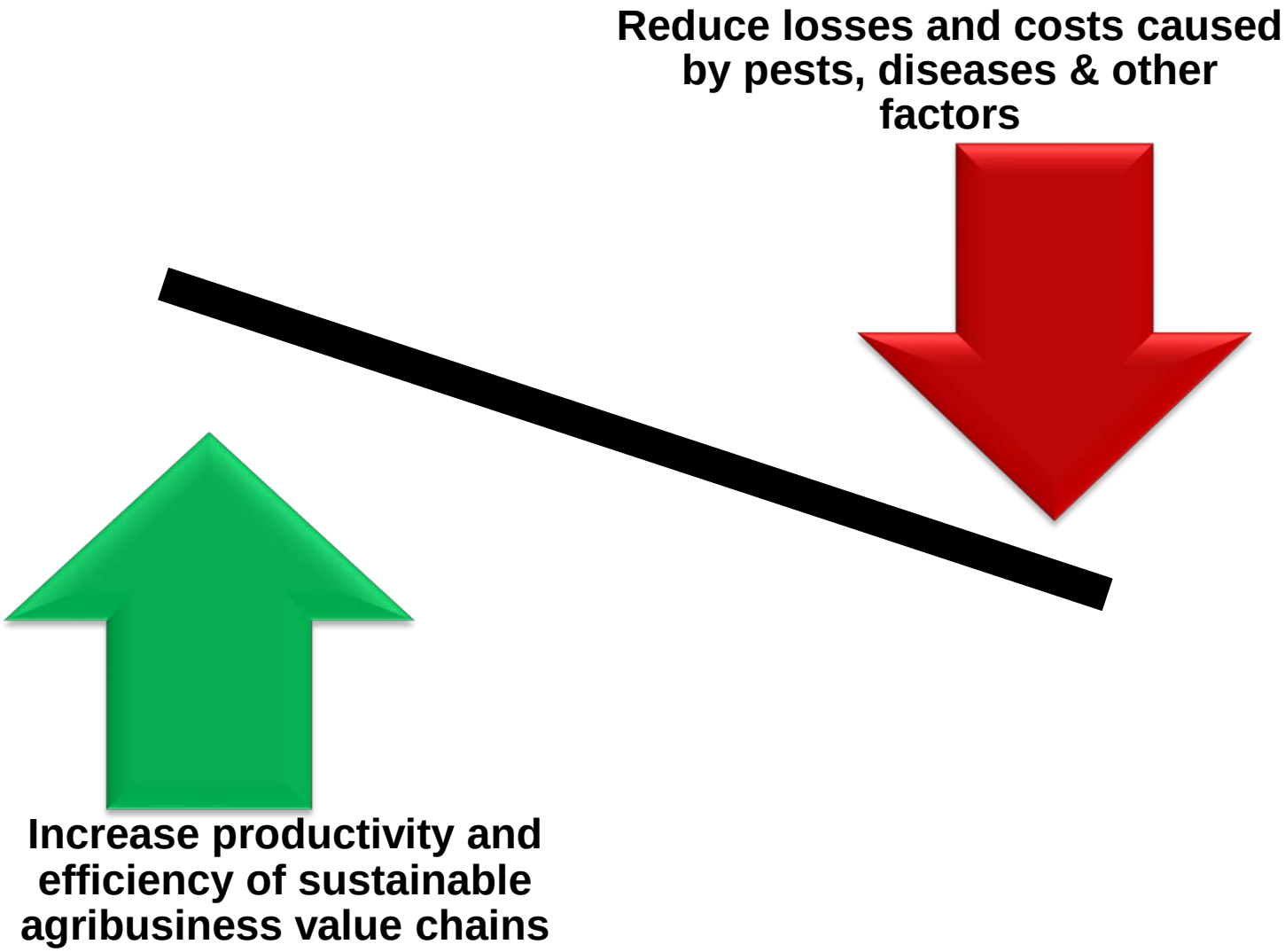
Increase in infested areas

FAW reported in 43 out of 47 counties in Kenya - 2018

Economic Importance of Fall Armyworm

Food and economic instability

Fall armyworm has affected agricultural balance



Fall armyworm has become important

❑ Maize is the most preferred host of FAW

- ❖ FAW also noted on other crop plants e.g. sorghum & wheat
- ❖ **Literature information:** FAW attacks over 80 plants species

The pest threatens:

- **Food and nutrition security**
- **Feeds industry**
- **Employment**
- **Trade**

- ❑ Maize is the main staple for over 85 % of the population in Kenya
- ❑ Kenya is a net importer of maize

Fall Armyworm in media

- **Invasion by FAW caused great panic**

DAILY NATION | Friday April 7, 2017

National News | 11

Food security threat > Call to mobilise resources to control pest in detected areas before it is too late

Destructive armyworms invade farms

Affected counties are Kwale, Taita Taveta, Trans Nzoia and Kisumu

BY NATION TEAM

Two armyworm species are wreaking havoc in different parts of the country. Threatening Kenya's grain harvest.

In western Kenya, the Fall armyworm, which is native to North and South America, and has caused damage in southern Africa, has invaded Trans Nzoia, Kakamega and Bungoma counties, where much of Kenya's maize is grown.

At the coast, the African armyworm has invaded Taita Taveta and Kwale counties.

Trans Nzoia announced that 500 hectares of maize were affected as of two weeks ago and announced Sh45 million to control the pest. Reports from the Kenya Broadcasting Corporation indicate funding was directed at Kimilili and Endebess sub-counties. All the sub-counties in Trans Nzoia, including Kwanza, Saboti and Kachibora, produce maize.

"The funds will enable us to acquire the right pesticides in controlling the pests which have been spotted in farms in Endebess and Kimilili sub-counties," said Governor Patrick Khaemba when he spoke in Kitale.

Mr Khaemba also said the funds will be committed to field extension services where farmers will be sensitised on how to identify the pest, if their crops are infested, for quicker action.

"We are however calling on the national government to supplement our services. This must start by declaring this infestation a national disaster and providing enough [illegible]," he added.

Worms with deadly appetite

Sh45million

103,876

Sh41.1bn

500

166

4.7 million

Kenya Seed Company managing director Agathan Sisi, said the vicious pest, which is tolerant to most pesticides, risks wiping out plantations in the affected region if measures are not taken quickly to combat it.

"It is difficult to control the pest which is the larvae stage of a Fall Armyworm moth. No single pesticide can neutralise the pest once it is at the larval stage," said Mr Sisi.

Unlike the African armyworm, the Fall

Thursday, April 12, 2018 KSh60/00 (TSh1,700/00 : USh2,700/00 : RF900/00) No. <serialnumber>

Food security> US agency warns of impending disaster on the farm

Hunger: Worm threatens half of Kenya's maize

Voracious pest already eating its way through farms at the Coast, Rift Valley, Western and Central in what could turn out to be another year of shortages and high food prices. Page 2

Facts about armyworm

- The Fall Armyworm originated in the US
- First sighted in Kenya in 2016 in maize-producing counties
- The larva is the most destructive stage of their formation
- The worms cause severe leaf damage and injuries to maize ears in nearly all the stages of crop development
- Highly resistant to pesticides in later stages of their development
- There is no data from the Ministry of Agriculture on the devastation by the Fall Armyworm
- Its destructive habit is made worse by fact that it feeds during the day and at night

1 million — Number of maize bags, or 20 per cent of yield, lost to the armyworm since the first invasion in Kenya in 2016.

1,300 — Ministry of Agriculture has trained 1,300 extension officers to conduct surveillance in the 47 counties.

2,000 — Females of the worm lay more than 2,000 eggs, which hatch in 4 to 5 days; pest can travel 100 kilometres.

Agriculture > Pesticides recommended by experts 'too expensive'

Armyworm wreaks havoc in country's grain basket

Government steps in as maize farmers count losses after pest destroys hundreds of acres of crop

BY PHILIP BWAYO

National Farmers Federation (Kenaff), Mr William Kimosong'.

He said a broad spectrum of pesticides recommended by the Ministry of Agriculture was very expensive with the cheapest costing Sh10,000 a litre. And that is enough for only one acre.

"This spells doom for us when coupled with the high cost of farm inputs, the drought in some parts of the region and the unstable maize market," said Mr Andrew Rotich, a farmer from Cherungany, Trans Nzoia County.

Outbreaks of armyworms have been reported in Bumula, Kabuchai, Kimilili, Webuye East, Webuye West and Kanduyi in Bungoma County.

County Director of Agriculture Fredrick Wotia said the new type of armyworms is from North and South America. He called on farmers to contact agricultural extension officers on the type of pesticide they should use.

A farmers contracted by Kenya Seed Company to grow seed maize, Mr Elkana Lumani, said he risks incurring huge losses since his efforts to control the pest on his 200-acre farm was unsuccessful.

Agriculture Cabinet Secretary Willy Bett noted that the armyworm poses a great danger to the country's food security with Kenya Seed also having a challenge in producing seed.

"We cannot run away from the fact that this challenge is almost becoming a national disaster since some parts of the country known for maize production have also been hit by drought," said Mr Bett in Trans Nzoia yesterday.

The national government has launched a multi-institutional initiative in the war against the disastrous pest, which has high tolerance to most pesticides.

The initiative will see all agricultural research institutions come up with various approaches.

The Trans Nzoia County government has set aside Sh45 million for fighting the pest, which could wipe out more than 500 hectares of maize plantation in the region.

"Our first priority is to sensitise farmers on how to identify the worm, through field extension services," said Deputy Governor Stanley Taru

Pest menace

ARMYWORM INVADES

Some of the counties where the armyworm has been reported:

1. Trans Nzoia
2. Kakamega
3. Bungoma
4. Uasin Gishu
5. Kwale
6. Taita-Taveta
7. Nandi
8. Makueni
9. Vihiga
10. Busia
11. Kisumu

Interventions and Achievements

Interventions mitigate effect of FAW in Kenya

Example of appreciation of efforts in print media

…..something has been done!

SEEDS OF GOLD

pests

MES>> USERS SHOULD ALTERNATE THE PESTICIDES TO PREVENT BUILD-UP OF RESISTANCE

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Y EVELYN LUSENAKA
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and Uasin

Agriculture CS Willy Bett (second left) on a farm last month in Kitale affected by the pest. FILE | NATION

Good progress made in fight against armyworms

variety of
pasture,
toes, col-
spinach,
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portant food crops in Kenyan households.

The good news is that pesticides offer an effective means to quickly control this voracious pest. However, the Agrochemicals Association of Kenya (AAK) supports an integrated pest management approach for sustainable control of the pest.

The Ministry of Agriculture initiated this approach recently when it convened a multi-institutional team comprising agrochemicals companies, researchers, Pest Control Products Board (PCPB), International Centre of Insect Physiology and Ecology (ICIPE), Food and Agriculture Organisation (FAO) and Centre for Agriculture and Bio-

Intervention Points in Kenya

1. Harnessing Technical Expertise to guide management of FAW
2. Assessment of FAW infestation and spread in Kenya
3. Issuance of alerts/advisories
4. Consolidation & dissemination of technical information materials
5. Information sharing & awareness creation
6. Authorization of pesticides for interim use & efficacy evaluation
7. Launching of nation-wide control campaigns & emergency response
8. Research to bridge knowledge and technological gaps

1. Harnessing Technical Expertise

- Multi-Institutional Technical Team (FAW-MITT) formed
  - Several institutions are represented in the team
  - Team met in January 2017 - information about FAW in some African countries
  - Team has been instrumental in development and implementation of strategies of managing FAW

KALRO Kenya Agricultural & Livestock Research Organization

KENYA PLANT HEALTH INSPECTORATE SERVICE • KEPHIS •

PEST CONTROL PRODUCTS BOARD

aak

HARAMBEE

JAS Joint Agriculture Secretariat

CABI

icipe African Insect Science for Food and Health

Food and Agriculture Organization of the United Nations

2. Assessment of FAW infestation and spread in Kenya

- **Assessments done by FAW-MITT to guide plans for action**
  - **March 2017:** First survey - confirmation of FAW in 3 counties (Trans Nzoia, Busia and Bungoma)
  - **Sept 2017:** Rapid survey in 20 counties
  - **May-August 2018:** Status appraisal

3. Issuance of alerts/advisories

- **Alerts issued to counties and general public**
  - To trigger surveillance, resource mobilization and action

DAILY NATION | Thursday April 13, 2017 — Advertiser's Announcement | 19

REPUBLIC OF KENYA

MINISTRY OF AGRICULTURE, LIVESTOCK & FISHERIES

ALERT ON THE FALL ARMY WORM (SPODOPTERA FRUGIPERDA) OUTBREAK IN KENYA

The Ministry of Agriculture, Livestock & Fisheries announces the invasion of the Fall Army Worm (FAW) in Western, North and South Rift regions of the country in counties such as: Baringo, Bungoma, Busia, Kakamega, Kericho, Nakuru, Nandi, Narok, Siaya and Uasin Gishu. This pest causes massive damage to maize but also attacks other cereal crops e.g. sorghum, rice, millet, wheat and barley. Pasture grasses e.g. Bermuda, hay and Napier grasses are also attacked. Other susceptible crops include: kales, cabbages, legumes or pulses, bananas, tomatoes, capsicum, ginger, spinach, amaranths, onions, sugar beet, citrus, cucumber and sunflower.

Characteristics of the Fall Armyworm moth

Metamorphosis

The FAW is a migratory pest which undergoes a full **eggs-larva-pupa-adult** metamorphosis. The female lays tiny eggs in masses of 150-200 which are covered with protein sheath to protect them from attack by natural enemies and pesticides. The larval stage is the most destructive phase, feeding on soft plant tissues. Adult Moths are active at night and mates in the evening.

How to identify FAW

The fall armyworm caterpillars are green, brown or black in color depending on development stage. A mature caterpillar has a distinct **white line between the eyes, which form an inverted "Y" pattern on the face** (this is seen when the worm is placed facing you). In addition, there are pronounced **four black spots** aligned in a **square** on the top of the **8th segment** near the back end of the caterpillar.

Signs & Symptoms of FAW on maize

Larval frass

"Y" pattern on head of Armyworm larva (Photo: desiree vanheerden syngenta

Distinct 4 black dots on 8th segment

Damage on the funnel by larvae (Photo: Moi Kasina, KALRO, Kenya)

Damage Caused by FAW

Fall armyworm is a ferocious feeder which upon invasion quickly destroys maize crop. The caterpillars feed more on the outer foliage, making large and ragged holes. Severe feeding gives the appearance of maize that has been damaged by hail. After feeding, FAW caterpillars leave behind large amounts of moist sawdust-like frass near the whorl and upper leaves. The caterpillar also damages the silk and tassles therefore interfering with grain set and ultimate yields.

Economic impact of FAW in Kenya

Attack on maize at early vegetative stage can result into 100% crop loss if no control measures are taken. The occurrence of this pest in the key seed maize production areas compounds the problem. Maize is the most important staple food crop in Kenya, with a per capita consumption of more than 78 kg per annum. Currently an approximated 11,000 Ha of off-season maize has been infested. Therefore this pest has the potential to cause national food insecurity unless the appropriate measures are implemented. Thus this pest is of great socioeconomic importance and warrants urgent attention.

How is FAW SPREAD?

The adult moth has capacity to fly over 30km in one night drifting through air current. The female lays 1500-2000 eggs in her life time, enabling the pest to quickly establish in new areas. Movement of infested plant materials will aid in translocating the different FAW stages within the same farm or to distant locations. In Kenya, long distance movement of green maize for roasting is a thriving business, which poses serious threat in spreading the pest.

In responding to the FAW invasion, the Government has:

1. Issued a national alert to all counties and disseminated necessary technical information
2. **Constituted a multi-institutional team to offer technical guidance in the fight against this worm comprising of** Ministry of Agriculture, Kenya Agricultural & Livestock Research Organization (KALRO), Kenya Plant Health Inspectorate Services (KEPHIS), Centre for Agriculture and Bioscience International (CABI), Pest Control Products Board (PCPB), International Centre Insect Physiology and Ecology (ICIPE), University of Nairobi and the Food and Agriculture Organization (FAO)
2. **Developed a national intervention plan which focuses on:**
   (a) Awareness creation
   (b) Capacity building of extension service providers
   (c) Pest surveillance & monitoring
   (d) Execution of control operations
   (e) Research & Development
3. Engaged by visiting farmers and stakeholders partners for concerted efforts by all towards containing the outbreaks of this pest

How to manage FAW

Farmers are encouraged to use a combination of the following management options:

Early warning

For early warning and detection of low numbers of FAW presence, farmers should mount at least one pheromone trap per Ha

Monitoring/scouting

Scouting for signs and symptoms of this pest should start one week after crop germination

Mechanical control:

- Deep ploughing exposes the pupae to predators and solar heat
- Planting varieties with hard husk cover provides a physical barrier
- Use hands to squash the caterpillars when infestation is in small farm plots. In addition, collect and drop caterpillars in hot water to drown them (Remember killing one caterpilar prevents multiplication of more than 1500 -2000 new caterpillars after a period of less than 4 weeks).

Cultural methods

Farmers should:

- Plant early and adhere to regional planting calendar, avoid late and off-season planting
- avoid planting new crop near infested plants
- use recommended fertilizers and keep fields weed-free to boost plant vigor

Mass trapping

Set up 4-6 FAW Pheromone traps per Ha to catch adult male moth, prevent mating and ultimately suppress the moth population build up

Chemical Control

For effective control in maize, spray at least three times starting at two weeks after emergence, at knee high and just before tassling. Spraying should be done late in the evening when caterpillars are most active.

Recommended list insecticides for management of Fall Army Worms.

	ACTIVE INGREDIENT + AMOUNT/L or Kg	TRADE NAME
1.	Gammacyhalothrin 60g/L	VANTEX 60 CS Capsule suspension
2.	Flubendiamide 480g/L	BELT 480 SC
3.	Chlorantraniliprole	CORAGEN 20SC
4.	Indoxacarb 150g/L	AVAUNT 150 BC (STEWARD 150 EC)
5.	Acephate 97g/Kg	ORTHENE Pellet
6.	Carbosullan 250g/L	MARSHAL 250EC
7.	Alpha-Cypermethrin 100g/L	FASTAC 10 EC emulsifiable Concentrate
8.	Chloranthraniliprole	VOLIAM TARGO d63 SC
9.	Lufenmon 50g/L	MATCH 50 EC (Serba 50EC)

Restrict movement of infested plant materials

The public is discouraged from moving infested plant materials to areas where the pest has not been reported.

For more information on the Fall Army Worm, farmers and those interested are requested to contact the Ministry's Plant Protection Division (PPSD) - **ppsdoffice@gmail.com** or the nearest county agricultural offices.

Invasion > Ministry advises farmers on use of pesticides

Armyworm alert issued after pest spreads wings

Farmers in some regions fear losses after young crops attacked by invasive caterpillars

BY NATION TEAM
newsdesk@ke.nationmedia.com

An alert has been issued on the invasion of armyworms.

The agriculture ministry said the pest is in North and South Rift, Baringo, Bungoma, Busia, Kakamega, Kericho, Nakuru, Narok, Nandi, Siaya and Uasin Gishu.

The worm is in the larvae stage, which is the most destructive as they feed almost continuously. Adult moths are mostly active at night, mating in the evening.

According to the ministry, when maize is attacked it can lead to 100 per cent crop loss.

Approximate 11,000 hectares of maize has been infested, which will lead to a food shortage to compound the drought.

The government is urging farmers to mount a pheromone trap per hectare for early detection of the army worms. They should also look out for the signs and symptoms of the pest one week after crops have germinated.

They have also been advised to practice deep ploughing, which exposes the pupae to predators and heat from the sun.

They should plant crops with hard husks which provide a barrier against the pests and to use their hands to squash caterpillars or collect and drown them in hot water on small-scale farms.

In Kisii County, farmers are a worried lot following armyworm and stalk borer invasions.

The Agriculture and Training Institute in the county is in danger of losing their maize crop.

Factbox

FEROCIOUS PESTS

The FAW can be identified by their green, brown or black colour depending on the stage of development. A mature caterpillar has a white inverted 'Y' shape between the eyes and four pronounced black spots on its eighth section towards the back end.

The adult moths can fly up to 30km a night being carried by the wind. Females lay between 1,500 to 2,000 eggs in their lifetime, laying 150 to 200 at a time.

Mr Mulei Mutiso, the county deputy agricultural director for crops, said the worm has so far been seen in Bonchari, Bomachoge Chache, Kitutu Chache North, Nyaribari Masaba, Bonchari and Nyaribari Chache.

He said most farmers discovered the pests too late when they had damaged their crops beyond salvage.

Farmer Morris Marube said he found the pests two weeks ago when the media aired news on the infestation in Trans Nzoia.

He said he has not used any insecticide as he does not have accurate information about the armyworms and lack of money.

County agriculture executive Vincent Sagwe said the armyworms are in the larvae stage, and have infested approximately 10 per cent of farms.

He said plans to secure pesticides for farmers are underway.

He said the county has appealed for support from the national government for pesticides.

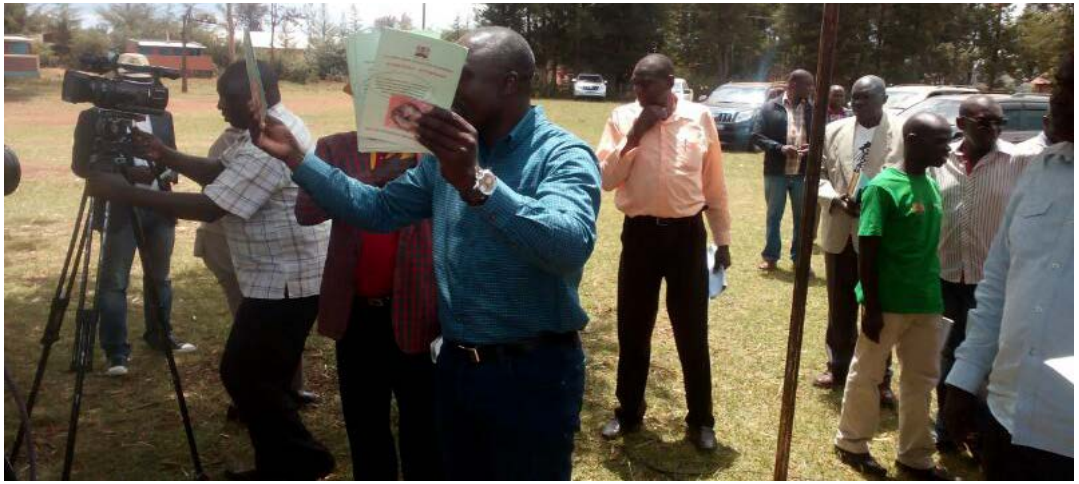
"This is an emergency. The department has identified pesticide vendors as we wait for the national government's response," Mr Sagwe said.

Mr Sagwe said they have sent out extension officers to train farmers on how to use the pesticides.

Reports by Agewa Magut, Elgar Machuka and Agrrey Omboki

4. Consolidation and dissemination of technical information materials on FAW

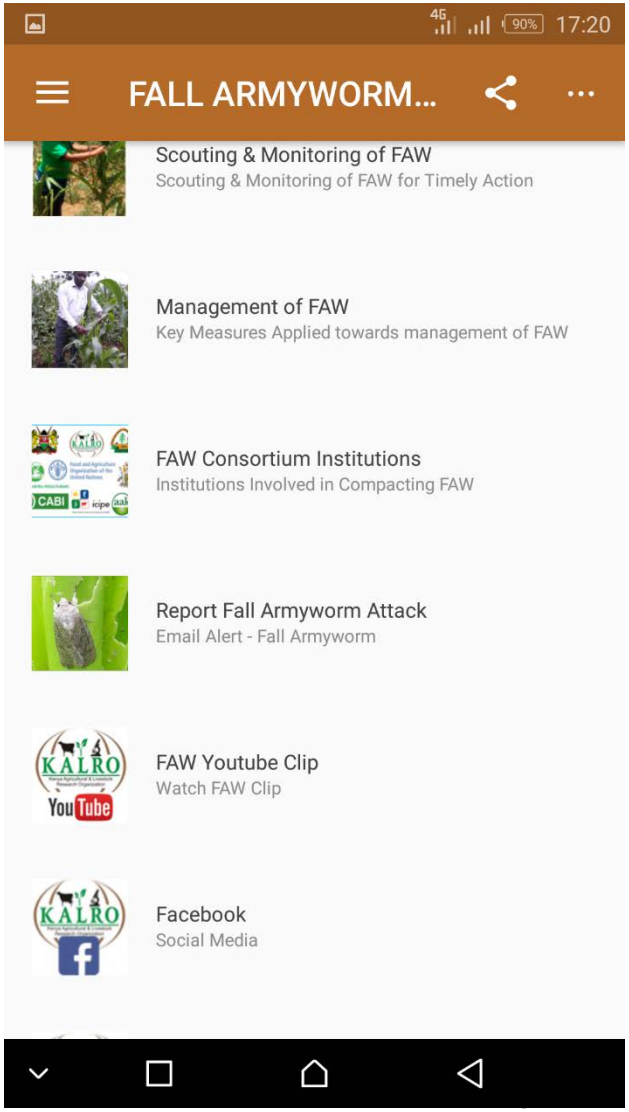
- Brochures
- Posters
- Factsheets
- Green and yellow list



5. Information sharing & awareness creation

Several channels used

- Mass media – radio, TV, Mobile Apps, Web publishing
- Training & extension
- Technical support e.g. through Plant clinics



6. Authorization of pesticides for interim use & subsequent evaluation for registration

Active Ingredient (AI)	Pesticide Examples(s)	Pesticide Class	Mode of Action	Who Classification
Gamma-cyhalothrin	Vantex 60CS	Pyrethroid	contact	NL (not listed)
Alpha-Cypermethrin	Bestox 20EC, Navigator 100EC	Pyrethroid	contact	II
Flubendiamide	Belt 480c	Ryanoid	systemic	III
Chlorantraniliprole	Coragen 20SC,	Ryanoid	systemic	U
Indoxacarb	Merit 150SC, Avaunt 150SC	Oxadiazine	contact	III
Acephate	Ortran 97, Orthene pellet	Organophosphate	contact/systemic	III
Carbosulfan	Marshall 250EC	Carbamate	systemic/contact	II
Lufenuron	Heritage 5%, Legacy, Match	Benzoylurea	systemic	II
Lambda Cyhalothrin	Duduthrin, Karate	Ryanoid	Contact	II
Abamectin + Chlorant-raniliprole	Voliam Targo 063		Contact	II

Products evaluated and registered (as at Sept 2018)

1. **Spinetoram 120g/L**
2. **Acephate 750g/L**
3. **Chlorantraniliprole 100g/L + Lambda Cyhalothrin 50g/L**

Note: Several others being evaluated

7. Launching of nation-wide control campaigns

- Provision of pesticides & personal protective equipment (PPE) for emergency use
- Training and demonstrations on control: national & county governments and other stakeholders

8. Bridging knowledge & technological gaps

No.	Initial areas of focus
1	Status and socioeconomics of fall armyworm
2	Tools and techniques for surveillance, monitoring and reporting
3	Insecticides - effectiveness, application regimes, socioeconomics & safety
4	Biopesticides, entomopathogenic isolates and botanical extracts
5	Diversity and host range of fall armyworm
6	Maize germplasm with resistance
7	Ecosystem management practices

Summary Status of FAW in Kenya

❖ Interventions reduced the levels of panic

- ❑ During the 2017 April-May period, 250,000 Ha of maize crop was affected
- ❑ Fiscal losses (2017):
  - ➢ 1.05 million 90-kg bags
  - ➢ worth KES 3.15 billion
- ❑ Losses (20%) were reduced through various interventions
- ❑ FAW reported in 43 out of 47 counties (August 2018)
  - ❖ **2018:** 200,000ha infested
    - ➢ Losses <5%
- ❑ 2019 – planting season starting in March and FAW still remains a threat

Sustainable management initiatives

…. we need to do more to succeed against FAW

…hence the need for a National FAW Management Strategy

Fall Armyworm Management Strategy

- Strategy developed by FAW-MITT

Goal: Sustainable maize production for enhanced food security, employment creation and improved livelihoods [addressing national development goals and Sustainable Development Goals].

Purpose: Reduce crop losses associated with FAW infestation [lose less; manage costs of production].

Components of FAW management strategy

1. Enhancing awareness, knowledge and skills
2. Impact assessment & immediate actions
3. Surveillance, early warning and reporting
4. Bridging knowledge gaps
5. Policy and regulatory support
6. National implementation and coordination mechanism

Critical Considerations for Success

- ✓ Team-work and strengthening of collaborative efforts are paramount in dealing with emerging pests/diseases.
  - ❖ Given the diversity of institutions involved, action and reaction time is sometimes very long

- ✓ Need to innovatively utilize available knowledge, skills and technologies.
  - ➢ Integrated management of pests should be emphasized, always.
    - ❖ Compatibility of various options under prevailing circumstances

- ✓ Policy and financial support should be accorded to an institutionalized "*Standing Committee on Crop Pests and Diseases*".
  - ❖ Readily available resources are vital in dealing with outbreaks

Acknowledgements

- FAW-MITT member institutions
- Government of Kenya – Treasury, Ministry & Technical Departments, County Governments
- Food and Agriculture Organization of the United Nations (FAO)
- US Agency for International Development (USAID)
- African Union (AU)
- East Africa Community
- Various other development partners
- WTO – SPS meeting organizers and sponsors

Thank you