



Communication, information sharing, and advisory services to raise awareness for fall armyworm detection and area-wide management by farmers

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Abstract

This is an opinion paper to the perspective paper “The spread of the Fall Army Worm *Spodoptera frugiperda* in Africa—what should be done next?” from the “Section Plant Protection in the Tropics and Subtropics” at the 61st German Congress of Plant Protection, held at the University of Hohenheim, Germany, on 11 September 2018. It highlights the best approaches in communication, information sharing, and advisory services to raise awareness for fall armyworm detection and area-wide management by farmers.

Keywords Invasive species · *Spodoptera frugiperda* · Knowledge management · Agricultural extension

The pest problem

Alien species can cause serious problems to agricultural production because specific natural enemies often lack when they arrive in new ecosystems. Farmers and their families are among the most affected.

Farmers as well as local agricultural extension workers rarely know about the presence of newly arrived and spreading species until disastrous damage occurs. This scenario has also been observed for the fall armyworm invasion in Africa (FAW, Lepidoptera: *Spodoptera frugiperda*). FAW caterpillars insatiably feed on maize but can survive

on many other crops (Silva et al. 2017). Maize losses have been estimated at 2½ to 6 million US\$ in Africa in 2017 (Day et al. 2017). FAW has potential to cause losses from 8 to 20 million tonnes of maize every year in the absence of effective control methods (for 12 biggest maize-producing countries in Africa). This represents 21 to 53% of the annual maize production.

The awareness problem

The FAW is difficult for farmers to distinguish from other caterpillar pests, such as African armyworm (*Spodoptera exempta*), Beet armyworm (*Spodoptera exigua*), African cotton leafworm (*Spodoptera littoralis*), *Helicoverpa* species,

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or stalk (stem) borers such as *Busseola* and *Chilo* species (CABI 2017). The recent arrival of the Southern armyworm (*Spodoptera eridania*) may add to the confusion (Lopez 2018). Therefore, FAW may initially remain unrecognised aiding its population build-up. To mitigate this, dissemination of information on early warning and management practices to key stakeholders including farmers is essential. However, agricultural extension services may be limited in achieving quick and large-scale outreach.

The role of agricultural mass extension

CABI, working with in-country partners, utilises mass communication, information sharing, and agricultural extension services to aid detection and management of FAW at farm level.

Unlike face-to-face approaches such as farmer field schools, plant clinics, or extension worker field visits, mass communication enables broader and swifter outreach to farmers, often at a lower cost (Table 1).

Plant health rallies are one example of a mass extension approach. Rallies are series of larger community meetings (often 100–200 people) informing many farmers in a short period of time about an agricultural topic of widespread concern (Boa et al. 2016), here the identification and management of FAW. They are pre-advertised through local radio or village announcements. Such plant health rallies are successful in a number of countries (e.g. Uganda, Kenya), but success may depend on local cultural aspects or legislative constraints. They are usually governmental campaigns (national or local) or NGO actions; some countries involve the army or large community actions (e.g. Rwanda).

Media-based mass extension approaches can include farmer-focussed television or radio programming (e.g. Zambia, Kenya), dissemination of printed materials such as posters (e.g. Uganda, Ghana, Kenya, Ethiopia, Madagascar, Mozambique), sharing of information via mobile platforms using SMS or Interactive Voice Response (IVR) technologies (e.g. Uganda, Kenya) or social media (e.g. WhatsApp/Telegram groups, e.g. Zambia, Malawi, Uganda), and specific apps (e.g. Plantwise Factsheet App).

Table 1 Approaches of agricultural extension and their influence on raising awareness on invasive species and other major plant health problems (* low towards ***** high)

Action	Player	Outreach	Outreach speed	Regional impact	Farm impact	Costs	Sustainability
Mass extension							
Radio	Private/public radio stations, sometimes farmer radio,...	*****	*****	***	*	** (mainly initial)	***
TV	Private/public TV stations, sometimes farmer TV,...	*****	*****	****	**	*** (mainly initial)	***
Social media	Farmers, NGO, gov. and other extensionists, ...	*****	***	****	***	*	***
Mobile platforms (e.g. SMS, IVR)	NGO, gov. and other extensionists, ...	***	***	***	**	***	**
Webpages	Gov. bodies, NGOs, agri-businesses, education bodies,...	****	***	***	**	**** (mainly initial)	***
Apps	NGOs, agri-businesses, education bodies,...	****	***	****	***	**** (mainly initial)	***
Plant health rally	Gov. extension and communication bodies, NGOs, communities,...	****	****	**	**	**** (mainly initial)	*
Face to face extension							
Plant clinic	Extensionist, ...	***	**	*	****	***	**
Extensionist advice to farmer	Extensionist, agri-input dealers, commodity bodies, ...	**	*	*	****	***	**
Farmer cluster meeting	Farmers, extensionist, NGOs,...	*	**	*	****	***	**
Farmer to farmer	Farmers	*	*	*	****	*	****
Learning by doing							
Farmer field school	Extensionist, training bodies, NGOs, ...	*	*	*	*****	***	**
On field experience	Farmers	*	*	***** (long term)	*****	*	*****
	Farmer groups, women groups, ...	*	*	***** (long term)	*****	**	***

The role of advisory services

Ideally, all agricultural extension workers should be trained in FAW detection and management by trained in-country trainers, given the scale and potential impact of the pest. In countries where a large network of governmental front-line extension workers exists (e.g. Tanzania), this approach may be effective; but in others this may not be possible. The Plantwise program has enhanced access by farmers to extension services in relation to pest and disease identification and management through facilitation of plant clinics (Cameron et al. 2016; Romney et al. 2013). Other approaches with local impact might be community mobilisation such as through farmer groups, women groups, or village-based video shows (e.g. Uganda).

Over time, farmers will learn through their own experiences with the new pest. Although learning through experience takes times and impact is not reached soon, in combination with access to good information on evidence-based, effective and practical pest management techniques, this may have the most lasting impact at reducing the problem of FAW and at stabilising yields.

The role of information sharing

All the above needs to be supported by open-access information sources, and many are available on FAW (comprehensive list in Abrahams et al. 2017). Official reporting services include the IPPC official pest reports (www.ippc.int/countries/all/pestreport), EPPO reporting service and Pest Alerts (www.eppo.int/PUBLICATIONS/reporting/reporting_service.htm), as well as national sources. Help on FAW field diagnosis may come, among others, from the CABI invasives twitter feed, USDA-APHIS PestLens (<https://pestlens.info/>), IITA News (www.iita.org/iita-news), PestNet Listserv (www.pestnet.org), Plantwise WhatsApp/Telegram groups, and identification guides on the Plantwise knowledge bank (www.plantwise.org/knowledgebank). Monitoring and pest management advice can be found on the Lancaster University Armyworm Network (<http://www.lancaster.ac.uk/armyworm/>), CIMMYT MaizeDoctor (<http://maizedoctor.org/>), the Plantwise knowledge bank, Plantwise Factsheets Library app, and again from Plantwise WhatsApp/Telegram groups. Comprehensive locally adapted and practical pest management advice is usually compiled in pest management decision guides (also called green and yellow lists) following IOBC and Plantwise standards (e.g. www.plantwise.org/knowledgebank). To facilitate access to all of the available information in one place, CABI developed a “FAW information portal” through CABI’s open-access Invasive Species Compendium (CABI 2018, www.cabi.org/isc/fallarmyworm). It supports sharing of information resources from many key players in the fall armyworm response.

Lessons learnt

To manage food-security endangering invasions, such as by FAW, quick actions are needed, but “quick” can raise concerns. First, quick action is only possible if an enabling framework is available or created. This means a defined leadership and coordination, non-red tape legislation and plant health system structures, sufficient and free information sources, and exchange tools with a mass outreach as described above. However, the speed of actions may result in poor awareness materials (e.g. new invasives not sufficiently discriminated from local species, management options copied from other pests without sufficient knowledge). This may be overcome through including field experts from the area of origin of the alien species alongside those from the area of introduction. Furthermore, a balance must be found between (1) scientifically proving all area-of-origin pest management options in the area of invasion before advising farmers, which delays an urgent response, versus (2) copying and advising area-of-origin pest management options prior local testing, which allows quick response, but may not always have the desired effects. Finally, biopesticides or synthetic pesticides known from the pest’s area of origin may not be registered and available for new invasive species and/or the considered crop. This requires legislation that allows emergency measures, which is available in most African countries.

In conclusion, we believe that the serious impact of invasive alien species can be reduced, through effective, rapid, and widespread communication of information to farmers to identify and manage a new pest. This will likely not entirely solve the problem of fall armyworm, but it will contribute to stabilising yields and food security.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflicts of interest related to this study.

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