Fall armyworm update

Brief status report and commentary following attendance at the FAO Regional Consultancy 20-22 March Bangkok

Background and known distribution until mid-2018

The pest potential of the fall armyworm (*Spodoptera frugiperda* Noctuidae) has been known since European settlers changed food production patterns along the Atlantic coast of North America in the eighteenth century. It is now recognized as a potential pest of many crops, especially those grown in high input conditions. It has a host range of about 300 species.

In mid-2016 FAW was found on Islands 300 km from the coast of Gabon and in maize fields near Ibadan in Nigeria. It had been identified in most of sub-Sahelian nations by the end of 2017. Populations in some locations achieved pest status during this period.

In **July 2018** there were reports of FAW on corn from Karnataka in South India. Other reports from Karnataka suggest the infestation was established before July. Scouting in subsequent months tracked populations moving in a north-easterly direction into Maharashtra, Andhra, Odisha, and Telengana. It was found in Sri Lanka and Bangladesh in December 2018.

The FAO brought together in Bangkok a consultative meeting of 90 international and national representatives to review the FAW situation in Asia and to help the Asian delegates plan how to deal with what may follow. The timing was perfect and the manner in which the meeting was conducted will surely have long lasting benefits.

Participants in the Bangkok consultation from Myanmar and China reported that it had spread into their countries during the turn of this year. A false alarm in Nepal was caused by a misidentified outbreak of *Spodoptera litura.* The first report of FAW in Vietnam was confirmed in the first week of March. Officials in Pakistan, Thailand, Korea, Cambodia, Indonesia, Malaysia, The Philippines and the smaller Asian Nations remain on high alert and are in various stages of preparing contingency protocols.

One of the objectives of this consultative meeting was to help the newly invaded nations and those at risk, and move forward on the basis of the lessons learned.

Important background points

#1 Other *Spodoptera* species are endemic in Africa and would almost certainly have been mistaken for FAW before keen eyed experts realized they had found something new.

#2 FAW brought with it from the Americas genes for the resistance to carbamate, organophosphorus, organochlorine, and pyrethroid insecticides. These represent the commercial materials that are most likely to be applied to crops for the management of FAW in less developed and other nations. This is one reason why conventional approaches to the management of FAW have failed.

#3 The ability of noctuid moths (e.g. *Spodoptera* and *Helicoverpa*) to travel vast distances carried on nocturnal winds and their high fecundity also gives them the ability to reproduce explosively if natural control factors are impaired or absent, e.g., if new territory is encountered.

Sharing experience

The purpose of the meeting was to give Asian National programs the opportunity of learning from the African experience: 'technology transfer on a continental scale'. This is what emerged from a series of focused workshops.

- How best to monitor for new infestations: crop scouting, helped by specially designed phone apps (FAMEWS) and ever improving pheromone traps are the basis of monitoring. Chinese scientists monitor flying insects as a matter of national policy to predict pest outbreaks. They have increased vigilance because the crops at highest risk to FAW attack are in the North of China and the winds trend SSW to NNE at this time of the year.
- Assume the worst and put in place bureaucratic structures that can enable regional on farm activities.
- Ensure that there are scientists, technicians and field support staff who can distinguish between FAW and related species. Be aware that CABI UK can provide DNA confirmation.

FAW presents a *biosecurity* problem, and is not a quarantine issue. High flying moths, such as noctuids, are not a border issue. Once established in a new region FAW is virtually impossible to eliminate because it is resistant to so many conventional insecticides. Its response to newer chemistries is not fully known. Ad hoc and over-done applications of the former will put local human populations at risk and eliminate the natural control agents that will eventually reduce crop losses caused by this pest.

DON'T PANIC. This was the slogan that was repeated many times over the three day consultation. The damage caused by the caterpillars looks much worse than it seems. The best thing an adviser can say to a newly afflicted farmer is DO NOTHING, and then explain why and provide insight into low tech approaches.

Plants carry a lot of redundant leaf material that can be lost to herbivores before crop yields are impaired. African delegates agreed that yield loss estimates by farmers exaggerated the true situation. Groundnut plants attacked by *S. litura* in S India in the 1990s could withstand 80% defoliation without showing pod loss. Applying pesticides in this scenario induced further pest outbreaks by killing predators (Wightman JA 2018. Can lessons learned 30 years ago contribute to reducing the impact of the fall army worm Spodoptera frugiperda in Africa and India? Outlook on Agriculture 2018, Vol. 47(4) 259–269). This enforces the emphasis on farmer education. This is the bedrock of the 'FAO method'.

Clearly pest identification is the primary necessity, and this can be tied into demonstrating the other components of IPM. Pest density estimates are facilitated via the mobile phone FAMEWS software. IPM components include:

- Crushing the egg masses by hand.
- Early and simultaneous sowing of cereal crops.
- Planting crops (and trees) strategically to encourage natural enemy build up (push-pull, functional diversity, and agroforestry approaches).

- Application of locally produced bio-pesticides – e.g., preparations of neem or other insecticidal or repellent plants.
- Village level preparation of pathogen formulations (NPV, Bt, Metarhyzium, etc.), and
- Application of 'local' and less understood materials to plants – wood ash, soil, soaps, and others. Farmers and their supporters report successes.
- Bird perches inserted into crops may helpful if predatory birds are in the vicinity.
- It is anticipated that locally adapted FAW resistant varieties will become available.

The strategy is to slow down the spread of FAW, at the same time allowing endemic parasites and predators (including birds) to adapt to and exploit this new host. New commercial pesticides will have a place if they are economically relevant and do not interfere with natural mortality.

Delegates with knowledge of the pan-African situation were quietly optimistic that this multi-prong IPM approach is working. Damage levels in the last rainy seasons were lower than anticipated, but the commentators add that this could have been due to rainfall patterns that favoured the crops and suppressed the FAW.

The experience of this adviser is that the adoption of sustainable and effective FAW management technology by millions of farmers will only happen if the pool of **information** available is converted to their joint bank of **knowledge** by dedicated and trained activists from both sectors - NGO and Government. The task is huge especially for nations that are already challenged in the food security sector.

What about the at-risk nations?

The pattern of dispersal of noctuids moths is for fertile females to get carried away from established outbreak areas on wind currents. These form outlier colonies, and so the process goes on.

What we see to date in SE and E Asia is the start of this process. The question is what happens next. The trend is for strong monsoon winds from the SW to be followed about six months later by weaker winds from the opposite direction. This implies that there will be some blow back. This could happen in the next few months and will result in a certain amount of gap filling.

The southern tropical cyclone belt extends from the coast of Africa, cross the South of SE Asia including the North of Australia into the Pacific. Moths caught up in these huge vortices could land up thousands kilometres from where they started. These are seen as the greatest source of a risk to Australia, PNG and Timor, and perhaps even New Zealand. Corn is not a priority crop in these larger land masses (<MT 500 000 pa for all of Australia), but sorghum, sugarcane, and rice have significance and are susceptible.

The message for these nations coming from the Bangkok Meeting is the same – do not panic and try to impede the application of the 'old' insecticides. Allow natural enemy populations to build up. It sounds easy...

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