

# The danger of a single story: The case of Fall armyworm

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# Content



Fall armyworm invasion and the damage potential



Fall armyworm biology and damage potential

Biology of cereal stemborers in relation to FAW



Pest invasion and displacement of native pest



The danger of a single story lesson from Chimamanda Adiche



Abundance and damage potential of FAW and stemborers on maize and sorghum in mono-cropped maize and Push-pull technology



Conclusion and recommendation



# The Fall Armyworm *Spodoptera frugiperda*

- Fall armyworm *Spodoptera frugiperda* is a lepidopteran pest which originated from the Americas;
- It has a wide host range (>80 plant species) but with major preference for maize
- Its lifecycle lasts 1-2 months (depending on weather)
- Female can lay up to 1000 eggs
- Moth can move up to distance of 500 km before oviposition; this distance can reach >1000 km with suitable wind.



# Economical Impact of Fall Armyworm in Africa

- Economic Impact on maize: US\$6.2 billion annually (CABI, 2017)
- It is believed that more than 1.5 M ha of maize is currently affected in Nigeria, Ghana, Kenya, Ethiopia, Zambia, and Zimbabwe.
- The potential impact of FAW on continental wide is estimated between 8.3 and 20.6 million tonnes per year of total expected production of 39 m tonnes per year ->losses
- The potential economical loss ranges US\$2.5 and US\$6.1 billion per year of total expected value of US\$11.5 billion per year (CABI, Sept 2017).



# Expansion and Status of Fall armyworm

January 2016



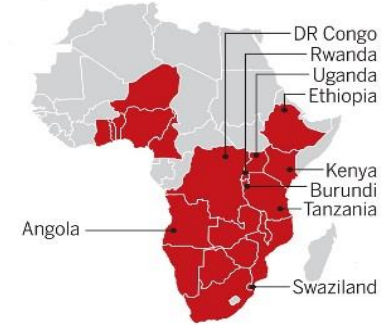
November 2016



February 2017



April 2017



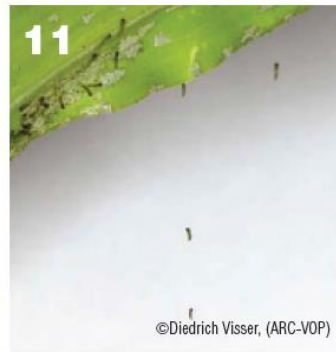
January 2018



Source: Eric Stokstad (2017), *Science* 356 (6337), 473-474



10 Feeding by young caterpillars results in semi-transparent patches on the leaves called windows.



11 Young caterpillars can spin silken threads which catch the wind and transport the caterpillars to a new plant.



12 Feeding through the whorl can cause a line of identical "shot" holes, when the leaf unfurls.



13 As they develop, Fall armyworm move permanently into the whorl. This means that it is difficult to detect early infestations.



14 Feeding can cause the whorl and upper leaves to be a mass of holes, ragged edges, and caterpillar poo (called "frass").



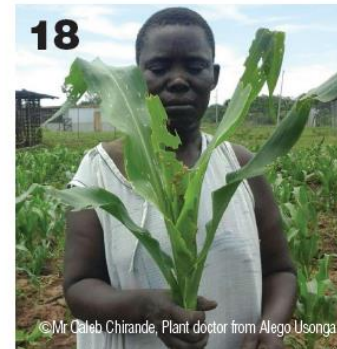
15 The caterpillars usually burrow into the side of the cob.



16 Fall armyworm infestation causes stunting and destruction of developing tassels and kernels, which reduces grain quality and yield.



17 When the caterpillars burrow into the side of the cob, damage to grains can lead to rot.



18 Holding a maize plant damaged by Fall armyworm.

# Fall armyworm is in Africa to stay



Abundance of **maize** throughout the year



Availability of alternative hosts  
throughout the year



Favourable weather condition



Weaker control measures

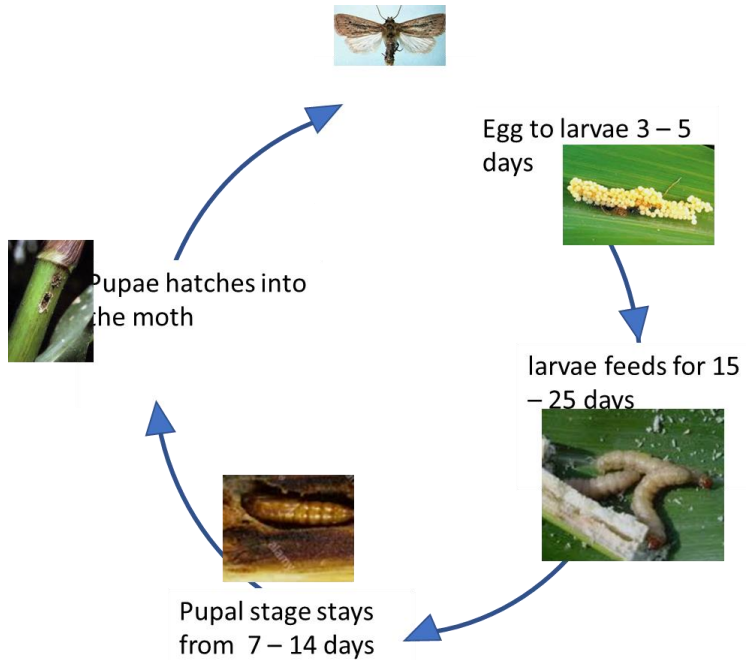


# Fall armyworm is a priority pest

- The presence of Fall armyworm diverted the attention of stakeholders towards control of the pest on maize;
- In the process little or no attention is being given to the already existing pests

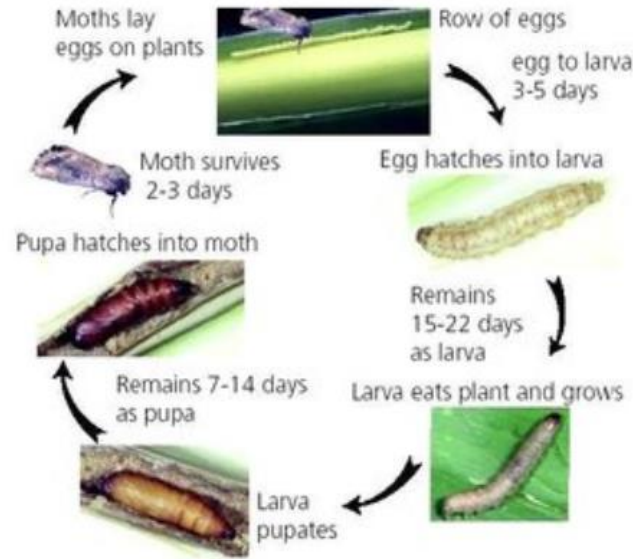


# Life cycle of major cereal insect pests and the comparative advantage to out compete



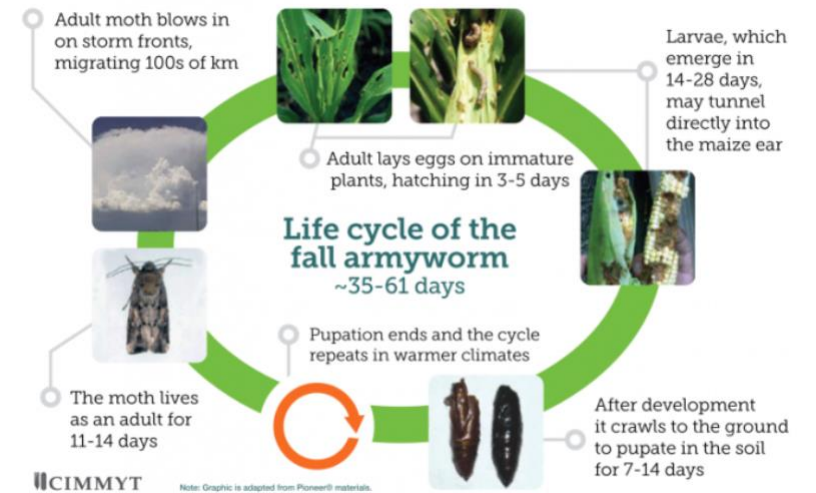
African stem borer  
*Busseola fusca*

African



Spotted stem borer  
*Chilo partellus*

Asian



Fall armyworm  
*Spodoptera frugiperda*

American

# Damage symptoms



African stem borer  
*Busseola fusca*



Spotted stem borer  
*Chilo partellus*



Fall armyworm  
*Spodoptera frugiperda*

# Pest displacement



Stem borer (*Busseola fusca*) Spotted stem borer (*Chilo partellus*)

Fall armyworm (*Spodoptera frugiperda*)

# Co - willing

## Vision

*To be a motivational source of inspiration and co-operation towards the fulfillment of the UN Sustainable development Goals (SDGs) in Africa*



# The danger of a single story by Chimamanda Adiche



[https://www.ted.com/talks/chimamanda\\_adichie\\_the\\_danger\\_of\\_a\\_single\\_story?language=en](https://www.ted.com/talks/chimamanda_adichie_the_danger_of_a_single_story?language=en)

# The lesson

- Wrong conclusions are made if the information is comprehensive
- Conflicts among communities (ethnic violence) or neighboring countries arise due to lack of understanding about the other side;
- African scholars are challenged to solve African problems with the knowledge gained from Europe and America;
- From diverse ecosystem and food source to few crops, from organic food to processed food. (Civilization is assumed as adopting from the west)
- The case of indigenous food crops substituted by exotic species for quick fix

# Questions that need answer for effective management options

1. What will happen to the already existing pest complex
2. How will other crops be affected due to the invasion of a new pest?
3. How efficient the biological control agents will be based on the biology and feeding behavior of the new pest?







# Objective of the study

*The major objective of the study was to determine abundance and damage potential of FAW on maize and sorghum and its effect on cereal stemborers under the mono-cropping and push-pull technology.*



# The treatments

Maize in a conventional push-pull technology;

Maize in a climate-smart push-pull technology;

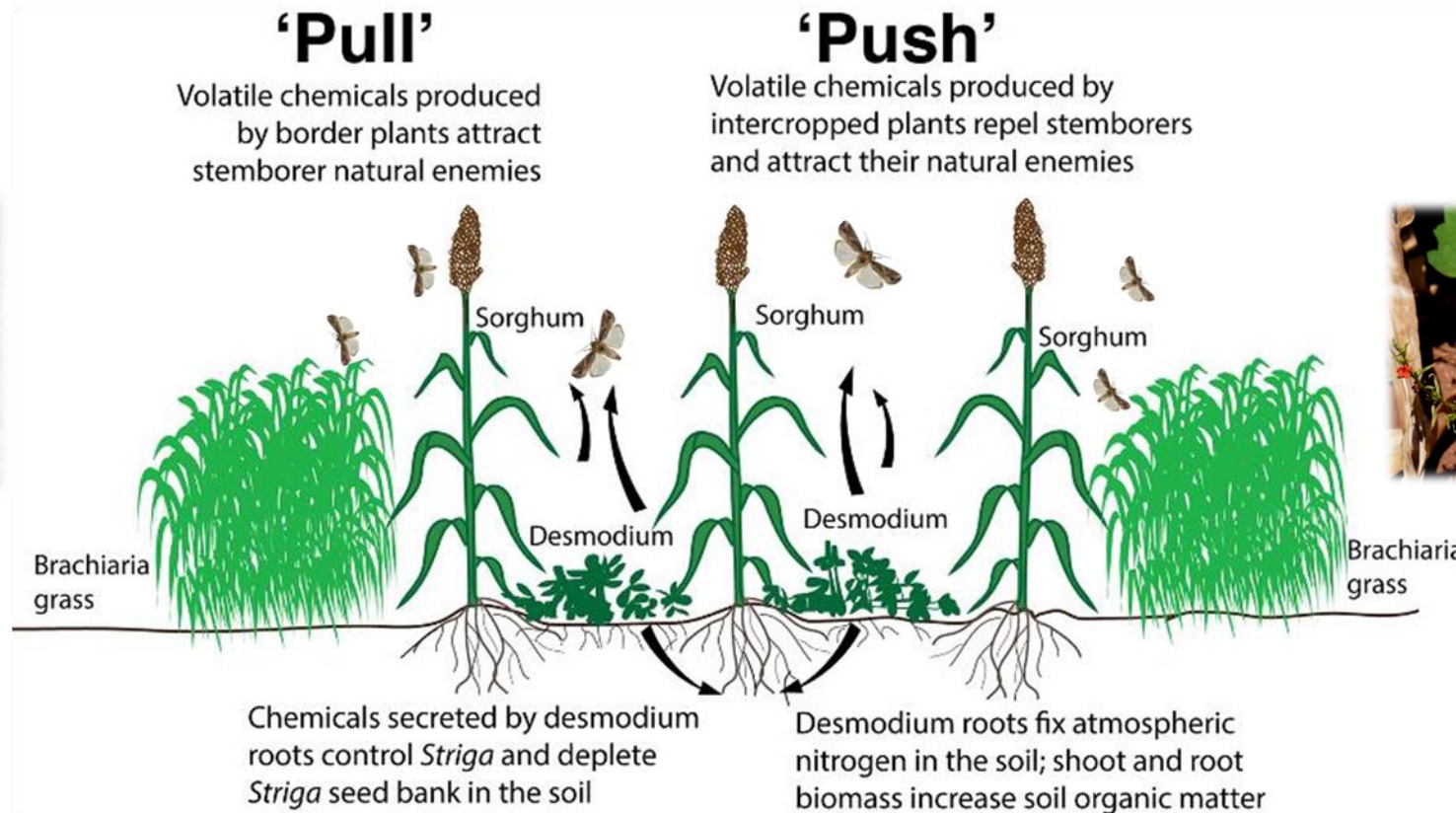
Sorghum in a conventional push-pull technology;

Sorghum in a climate-smart push-pull technology;

Mono-cropped maize and

Mono-cropped sorghum.

# Push-pull technology



# Climate-smart Push-pull technology

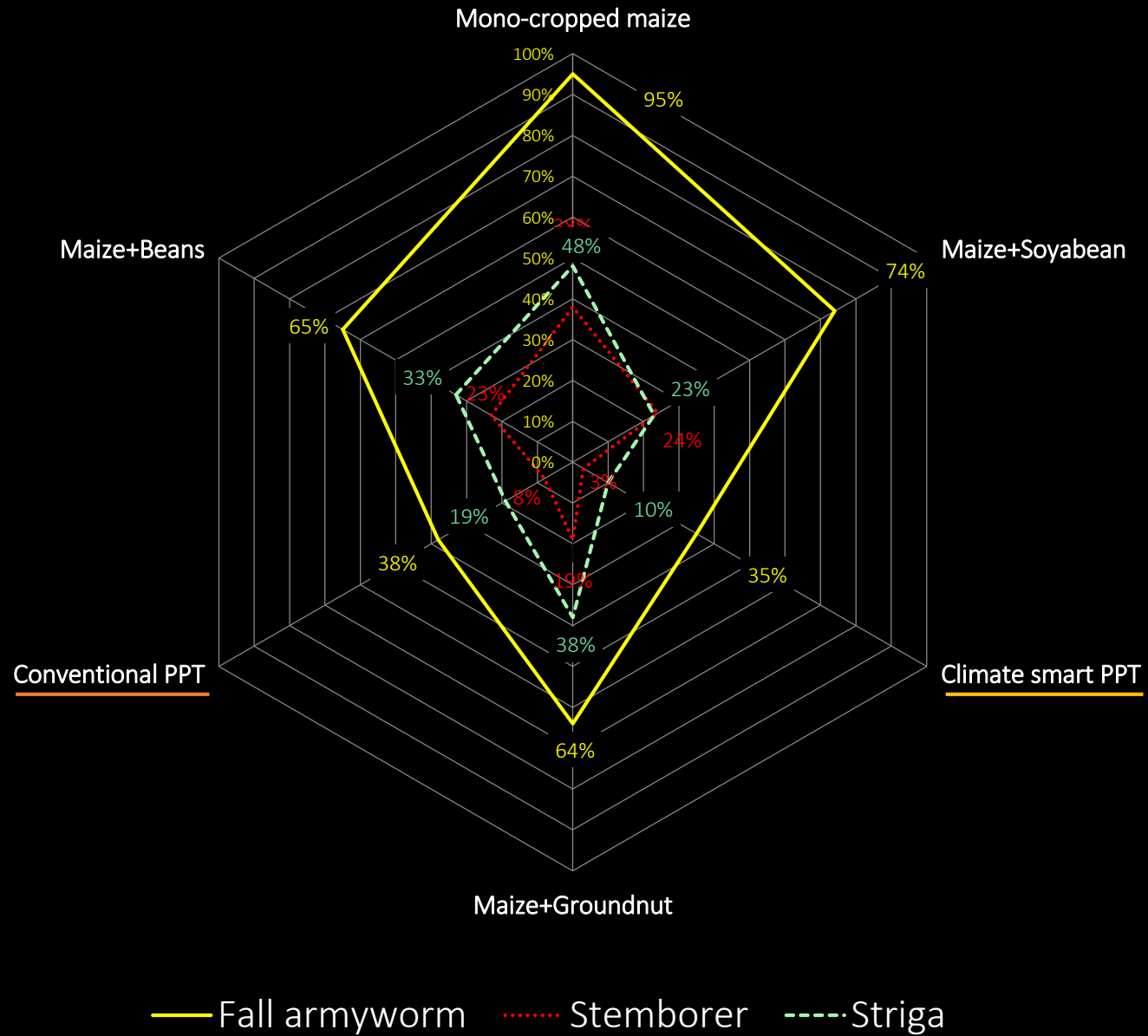


### Maize–Legume Intercropping and Push–Pull for Management of Fall Armyworm, Stemborers, and Striga in Uganda

Girma Hailu,<sup>a</sup> Saliou Niassy, Khan R. Zeyaur, Nathan Ochatum, and Sevgan Subramanian

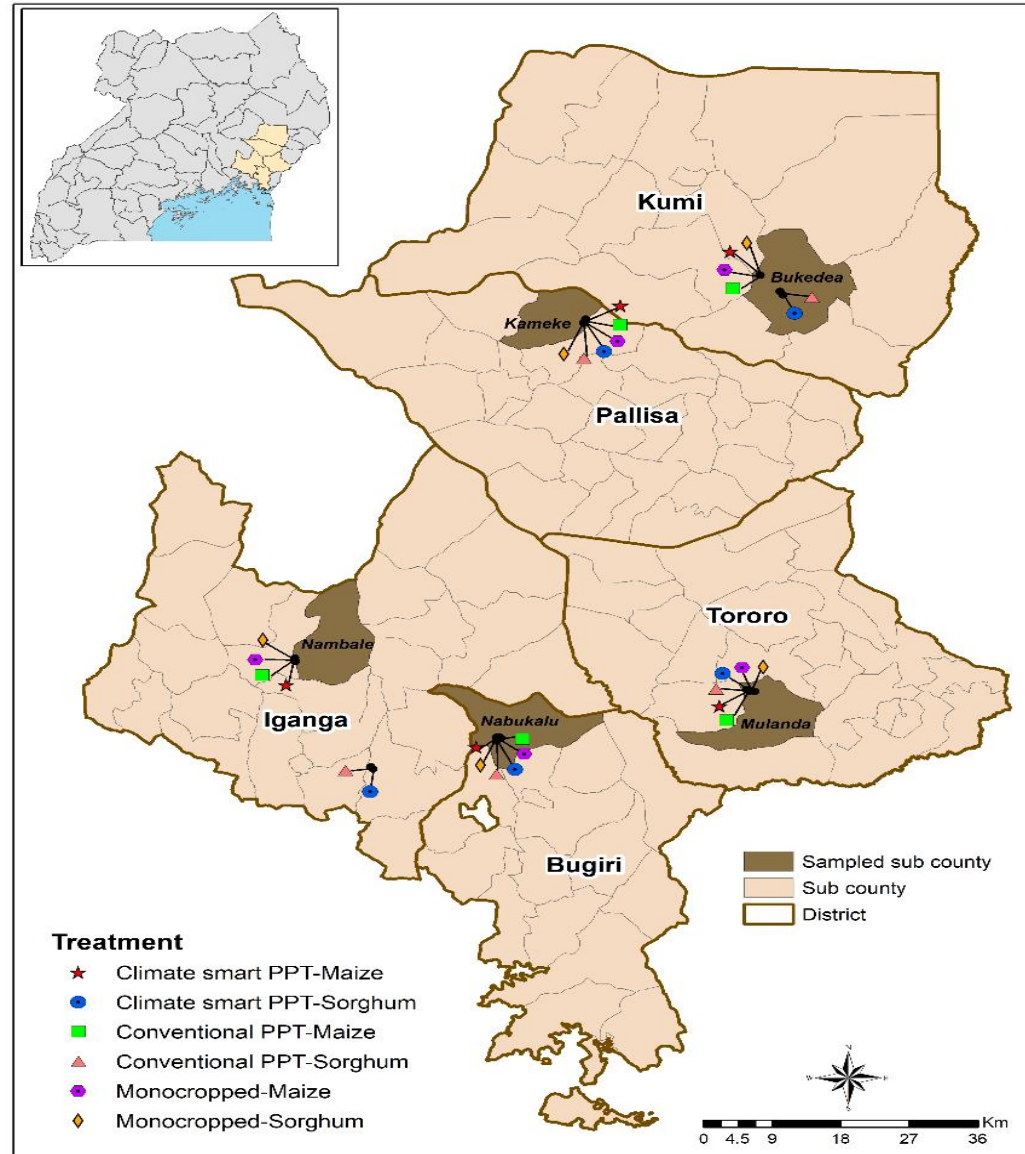
**ABSTRACT**  
 Maize (*Zea mays* L.) production in Africa is constrained by several biotic and abiotic factors. The recent occurrence of fall armyworm (FAW), *Spodoptera frugiperda* (JE Smith), a new invasive pest in Africa, has escalated the problem. Push–pull technology (PPT), proven to be effective for stemborers (*Chilo partellus* Swinhoe and *Bassella fusca* Fuller) and the parasitic weed striga (*Striga hermoniacica* Delile) management in Africa has been shown to provide good control of FAW. This study investigated if intercropping maize with edible legumes can also reduce the abundance of FAW. Six treatments including (i) climate smart PPT, (ii) conventional PPT, (iii) maize intercropped with bean [*Phaseolus vulgaris* L.], (iv) maize intercropped with soybean [*Glycine max* (L.) Merr.], (v) maize intercropped with groundnut [*Arachis nigrifolia* (L.) Walp.] and,

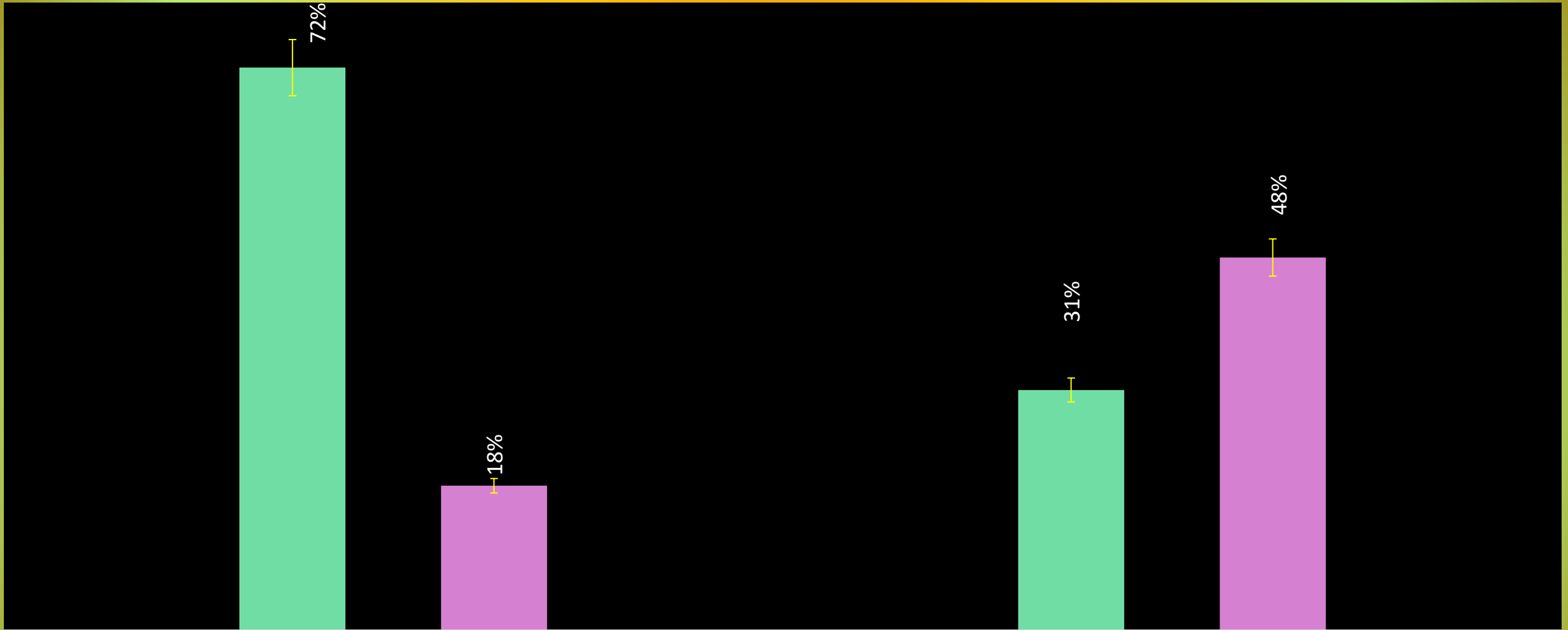
MAIZE RANKS first among cereal crops grown worldwide, and in Africa alone, the lives of more than 300 million people depend on it. Maize occupies 24% of the farmland (Okweche et al., 2013; Shiferaw et al., 2011; International Plant Biotechnology Outreach, 2017). Maize is one among the most important food crops produced in Uganda. According to the census report in 2008/2009, Uganda produced 1,108,554 t of maize (Ministry of Agriculture, Animal Industry and Fisheries, 2010). However, its low productivity coupled with a high population growth is a serious threat for food security (FAO, 2015). The production of maize is constrained by biotic and abiotic factors. Cereal stemborers and the parasitic striga weed are among the predominant pests (De Groote et al., 2004; Mugo et al., 2005). In East Africa, losses in cereal grain yields due to stemborers range from 44 to 50% (Robert et al., 2014).



— Fall armyworm    ..... Stemborer    - - - - Striga

# Study sites





MAIZE

SORGHUM

■ FAW ■ Cereal stemborers

## OVERVIEW: IMPORTANCE OF SORGHUM IN AFRICA

- *In terms of tonnage, sorghum is Africa's second most important cereal.*
- *The continent produces about 20 million tonnes of sorghum per annum, about one-third of the world crop.*
- *Sorghum is the only viable food grain for many of the world's most food insecure people.*
- *The potential for sorghum to be the driver of economic development in Africa is enormous.*

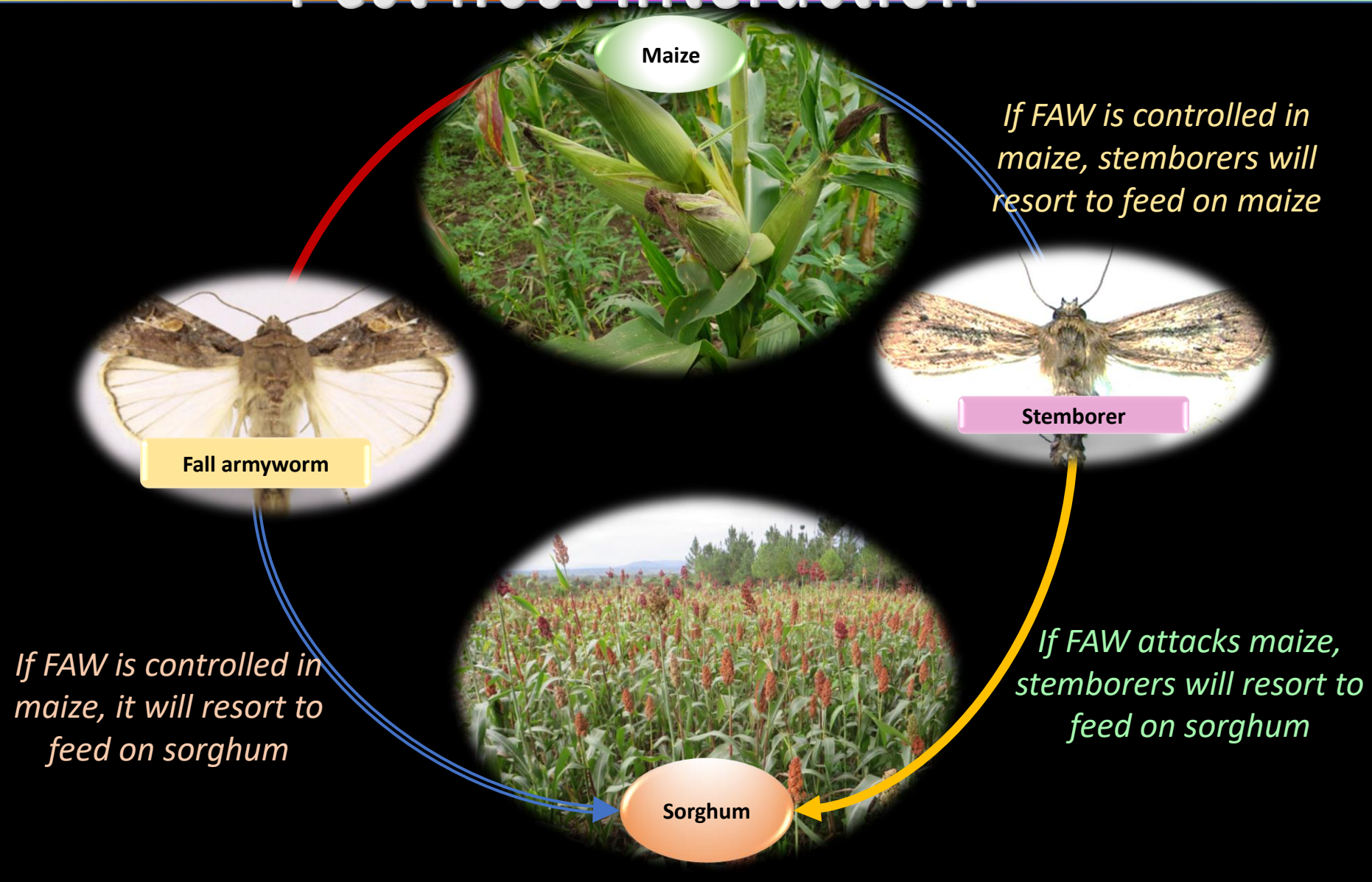


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# Pest host interaction



# Conclusion and recommendation

- Focusing only on a single pest and crop will not provide effective and sustainable production for generalist pest (multi-host insect pests)
- FAW is displacing cereal stemborers from maize
- Displaced cereal stemborers are resorting to feed on sorghum
- IPM strategies need to take into account the biology and behavior of complex pests
- The FAW control measures that work on maize should also work on sorghum in case there is a shift